

20th INTERNATIONAL STRATEGIC MANAGEMENT CONFERENCE

SEPTEMBER 11-13, 2025

BELGRADE, SERBIA



PROCEEDINGS OF THE 20TH INTERNATIONAL STRATEGIC MANAGEMENT CONFERENCE

*“Leveraging Strategic Management for a Sustainable Digital
Economy”*

**PROCEEDINGS OF
THE 20TH INTERNATIONAL
STRATEGIC MANAGEMENT
CONFERENCE**

*Leveraging Strategic Management for a Sustainable Digital
Economy*

September 11-13, 2025, Belgrade, Serbia

Title: Proceedings of the 20th International Strategic Conference

Editor:

Ece Nur Polat, Gebze Technical University, Turkey

Publisher:

Institute of Economic Sciences
Zmaj Jovina 12, 11000 Belgrade, Serbia
Tel. +381 11 2623-055, 2622-357
www.iem.bg.ac.rs
ienoffice@iem.bg.ac.rs

For publisher:

Jovan Zubović, PhD, Director

Published by:

Institute of Economic Sciences, Belgrade

Circulation:

50

ISBN 978-86-89465-81-5

Online-only publication

The Proceedings Book is co-funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia

Statements of facts or opinions appearing in Proceedings of the 20th International Strategic Management are solely those of the authors and do not imply endorsement by the Organizing Committee or Publisher.

CC by:

Creative Commons Attribution-Noncommercial-No Derivative Works 4.0.

TABLE OF CONTENTS

KEYNOTE SPEECHES

- Using Neuroscience to Strategically Engage the Hearts and Minds of Consumers for A Sustainable Digital Economy (CORNELIUS BOTHMA)* 2
- Automation, Ai, And International Trade: Lessons from The Rise of Industrial Robots (ERHAN ARTUC)* 3

SHAPING THE FUTURE OF THE DIGITAL ECONOMY

- The Impact of Digital Equity in Healthcare Sector on the Sustainable Digital Economy (DARIJANA ANTONIĆ, IMRAN ASLAN, SLOBODAN STANIC)* 9
- Framing Digital Innovation and Sustainability Narratives Within the Digital Economy: Lessons from Top Technology Companies (IRGE SENER, YAVUZ SELIM BALCIOGLU, AHMET ANIL KARAPOLATGIL)* 16
- The Digitalized Economy and the Transformation of E-Commerce: Drivers and Research Trends (FULYA TASEL, EBRU BEYZA BAYARCELİK)* 25

DIGITAL MARKETING STRATEGIES

- User Interface Evaluation of Sales Applications in the Telecommunication Sector (HUSEYIN SELCUK KILIC, ZEYNEP TUGCE KALENDER, NUR BESER, SEVAN KATRANCIOGLU)* 37
- Perceptions of Instagram Posts in Kuwait's Banking Sector: Insights from Bank Marketing Managers and Consumers (MARCELLE DE LA ROCHE, FAIDON THEOFANIDIS, FATIMA ALLOUGMAN, ALEKSANDRA JOVANOVIC, VLADIMIR SIMOVIC)* 45
- The Effects of Digital Marketing Strategies on Purchase Intention: Mediating Role of Brand Awareness in the Aviation Industry (MELIKE ZEHIR, MUSTAFA KEMAL YILMAZ, HADDY FAAL)* 53

LEADERSHIP FOR TRANSFORMATION

- Digital Leadership as a Catalyst for Digital Transformation and Sustainable Digital Economies: a Mixed-Methods Research (ZEYNEP KAPTAN, BORA YILDIZ)* 65
- Sparkling Leadership's Role in Enhancing Gen Z Employees' Innovation and Self-Efficacy (ELIF BILGINOGLU, UGUR YOZGAT)* 74
- Comparison of Leadership Styles and Organizational Commitment Perceptions of Teachers Working in Giresun, Ordu and Trabzon Provinces in Terms of State and Private Schools (SELIM KOCA, KURTULUS YILMAZ GENÇ)* 91
- Collaboration Between Engineers and Managers: a Study in the Palestinian Manufacturing Sector (AYSAR EL NJOUM, PELIN VARDARLIER)* 104

FINANCE IN THE DIGITAL ERA

- Gender Diversity as a Risk Buffer: Corporate Governance and Financial Stability in Spanish SMEs* 114
(ANTONIO MINGUEZ-VERA, JOANNA HERNIK, LUIS A. PALMA-MARTOS, MARIA SAFITRI)
- Comparison of Countries with Socio-Economic Indicators According to Their Development Level* 123
(ASLI ORGERIM, MEHMET TEPELI, ADNAN KALKAN)
- Financial Sustainability: Importance and Functioning of Fintech Applications* 136
(YUSUF BAHADIR KAVAS, BATUHAN MEDETOGLU, ARIF SALDANLI)
- Uncovering Digital Maturity and Financial Performance Relationship in the Service Sectors* 140
(MUSTAFA K. YILMAZ, MINE AKSOY, ESRA CENGIZ TIRPAN, MEHTAP OZSAHIN, ERMAN COSKUN, OZGUR UYSAL)

FROM DIGITALIZATION TO DELIVERY

- Integrating Digital Technologies for Enhanced Sustainability and Performance in Supply Chains* 148
(YAMEN NISSI, FAIDON THEOFANIDIS, FARID ABDALLAH)
- Logistics Performance as a Logistics Barrier for a Country* 156
(ZBIGNIEW BENTYN, SYLWIA KONECKA, A. ZAFER ACAR)
- Cyberattacks as a Logistical Barrier in the Context of LPI Analysis* 159
(SYLWIA KONECKA, ZBIGNIEW BENTYN A. ZAFER ACAR)
- Evaluation of Automotive After Sales Services in Türkiye* 164
(ADNAN CORUM, SINEM ARPACI YIGIT)

HUMAN CAPITAL IN THE DIGITAL ERA

- Eye Movements to Strategic Talent Decisions: A Sustainability-Oriented Approach to Digital Recruitment Using Eye-Tracking Technology* 169
(PELIN VARDARLIER)
- Strategic Performance Management in the Digital Era: Data-Driven HR & Leadership* 180
(MIRNA SAFI, YAMEN NISSI, OUALID ABIDI)
- Digital Competence Mapping of Local Government Employees in Heraklion Prefecture Based on the Digcomp 2.2 Framework* 188
(KOUNOUPAS NIKOS, YIANNIS DIMOTIKALIS, CHRISTOS H. SKIADAS)
- Industry 5.0 – the Impact of Robots and Cyborgs on Organizations From the Perspectives of Organizational Behavior and Human Resource Management* 198
(SEDA DEMIR, KADIR ALPASLAN DEMIR, MERAL ELCI)

FROM GREEN INNOVATION TO SMART CITIES

- Strategic Governance for Sustainable Performance: ESG Impacts of Board and Financial Structures in International Logistics* 209
(MERT DEMIR, BAHAUDIN G. MUJTABA, PELIN VARDARLIER)
- Organizational Resilience in Micro-Enterprises: A Case Study of a Family Business* 227
(HANDAN GUNYAKTI AKDENIZ, HATICE ZUMRUT TONUS)

A Bibliometric Review of Green Innovation and Environmental Performance (LAZGEEN MOHAMMEL HALO, ESIN CAN) 233

Strategies and Perspectives of Big Data in Smart City Monitoring for the Achievement of Sustainable Development Goals (SDG) (CATERINA AURA) 242

HUMAN-CENTRIC DIGITAL TRANSFORMATION

Work-Life Balance in the Age of AI: Opportunities and Challenges for Women (JELENA KRSTIĆ, IVANA DOMAZET) 253

Strategic Implications of Digital Competence, Self-Directed Learning, and Digital Engagement among University Students: Insights for Adapting to Future Digital Work Environment (SEHNAZ OKKIRAN, CAN DEMIRAL) 260

The Level of Artificial Intelligence Usage among the Students of Management Information Systems Department (KAAN HASAN KALKAN, MEHMET NACI EFE, SIMGE COSKUN, BAHADIR HAMZA GUL) 270

Navigating the Digital Trustscape: A Systematic Review of Online Reviews and Review Authenticity (FATMA PELIN EREL, YASEMIN ORAMAN) 281

STRATEGIC PERFORMANCE AND INNOVATION

Effects of Business Models on Bank Performance (KAMELIA ASSENOVA) 294

Innovation Starts Inside: the Impact of Organizational Structure on Innovation Performance (GONCA LAZOGLU GUR, KURTULUS YILMAZ GENÇ) 303

Strategic Analysis of the Impact of Global Sea Level Events on Coastal Airports (DIDEM RODOPLU SAHIN, NALAN AKYURT) 313

The Relationship Between Absorptive Capacity, Product Innovation, Firm Performance and Market Turbulence (CEMAL ZEHIR, YASIN SEHITOGLU, SUMEYYE CICEK VURAL) 319

FROM METRICS TO DIGITAL INNOVATION

The Interplay Between University Characteristics, Sustainability Performance, and Industry Outcomes in the GCC Region (OUALID ABIDI, VLADIMIR DZENOPOLJAC, ALEKSANDRA DZENOPOLJAC) 326

From Unipolar to Multipolar: Global University Rankings (2003–2024) a Comparative Analysis of Global University Rankings (2003–2024) (MEHMET BARCA, SEMIH CEYHAN, MUSAB TALHA AKPINAR, MUHAMMED FATI H OZER, EMIRHAN YAGCI) 333

From Utility to Dependency: Gendered Patterns of Technology Addiction and Their Impact on Learning Engagement in Higher Education (SEHNAZ OKKIRAN, CAN DEMIREL) 343

Market Driven Rise of Digital University in the 21st Century (ALI ESKINAT, SUAT TEKER) 352

ORGANIZATIONAL BEHAVIOR AND TECHNOLOGY

Strategic Collaboration as Dynamic Capability: A Mechanism-Based Framework for Hybrid 358

Organizations (CIHAN TINAZTEPE CAGLAR)

<i>The Situation of Artificial Intelligence Usage among Management Information Systems Students According to Demographic Indicators (ADNAN KALKAN, SIMGE COSKUN, KAAAN HASAN KALKAN)</i>	367
<i>A Bibliometric Perspective on Technostress Research: Trends, Themes, and Collaboration Networks (MERT TEMUR, ESIN CAN)</i>	382
<i>Is Individual Adapting Effective in the Technology Acceptance Model? (CEREN OZKAN, SONGUL YILDIZ)</i>	392

**DIGITAL TRANSFORMATION IN EDUCATION,
ENTREPRENEURSHIP, AND BUSINESS MANAGEMENT**

<i>Examining Digital Methods in Health Sciences Education: A Meta-Analysis Study (YIGIT KEREM YILDIZ, FADIME CINAR, UGUR YOZGAT)</i>	401
<i>Which Socio-Demographic Factors Drive Digital Merchant Payments? Evidence from Serbia and Türkiye (MARIJA ANTONIJEVIĆ, IVANA DOMAZET)</i>	416
<i>Digital Literacy and Entrepreneurship: Trends & Insights (ECE NUR POLAT, DILAN KIZILTEPE, SENANUR SELDA CETINKAYA, DILAN DERYA DURAK, SEVVAL NISA KULLU)</i>	424
<i>A Study on the Ability of Digital Twin Technologies to Fulfill Managerial Tasks in Businesses (IZZET KILINC, ASELE DEMIRDAG, ASLIHAN UNAL)</i>	433

INNOVATIVE AND SUSTAINABLE MARKETING

<i>Big Five Personality, Tourism Image and Experiential Marketing Affecting Tourist's Re-Visiting Phatthalung Province (CHETSADA NOKNOI)</i>	443
<i>The Impact of Sustainable Marketing on Purchase Behavior: The Moderating Role of Perceived Consumer Effectiveness (FARIZ HASANOV, HATICE ANIL DEGERMEN)</i>	451
<i>Saving Time or Saving Money? Exploring the Effect of Opportunity Cost of Time on Store Deal Proneness and Value Consciousness (AYSUN SAHIN)</i>	469
<i>Proactive Customer Loyalty Initiatives in the Telecommunications Services Industry – Evidence from Montenegro (SABAHUDIN KUJOVIĆ, IVANA DOMAZET)</i>	479

**PSYCHOLOGICAL AND ORGANIZATIONAL DRIVERS OF
CAREER ENGAGEMENT AND JOB CRAFTING**

<i>The Mediating Role of Psychological Empowerment in the Effect of General Self-Efficacy on Job Crafting: a Study on Aviation Industry Employees (SEMIH SORAN, PINAR HORASANLI GÖKALP)</i>	489
<i>Wishful Thinking or Worthwhile Inspiration? The Role of Celebrity Role Models' Influence on Undergraduates' Career Engagement (BERIVAN TATAR, ZEYNEP KARADENIZ CISDIK, OYA ERDIL)</i>	494
<i>Understanding Intention to Continue among International Students: A Parallel and Serial Mediation Model of Socio-Cultural Influences (ALPEREN SAHIN, T. SABRI ERDIL, BAHADIR AYAR)</i>	502
<i>The Role of Job Insecurity on Person-Organization Fit (MESUT YURTCU, ADNAN CEYLAN)</i>	509

ENTREPRENEURSHIP, INCLUSION, AND DIGITAL EMPOWERMENT FOR WOMEN IN BUSINESS

- Promoting Female Entrepreneurship in Non-Urban Areas of the Republic of Serbia (JELENA VUJADINOVIĆ, DARKO MARJANOVIĆ)* 517
- Entrepreneurial Intention among Female Students: the Role of Personality, Orientation, Digital Skills, and Social Support (VEHAP KOLA, GENTJAN ULAJ, ELVISA DRISHTI, IRISI KASAPI, DORIAN ALIU)* 523
- Global Value Chains: From Multinational Dominance To Sme Empowerment In A Regionalized And Digitalized World (IRMAK ORMAN, SUAT TEKER, DILEK TEKER)* 530

BRIDGING RESEARCH AND PRACTICE

- Evaluating the Impact of Game-Based Learning on University Student's Skill Development – a Cross-Cultural Analysis (STEPHEN COLBRAN, VLADIMIR SIMOVIC, ALPER ERTURK)* 537
- Digital Marketing Capacity Building - Empowering Persons with Physical Disabilities for Remote Work (VLADIMIR SIMOVIC)* 545
- Serious Games in Action: Educational Insights with Simbound (LOUIS HAVRILUC , Simbound CEO)* 546
- NewEcoSmart: Fostering sustainable growth and social inclusion in European habitat sectors through adult upskilling and social innovation (ALMUDENA MUÑOZ PUCHE, VASILIKI SKOULOU, ALEKSANDAR ERCERG, HASAN VOLKAN ORAL, MERIM KASUMOVIC, JIRI STROUHAL)* 547

NAME INDEX

549

ORGANIZING COMMITTEE

- MEHTAP OZSAHIN (CHAIR, GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)
- ALPER ERTÜRK (CO-CHAIR, AUSTRALIAN UNIVERSITY, KUWAIT)
- VLADIMIR SIMOVIC (CO-CHAIR, INSTITUTE OF ECONOMIC SCIENCES, SERBIA)
- BERİVAN TATAR (GEBZE TECHNICAL UNIVERSITY, TURKIYE)
- BORA YILDIZ (ISTANBUL TECHNICAL UNIVERSITY, ISTANBUL-TURKIYE)
- CEMAL ZEHİR (YILDIZ TECHNICAL UNIVERSITY, ISTANBUL-TURKIYE)
- FRANCESCO SCALERA (UNIVERSITY OF BARI, ITALY)
- JANIS PRIEDE (UNIVERSITY OF LATVIA, LATVIA)
- LUDMILA MLADKOVA (UNIVERSITY OF ECONOMICS PRAGUE-CZECHIA)
- LUTFIHAK ALPKAN (ISTANBUL TECHNICAL UNIVERSITY, ISTANBUL-TURKIYE)
- MARIJA ANTONIJEVIC (INSTITUTE OF ECONOMIC SCIENCES, SERBIA)
- MERAL ELCI (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)
- OYA ERDİL (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)
- TANSER YASEMIN GÜLSOY (BEYKENT UNIVERSITY, ISTANBUL-TURKIYE)
- ZBIGNIEW BENTYN (POZNAŃ UNIVERSITY OF ECONOMICS AND BUSINESS, POLAND)

SCIENTIFIC COMMITTEE

- ADALET MURADOV (AZERBAIJAN STATE UNIVERSITY OF ECONOMICS, BAKU- AZERBAIJAN)
- ALPER ERTURK (AUSTRALIAN UNIVERSITY – KUWAIT)
- AYSEGUL ASUMAN AKDOGAN (KYRGYZ-TURKISH MANAS UNIVERSITY, BISHKEK, KYRGYZ REPUBLIC)
- CEMAL ZEHİR (YILDIZ TECHNICAL UNIVERSITY, ISTANBUL-TURKIYE)
- DABABRATA N. CHOWDHURY (UNIVERSITY CAMPUS SUFFOLK, IPSWICH UK)
- FAIDON THEOFANIDIS (AUSTRALIAN UNIVERSITY – KUWAIT)
- FRANCESCO SCALERA – (UNIVERSITY OF BARI, ITALY)
- ISAM ZABALAWI (AUSTRALIAN UNIVERSITY – KUWAIT)
- IVANA DOMAZET (INSTITUTE OF ECONOMIC SCIENCES, SERBIA)
- JAMALUDDIN H. HUSAIN (PURDUE UNIVERSITY, USA)
- JANIS PRIEDE (UNIVERSITY OF LATVIA, LATVIA)
- JELENA KRSTIC (INSTITUTE OF ECONOMIC SCIENCES, SERBIA)
- JOVAN ZUBOVIC (INSTITUTE OF ECONOMIC SCIENCES, SERBIA)
- LUDMILA MLADKOVA (UNIVERSITY OF ECONOMICS PRAGUE-CZECHIA)
- LUTFIHAK ALPKAN (ISTANBUL TECHNICAL UNIVERSITY, ISTANBUL-TURKIYE)
- MATILDA IVANOVA ALEXANDROVA-BOSHPAKOVA (UNWE, SOFIA-BULGARIA)
- OUALID ABIDI (AUSTRALIAN UNIVERSITY – KUWAIT)
- OYA ERDİL (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)
- RICHARD LYNCH (MIDDLESEX UNIVERSITY, LONDON-UK)
- RICHARD RUTTER (AUSTRALIAN UNIVERSITY – KUWAIT)
- RUMEN GECHEV (UNWE, SOFIA-BULGARIA)
- MILENA LAZIC (INSTITUTE OF ECONOMIC SCIENCES, SERBIA)
- SELIM ZAIM (IBN HALDUN UNIVERSITY, ISTANBUL-TURKIYE)
- SEVİNÇGÜL ULU (SOUTHERN ILLINOIS UNIVERSITY, USA)
- STEPHEN COLBRAN (CENTRAL QUEENSLAND UNIVERSITY, AUSTRALIA)
- TZVETANA SOYANOVA (UNWE, SOFIA-BULGARIA)
- UGUR YOZGAT (NİŞANTAŞI UNIVERSITY, ISTANBUL-TURKIYE)
- VLADIMIR SIMOVIC (INSTITUTE OF ECONOMIC SCIENCES, SERBIA)
- WALDEMAR W. BUDNER (POZNAŃ UNIVERSITY OF ECONOMICS AND BUSINESS, POLAND)
- ZBIGNIEW BENTYN (POZNAŃ UNIVERSITY OF ECONOMICS AND BUSINESS, POLAND)
- ZHONGQI JIN (MIDDLESEX UNIVERSITY, LONDON-UK)

PEER-REVIEW COMMITTEE

- AVNI ZAFER ACAR (ISTANBUL BİLGİ UNIVERSITY, ISTANBUL-TURKIYE)
- ABDULLAH KURSAT MERTER (GEBZE TECHNICAL UNIVERSITY- TURKIYE)
- ADNAN CELİK (SELCUK UNIVERSITY, KONYA-TURKIYE)
- AHU TUGBA KARABULUT (ISTANBUL COMMERCE UNIVERSITY, TURKIYE)
- ALBERT SCHRAM (MAASTRICHT UNIVERSITY-NETHERLANDS)
- ALI AKDEMİR (AREL UNIVERSITY, ISTANBUL-TURKIYE)
- ALI EKBER AKGUN (YILDIZ TECHNICAL UNIVERSITY, ISTANBUL-TURKIYE)

- *ALI HALICI (ISTANBUL TOPKAPI UNIVERSITY, ISTANBUL-TURKIYE)*
- *ALISTAIR M BROWN (CURTIN UNIVERSITY OF TECHNOLOGY, WESTERN AUSTRALIA)*
- *ALPER ERTURK (AUSTRALIAN UNIVERSITY – KUWAIT)*
- *ALPTEKIN ERKOLLAR (ETCOP INSTITUTE, VIENNA, AUSTRIA)*
- *ALTAY ISMAYILOV (AZERBAIJAN STATE UNIVERSITY OF ECONOMICS, BAKU- AZERBAIJAN)*
- *ANDRI OTTESEN (AUSTRALIAN UNIVERSITY – KUWAIT)*
- *ANGEL ANGELOV MARCHE (UNWE, SOFIA-BULGARIA)*
- *ANNA ŁUPICKA (POZNAŃ UNIVERSITY OF ECONOMICS AND BUSINESS, POLAND)*
- *ANTOAN KRASIMIROV SHOTARO (UNWE, SOFIA-BULGARIA)*
- *ANTONIO MINGUEZ VERA (UNIVERSIDAD DE MURCIA, SPAIN)*
- *AYSE GUNSEL (KOCAELI UNIVERSITY, KOCAELI-TURKIYE)*
- *AYSEGUL ASUMAN AKDOGAN (KYRGYZ-TURKISH MANAS UNIVERSITY, BISHKEK, KYRGYZ REPUBLIC)*
- *AYSEN HIC GENCER (ISTANBUL AYDIN UNIVERSITY, TURKIYE)*
- *AZIZE MUGE YALCIN (MARMARA UNIVERSITY, ISTANBUL-TURKIYE)*
- *AZIZE SAHIN (ISTANBUL UNIVERSITY, ISTANBUL-TURKIYE)*
- *BASHAYER ALKHALIFAH (AUSTRALIAN UNIVERSITY – KUWAIT)*
- *BERIVAN TATAR (GEBZE TECHNICAL UNIVERSITY- TURKIYE)*
- *BHASKAR BHOWMICK (INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR, INDIA)*
- *BODOUR ALSHAKHSS (AUSTRALIAN UNIVERSITY – KUWAIT)*
- *BULENT SEZEN (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)*
- *BUSRA MUCELDILI (YILDIZ TECHNICAL UNIVERSITY- ISTANBULTURKIYE)*
- *BUSRA OZDENIZCI KOSE (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)*
- *CANAN CETIN (MARMARA UNIVERSITY, ISTANBUL-TURKIYE)*
- *CANSU GÖKMEK KÖKSAL (ISTANBUL TOPKAPI UNIVERSITY- TURKIYE)*
- *CAVİDE BEDİA UYARGİL (ISTANBUL UNIVERSITY, ISTANBUL-TURKIYE)*
- *CEMAL ZEHİR (YILDIZ TECHNICAL UNIVERSITY, ISTANBUL-TURKIYE)*
- *CENGİZ YILMAZ (ABDULLAH GÜL UNİVERSİY, KAYSERİ-TURKIYE)*
- *CEVAT GERNİ (BEYKENT UNIVERSITY, ISTANBUL-TURKIYE)*
- *CEVDET KIZIL (ISTANBUL MEDENİYET UNIVERSITY, ISTANBUL-TURKIYE)*
- *DABABRATA N. CHOWDHURY (UNIVERSITY CAMPUS SUFFOLK, IPSWICH UK)*
- *EBRU BEYZA KOCAPINAR BAYARCELİK (MALTEPE UNIVERSITY, ISTANBUL-TURKIYE)*
- *EBRU TUMER (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)*
- *ELİF AKBEN SELCUK (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)*
- *EMİNE COBANOGU (MARMARA UNIVERSITY, ISTANBUL-TURKIYE)*
- *ENIDA PULAJ (UNIVERSITY OF VLORA, ALBANIA)*
- *ERDAL AYDIN (CANAKKALE ONSEKİZ MART UNIVERSITY, TURKIYE)*
- *ERDAL SEN (FENERBAHÇE UNIVERSITY, ISTANBUL-TURKIYE)*
- *EREN DURMUŞ ÖZDEMİR (AKDENİZ UNIVERSITY, ANTALYA-TURKIYE)*
- *ERKUT ALTINDAG (BEYKENT UNIVERSITY, TURKIYE)*
- *ERMAN COŞKUN (BAKIRÇAY UNIVERSITY, İZMİR, TURKIYE)*
- *ESİN CAN (YILDIZ TECHNICAL UNIVERSITY, ISTANBUL-TURKIYE)*
- *ESİN SADIKOGLU (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)*
- *ESRA ALNIACIK (KOCAELI UNIVERSITY, TURKIYE)*
- *FAİDON THEOFANİDİS (AUSTRALIAN UNIVERSITY – KUWAIT)*
- *FARİD HUSEYNOV (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)*
- *FARZAD SATTARI ARDABİLİ (ISLAMIC AZAD UNIVERSITY, ARDABIL, IRAN)*
- *FATİH SEMERCİOZ (ISTANBUL UNIVERSITY, ISTANBUL-TURKIYE)*
- *FATMA MUGE ARSLAN (MARMARA UNIVERSITY, ISTANBUL-TURKIYE)*
- *FEDERICA BRESSAN (UNIVERSITY OF VERONA, ITALY)*
- *FETHİ ÇALIŞIR (ISTANBUL TECHNICAL UNIVERSITY, ISTANBUL-TURKIYE)*
- *FRANCESCO SCALERA – (UNIVERSITY OF BARI, ITALY)*
- *FÜLYA TAŞEL (MALTEPE UNIVERSITY, ISTANBUL-TURKIYE)*
- *GAYE KARAÇAY AYDIN (ISTANBUL TECHNICAL UNIVERSITY, ISTANBUL-TURKIYE)*
- *GOKHAN OZER (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)*
- *GULDEN TURHAN (MARMARA UNIVERSITY, ISTANBUL-TURKIYE)*
- *HAKAN KİTAPCI (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)*
- *HALİM KAZAN (ISTANBUL UNIVERSITY, ISTANBUL-TURKIYE)*
- *HALİT KESKİN (YILDIZ TECHNICAL UNIVERSITY, ISTANBUL-TURKIYE)*
- *HANDE SİNEM ERGÜN (MARMARA UNIVERSITY, ISTANBUL-TURKIYE)*
- *HARUN DEMİRKAYA, (ISTANBUL AREL UNIVERSITY, ISTANBUL-TURKIYE)*
- *HASSAN MOHEBBI (ARDABIL INDUSTRIAL MANAGEMENT INSTITUTE, ARDABIL, IRAN)*
- *HİLMİ BAHAİR AKIN (NECMETTİN ERBAKAN UNIVERSITY, KONYA-TURKIYE)*
- *HİSAO FUJİMOTO (OSAKA UNIVERSITY OF ECONOMICS, JAPON)*

- HUSEYIN INCE (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)
- IBRAHİM ANIL (İSTANBUL KENT UNIVERSITY, TURKIYE)
- İLHAN CAM (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)
- INCI DURSUN (YALOVA UNIVERSITY, TURKIYE)
- IRGE SENER (CANKAYA UNIVERSITY, TURKIYE)
- İREM EREN ERDOĞMUS (MARMARA UNIVERSITY-TURKIYE)
- IRINA KUZMINA-MERLINO (TRANSPORT AND TELECOMMUNICATION INSTITUTE, LATVIA)
- İSİL PEKDEMİR (İSTANBUL UNIVERSITY, İSTANBUL-TURKIYE)
- IVAN VASILEV TODOROV (UNWE, SOFIA-BULGARIA)
- IVANA DOMAZET (INSTITUTE OF ECONOMIC SCIENCES, SERBIA)
- JAMALUDDIN H. HUSAIN (PURDUE UNIVERSITY, USA)
- JANIS PRIEDE (UNIVERSITY OF LATVIA, LATVIA)
- JAROEN KRAAIJENBRINK (UNIVERSITY OF TWENTE, NETHERLANDS)
- JAWAD CHAHINE (AUSTRALIAN UNIVERSITY – KUWAIT)
- JELENA KRSTIC (INSTITUTE OF ECONOMIC SCIENCES, SERBIA)
- JUSTYNA MAJCHRZAK-LEPCZYK (POZNAŃ UNIVERSITY OF ECONOMICS AND BUSINESS, POLAND)
- KADIR VAROĞLU (BASKENT UNIVERSITY-TURKIYE)
- KENNETH HOLLAND (BALL STATE UNIVERSITY-USA)
- KUBRA SIMSEK (ABDULLAH GUL UNIVERSTIY-TURKIYE)
- KRYSZYNA KIETLIŃSKA (UNIVERSITY OF LODZ, POLAND)
- LAILA EL DABT (AUSTRALIAN UNIVERSITY – KUWAIT)
- LARS EHRENGREN (STOCKHOLM UNIVERSITY, SWEDEN)
- LONNIE STRICKLAND (THE UNIVERSITY OF ALABAMA, TUSCALOOSA, ALABAMA - USA)
- LUBICA BAJZIKOVA (COMENIUS UNIVERSITY, SLOVAK REPUBLIC)
- LUTFIHAK ALPKAN (İSTANBUL TECHNICAL UNIVERSITY, İSTANBUL-TURKIYE)
- M. SUKRU AKDOĞAN (ERCIYES UNIVERSITY-TURKIYE)
- MACIEJ SZYM CZAK (POZNAŃ UNIVERSITY OF ECONOMICS AND BUSINESS, POLAND)
- MAJA ALEXANDROVA TSOKLINOVA-KOLEVA (UNWE, SOFIA-BULGARIA)
- MARIUS UNGERER (STELLENBOSCH UNIVERSITY, SOUTH AFRICA)
- MEHMET BARCA (ANKARA SOSYAL BİLİMLER UNIVERSITY, TURKIYE)
- MEHMET SAHİN GOK (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)
- MEHTAP OZSAHİN (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)
- MELİSA ERDİLEK KARABAY (MARMARA UNİVERSİTY, TURKIYE)
- MERAL ELÇİ (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)
- MICHAL PATAK (UNIVERSITY OF PARDUBICE, CZECH REPUBLIC)
- MILENA LAZIC (INSTITUTE OF ECONOMIC SCIENCES, SERBIA)
- MILITA VIENAŽINDIENĖ (VYTAUTAS MAGNUS UNIVERSITY, LITHUANIA)
- MINE AKSOY KAVALCI (YALOVA UNIVERSITY, TURKIYE)
- MIRNA SAFI (AUSTRALIAN UNIVERSITY – KUWAIT)
- MİNE AFACAN FİNDİKLİ (İSTİNYE UNIVERSITY, İSTANBUL-TURKIYE)
- MOHAMAD ATYAH (AUSTRALIAN UNIVERSITY – KUWAIT)
- MUATH ABDEL QADER (AUSTRALIAN UNIVERSITY – KUWAIT)
- MUFİDE SULE EREN (CANAKKALE ONSEKİZ MART UNIVERSITY, TURKIYE)
- MUJDELEN İPEK YENER (MARMARA UNIVERSITY, TURKIYE)
- MUNEVVER CETİN (MARMARA UNIVERSITY, İSTANBUL-TURKIYE)
- MURAT KASIMOĞLU (İSTANBUL COMMERCE UNIVERSITY, İSTANBUL-TURKIYE)
- NECDET TIMUR (ANADOLU UNIVERSITY, ESKİSEHIR-TURKIYE)
- NİGAR DEMİRCAN ÇAKAR (DUZCE UNIVERSITY, TURKIYE)
- NİHAN YILDIRIM (İSTANBUL TECHNICAL UNIVERSITY, TURKIYE)
- NİZAMETTİN BAYYURT (İSTANBUL TECHNICAL UNIVERSITY, TURKIYE)
- NURHAN PAPATYA (SULEYMAN DEMİREL UNIVERSITY, İSPARTA-TURKIYE)
- NURULLAH GENÇ (THE CENTRAL BANK OF THE REPUBLIC OF TÜRKİYE, ANKARA-TURKIYE)
- OLCAY BİGE ASKUN (MARMARA UNIVERSITY-TURKIYE)
- OMUR NECZAN OZMEN (DOKUZ EYLUL UNIVERSITY, İZMİR-TURKIYE)
- OQTAY QULİYEV (AZERBAIJAN STATE UNIVERSITY OF ECONOMICS, BAKU- AZERBAIJAN)
- OUALİD ABİDİ (AUSTRALIAN UNIVERSITY – KUWAIT)
- OYA ERDİL (GEBZE TECHNICAL UNIVERSITY, KOCAELI-TURKIYE)
- ÖZLEM ATAY (ANKARA UNIVERSITY, ANKARA-TURKIYE)
- PELİN VARDARLIER (BALIKESİR UNIVERSITY- TURKIYE)
- PHILIP PETROV STOYANOV (UNWE, SOFIA-BULGARIA)
- PIOTR BANASZYK (POZNAŃ UNIVERSITY OF ECONOMICS AND BUSINESS, POLAND)
- RAMONA RUPEİKA-APOGA (UNIVERSITY OF LATVIA, LATVIA)
- RAMUNĖ ČIARNIENĖ (KAUNAS UNIVERSITY OF TECHNOLOGY, LITHUANIA)

- RECEP İBRAHİM PINAR (İSTANBUL UNIVERSITY, İSTANBUL-TURKIYE)
- REFIKA BAKOĞLU (MARMARA UNIVERSITY, İSTANBUL-TURKIYE)
- RICHARD LYNCH (MIDDLESEX UNIVERSITY, LONDON-UK)
- RICHARD RUTTER (AUSTRALIAN UNIVERSITY – KUWAIT)
- ROVŞAN GULİYEV (AZERBAIJAN STATE UNIVERSITY OF ECONOMICS, BAKU- AZERBAIJAN)
- SABAHAT BAYRAK KÖK (PAMUKKALE UNIVERSITY, DENİZLİ-TURKIYE)
- SANNUR ALİYEV (AZERBAIJAN STATE UNIVERSITY OF ECONOMICS, BAKU- AZERBAIJAN)
- SEFER SENER (İSTANBUL UNIVERSITY, İSTANBUL-TURKIYE)
- SELİM AREN (YILDIZ TECHNICAL UNIVERSITY, İSTANBUL-TURKIYE)
- SELİM ZAIM (İBN HALDUN UNIVERSITY, İSTANBUL-TURKIYE)
- SENAY YURUR KARSLIOĞLU (YALOVA UNIVERSITY, TURKIYE)
- SENEM BESLER (ANADOLU UNIVERSITY, TURKIYE)
- SEVİNÇ KÖSE (CELAL BAYAR UNIVERSITY, MANİSA-TURKIYE)
- SEVİNÇGÜL ULU (SOUTHERN ILLINOIS UNIVERSITY, USA)
- SEVKİ ÖZGENER (NEVSEHİR UNIVERSITY, NEVSEHİR-TURKIYE)
- SHAUKAT ALI (UNIVERSITY OF WOLVERHAMPTON, SHROPSHIRE-GREAT BRITAIN)
- SHTERYO NOZHAROV (UNWE, SOFİA-BULGARIA)
- SIMA NART (SAKARYA UNIVERSITY, TURKIYE)
- STASYS VAITKEVICIUS (MYKOLAS ROMERIS UNİVERSTY-LITHUANIA)
- STEVEN TELFORD (AUSTRALIAN UNIVERSITY – KUWAIT)
- SUBODH BHAT (SAN FRANCISCO STATE UNIVERSITY, SAN FRANCISCO - USA)
- SUDİ APAK (ESENİYURT UNIVERSITY, İSTANBUL-TURKIYE)
- SUSMITA GHOSH (JADAVPUR UNIVERSITY, INDIA)
- SVETLANA SAKSONOVA (UNIVERSITY OF LATVIA, LATVIA)
- TANSER YASEMİN GULSOY (BEYKENT UNIVERSITY, İSTANBUL-TURKIYE)
- UĞUR YOZGAT (NİŞANTAŞI UNIVERSITY, İSTANBUL-TURKIYE)
- UMIT ALNİACIK (KOCAELİ UNIVERSITY, TURKIYE)
- VELİ DENİZHAN KALKAN (İSTANBUL MEDENİYET UNIVERSITY, İSTANBUL-TURKIYE)
- VIESTURS PAULS KARNUPS (UNIVERSITY OF LATVIA OF RİGA - LATVIA)
- VLADİMİR SIMOVİC (İNSTITUTE OF ECONOMIC SCIENCES, SERBIA)
- WAEL DABBOUSSI (AUSTRALIAN UNIVERSITY – KUWAIT)
- WARREN J. KEEGEN (PACE UNIVERSITY, USA)
- XAVIER RICHET (UNIVERSITY OF SORBONNE NOUVELLE-PARİS 3, FRANCE)
- YAMEN NİSSİ (AUSTRALIAN UNIVERSITY – KUWAIT)
- YENER PAZARCIK (CANAKKALE ONSEKİZ MART UNIVERSITY, CANAKKALE-TURKIYE)
- YONCA GÜROL (YILDIZ TECHNICAL UNIVERSITY, İSTANBUL-TURKIYE)
- ZBIGNIEW BENTYN (POZNAŃ UNIVERSITY OF ECONOMICS AND BUSINESS, POLAND)
- ZEYNEP İREM ERDOĞMUS (MARMARA UNIVERSITY, TURKIYE)
- ZOLTAN VERES (UNIVERSITY OF PANNONIA, HUNGARY)

PREFACE

Dear participants of the 20th International Strategic Management Conference.

I would like to thank all of you for attending and participating our conference this year. It is an honor to serve as the chair for this significant event.

At first, I would like to convey my special thanks to Professor **Jovan Zubovic**, the Director of the Institute of Economic Sciences, Serbia, for hosting us in such a amazing city of Belgrade where rich culture and history meets, Professor **Vladimir Simovic**, Professor **Alper Ertürk**, the Co-chairs of the 20th International Strategic Management Conference, for their outstanding efforts, close collaboration and cooperation for planning, realization, and execution of this Conference.

Next, I would like to extend my special thanks to those who have contributed a lot to this year's conference. Professor **Oya Erdil**, President of International Strategic Management and Manager Association and Professor **Lütfihak Alpkan** vice-president of the Association, for their mentorship; Conference secretariat **Ece Nur Polat**, for her dedication and outstanding hardwork; Organizing committee members Professors **Cemal Zehir**, **Meral Elçi**, **Tanses Gülsoy**, **Bora Yıldız** for their support in their respective fields.

This year's conference theme is "**Leveraging Strategic Management for a Sustainable Digital Economy**" and we have two very precious keynote speakers: Professor **Cornelius Bothma**, from University of South Africa-UNISA, South Africa and Professor **Erhan Artuc**, Senior Economist at World Bank. I would like to thank them for their key note speeches focusing on "**Using neuroscience to strategically engage the hearts and minds of consumers for a sustainable digital economy**" and "**Automation, AI and International Trade**".

This year, **77 extended abstracts** were submitted from **25** different countries including **Albania, Australia, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Canada, Colombia, Croatia, Greece, India, Indonesia, Iraq, Italy, Kuwait, Montenegro, Philippines, Poland, Serbia, Spain, Thailand, Turkish Republic of Northern Cyprus, Ukraine United Arab Emirates, USA and Türkiye**. Among these, **61 high quality** papers were accepted after a double-blind review process to be presented online and in-person during these two days.

In addition to the abstract presentations, this year's conference has featured two special sessions. On the first day, mBrainTrain Company presents a demonstration on the use of Nurotechnology in customer experience. Following day, four international projects are presented on the application of researches to our daily lives. These special sessions aim to create a platform for international collaboration and cooperation among the participants who are interested in engaging in international projects.

Last year, we have successfully published two books with selected papers which were presented during the conference by IGI Global and these books are indexed by SCOPUS. This year we continue with this practice and selected full papers will be published in this year's book.

As always, I can not go without remembering the memory of **Prof. Erol Eren**, who has initiated our Conference 20 years ago and contributed immensely to the strategic management field. May his soul rest in peace..

Once again, as the chair, I would like to thank all colleagues, academicians, participants, sector representatives, and students for their contributions to this successful, productive and enjoyable Conference in Belgrade. I hope to see all next year.

Mehtap Özşahin (Ph.D.)

Chair

20th International Strategic Management Conference

PREFACE

Dear Guests and Dear Colleagues,

It is a great pleasure for us to welcome you to the 20 th International Strategic Management Conference held in Belgrade, Serbia. This year the conference will focus on the theme of “Leveraging Strategic Management for a Sustainable Digital Economy”. The conference is organized by the International Strategic Management and Managers Association with partner universities as it has been for twenty years. This year the Conference is organized with the cooperation of partner universities namely Gebze Technical University, Yıldız Technical University, Australian University of Kuwait and hosting university, the Institute of Economic Sciences, Serbia.

I would like to thank to Jovan Zubovic, the Director of the Institute of Economic Sciences, Serbia for their cooperation and hospitality to make this conference a success.

I would like to extent my thanks to the Chair, Mehtap Özşahin, Co-chairs Viladimir Smovic and Alper Ertürk, the members of Organizing Comittee Lutfihak Apkan, Cemal Zehir, Meral Elçi, Tanses Gülsoy and Bora Yıldız and Conference Sekreteriat Ecenur Polat for their valuable efforts and contributions.

Once more we remember Prof. Erol Eren the founder of the association and this conference is always in our hearts. May his soul rest in peace.

Dear colleagues, thank you for your participation. I hope you will benefit from the Conference and enjoy your stay in Belgrade.

Oya Erdil, (Ph.D)

Gebze Technical University

Head of the International Strategic Management and Managers Association

PREFACE

Dear distinguished participants

It is my great pleasure and privilege to present the proceedings of the 20th International Strategic Management Conference, with the theme “Leveraging Strategic Management for a Sustainable Digital Economy.” As the Co-Chair of this esteemed conference, jointly organized by International Strategic Management and Managers Association (ISMMA), Gebze Technical University (Türkiye), Yıldız Technical University (Türkiye), Australian University -Kuwait, and hosted by Institute of Economic Sciences (Serbia) in Belgrade, Serbia, I would like to emphasize the remarkable alliance among those well-respected institutions that have shown their devotion and great commitment to fostering international partnerships, as well as encouraging exchange of noteworthy outcomes and insights from the latest academic studies and research.

In our conference this year, we have the opportunity to provide an important platform for esteemed academics and professionals from all over the world to get together and share their invaluable experiences and substantial knowledge in the field of strategic management and digital economy. In addition to 61 papers presented, we also had the opportunity to have the presentations / workshops of five significant projects in our conference program.

We express our sincere gratitude to the authors for their significant contributions and their commitment to furthering knowledge in this domain. Their research demonstrates a combination of academic rigor and practical application, making this volume an important resource for both researchers and professionals. The diversity of subjects addressed in this volume illustrates the extensive and profound discussions that occurred during the conference. Covering themes such as digital marketing, digital economy, governance, sustainability, resilience, and digital transformation, each paper explores essential elements of strategic management.

Moreover, I would like to express my sincere gratitude to our esteemed keynote speakers, Prof. Cornelius Bothma from University of South Africa, and Dr. Erhan Artuc, Senior Economist in the World Bank's Development Research Group, for their informing and invaluable presentations. Their contribution has added considerable value to our conference.

Furthermore, I also would like to convey my sincere appreciation to my dear colleagues, Conference Chair, Assoc. Prof. Mehtap Özşahin, and Co-Chair Assoc. Prof. Vladimir Simovic for their amazing support, great effort and collaboration throughout the preparation period, as well as during the conference. In addition, I also would like to thank Prof. Jovan Zubovic, Director of Institute of Economic Sciences, and his team for their extensive support and amazing hospitality.

Moreover, I also would like to extend my gratitude to all session chairs, and reviewers who devoted their time and effort to ensure the quality of the papers presented. Their outstanding contributions cannot be emphasized enough in the success of this conference. Last but not least, I want to express my profound appreciation to all the participants of the conference who have embarked on this intellectual journey with us. Their passion, involvement, and

stimulating discussions greatly contributed to better understanding the intervening role of strategic management in the digital economy from different aspects.

This conference volume is envisioned as a booster for contributing research, innovation, and collaboration in the realm of strategic management. I hope that the insights shared within will encourage individuals, organizations, and policymakers to actively pursue the opportunities and address the challenges arising from digital economy.

Sincerely,

Alper Erturk (Ph.D.)

Co-Chair

20th International Strategic Management Conference

PREFACE

Dear participants,

It is my great pleasure to present the proceedings of the 20th International Strategic Management Conference, held in Belgrade, Serbia, from September 11 to 13, 2025, under the theme “Leveraging Strategic Management for a Sustainable Digital Economy.”

This conference was organized by the International Strategic Management and Managers Association (ISMMA), in partnership with Gebze Technical University (Türkiye), Yıldız Technical University (Türkiye), Australian University – Kuwait, and hosted by the Institute of Economic Sciences (Serbia). I would like to acknowledge with deep appreciation the leadership of our partner institutions and the strong commitment of the president of the organizing body Prof. Oya Erdil, whose vision and dedication have been crucial to the success of this event.

As one of the Co-Chairs of the conference, it has been an honor to work alongside Prof. Mehtap Özşahin, Conference Chair, and my colleague and friend Prof. Alper Erturk, Co-Chair, whose collaboration and support throughout the preparation period were invaluable. Together, we have had the privilege of welcoming more than one hundred participants and presenters from fourteen countries, whose diverse contributions enriched the discussions and expanded the scope of our shared knowledge.

On a personal note, I would like to express my heartfelt gratitude to my colleagues from the Digital Economics Department from the Institute of economic sciences for their tireless efforts and support in preparing both the conference and these proceedings. I also extend my thanks to the entire Institute of Economic Sciences team for their invaluable assistance and hospitality. A special acknowledgment goes to the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, whose financial support was essential in bringing this international gathering to fruition.

I hope that the papers presented in this volume will serve as both a record of the fruitful exchanges that took place during the conference and as a catalyst for further research, collaboration, and innovation in the fields of strategic management and digital economy.

Sincerely,

Vladimir Simovic (Ph.D.)

Co-Chair

20th International Strategic Management Conference

KEYNOTE SPEECHES

USING NEUROSCIENCE TO STRATEGICALLY ENGAGE THE HEARTS AND MINDS OF CONSUMERS FOR A SUSTAINABLE DIGITAL ECONOMY

CORNELIUS BOTHMA
University of South Africa

Using the term 'neurobusiness' to describe all neuroscience activities in the business-, management- and economic-sciences fields, the presentation strives to entice the audience to consider neurobusiness research in their respective areas of endeavour. The ultimate aim being to encourage the use of neurobusiness to engage with the hearts (emotions) and minds (reasoning) of consumers in the context of a sustainable digital economy. The total number of articles on neuroscience, as a broad topic which includes both neurobusiness articles and non-neurobusiness articles (mostly medical and clinical), is about 114000 according to the Scopus bibliography. Of these, only 2600, or little over 2.2%, are in the business, management and economic fields. The evidence suggests that considerably more research into neuroscience has been done in the medical, clinical and 'hard sciences' fields, than in business and management. Nevertheless, there has been a 62% growth in research articles on neurobusiness published in the Scopus bibliography in 2024 over 2023, as well as a 75% increase in research cumulatively in the past five years (2020-2024) over the previous five years (2015-2019). In both instances the growth in neurobusiness research articles is growing at a faster rate compared with the growth in neuroscience articles in non-neurobusiness fields. Neurobusiness is thus a growing field of research. As business moves increasingly into the 5IR- and AI-dominated worlds, where the focus is on the human in the context of fast-changing technologies, there is a need to draw on even more research that involves the brain. This research should look at the brain's core role in driving decision-making as well as at how consumers and staff respond to and behave in these changing circumstances. The presentation begins by defining neurobusiness, and briefly introduces the brain and the soma (the body), as well as the technologies that can be used to tap into the subconscious brain. Several examples of neurobusiness research are provided to illustrate neurobusiness' applications in practice. These include; the brain as decision maker, emotions in decision making, product development, the role of neuroplasticity, the interface between the brain and the human, customer experience, and reasoning/rationality. The presentation ends by proposing possible cooperation across disciplines and nations, with researchers working together towards interdisciplinary research, as well as developing sustainable digital solutions in a 5IR world.

AUTOMATION, AI, AND INTERNATIONAL TRADE: LESSONS FROM THE RISE OF INDUSTRIAL ROBOTS¹

Erhan Artuc
World Bank –Development Research Group

“... one way to understand what makes us human is to ask:

‘What makes us different from the other apes, and from the rest of the animal kingdom?’

*What makes us special? For instance, unlike all the other apes, we walk on two legs, and this frees our **hands** to do all kinds of things that other apes can’t do. And (perhaps the two are connected) we have much **bigger brains** than the other apes.”*

Richard Dawkins (The New Statesman, 2014)

COMPARATIVE ADVANTAGE OF HUMANS

Human comparative advantage is at risk

- Hands →Industrial robots are replacing blue-collar jobs
- Big brains →Artificial intelligence is replacing white-collar jobs

Industrial robots (automation) and artificial intelligence

- Conceptually similar technologies: We can use similar theoretical models to analyze them
- General purpose: They can be reprogrammed and repurposed in different sectors for different tasks -unlike conventional capital

WHAT WILL THE FUTURE LOOK LIKE?

We cannot scientifically answer such a big question with too many unknowns and uncertainties

(1) We can look at historical episodes of rapid technological progress and its impact on society (qualitative analysis)

- Industrial revolution and textile mills

(2) We can look at a well specified economics problem to get a better understanding of the bigger picture (quantitative analysis)

- Automation and international trade patterns

HISTORY: INDUSTRIAL REVOLUTION

Started in Great Britain in late 18th and early 19th centuries

Multiple new technologies arrived simultaneously

¹ The findings, interpretations, and conclusions expressed in this presentation are entirely those of the authors. They do not necessarily represent the views of the World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank, or the governments they represent.

Switch from hand production to machines
Chemical manufacturing

- Steam engine
- Iron production
- Textile mills

Textile mills: major disruption to the global economic system

Caused fear: Famous English poet William Blake coined the phrase “dark satanic mills”, a reference to industrial mills

HISTORY: TEXTILE MILLS

Early adaptor: Great Britain, largest exporter of textiles in the 19th century

Textile production is currently associated with developing countries

Today, textile industry is almost non-existent in developed countries

In the 19th century, nobody could foresee that Bangladesh would be a major exporter, and England would stop producing textiles

TODAY: INDUSTRIAL ROBOTS

What is an industrial robot?

Automatically controlled, reprogrammable, multipurpose manipulator

→ Parts: (1) Robotic arm + (2) specialized tool (i.e., hand) + (3) control software

Developed countries: rapid surge starting from early 2000s

Developing countries: Recent phenomenon

Replaced blue collar workers in many industries: Especially automotives

TRADE, DEVELOPMENT, AND AUTOMATION

International trade is important for economic development

Offshoring: Move production from developed countries to overseas, especially to developing countries with cheap labor

Developing countries export goods that rely on blue-collar workers

Result: Exports accelerate economic growth

What happens if developed countries use industrial robots to cheaply produce goods that rely on blue-collar workers?

- No reason to import from developing countries

PREDICTION: COLLAPSE OF INTERNATIONAL TRADE?

Robots are cheap: As advanced economies utilize industrial robots, there is no reason to import from developing countries

Reshoring: Production that has moved to developing countries for cheap labor will go back to advanced economies

EMPIRICAL ANALYSIS: SETUP

$$Trade_{nmit} = \beta Robots_{nit} + \Psi nmt + \Lambda it + \epsilon$$

Regression analysis about the impact of robotization in north on trade between south and north

Variation: Each industry and country has different numbers of robots over time

Data: International Federation of Robotics, World Integrated Trade Solution, and EU KLEMS, 1995-2015

EMPIRICAL ANALYSIS: REVERSE CAUSALITY

There may be reverse causality: correlation \neq causation

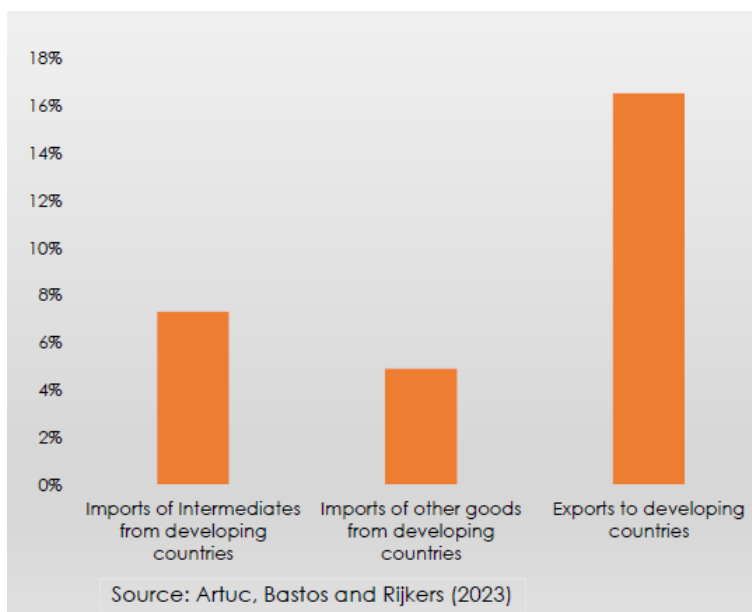
Maybe international trade causes robotization instead: Cannot use number of robots as an explanatory variable

Go through occupation classifications and find replaceable tasks, such as “assembling”, “dispensing”, “handling”, “processing”, “welding”, then map them to industries codes: This is exogenous

Create instrument based on global robot prices, number of replaceable tasks in each industry, and initial labor costs

Run an instrumental variables regression

EMPIRICAL ANALYSIS: RESULTS



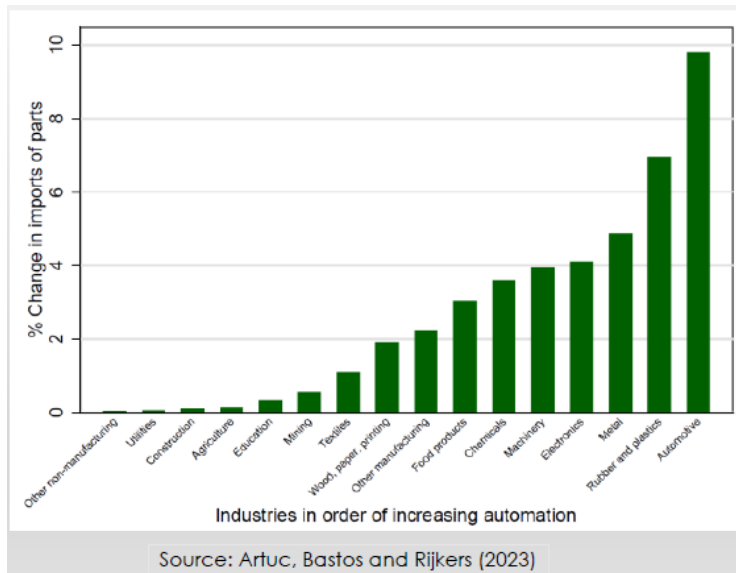
Both imports and exports increase with robotization

This result was initially surprising, but turned out to be correct

Economic theory: Robotization can increase trade (not obvious)

Following papers and new evidence by many other researchers support this

COMPLEX MECHANISM: IMPACT ON TRADE



Trade networks are complex: Global value chains

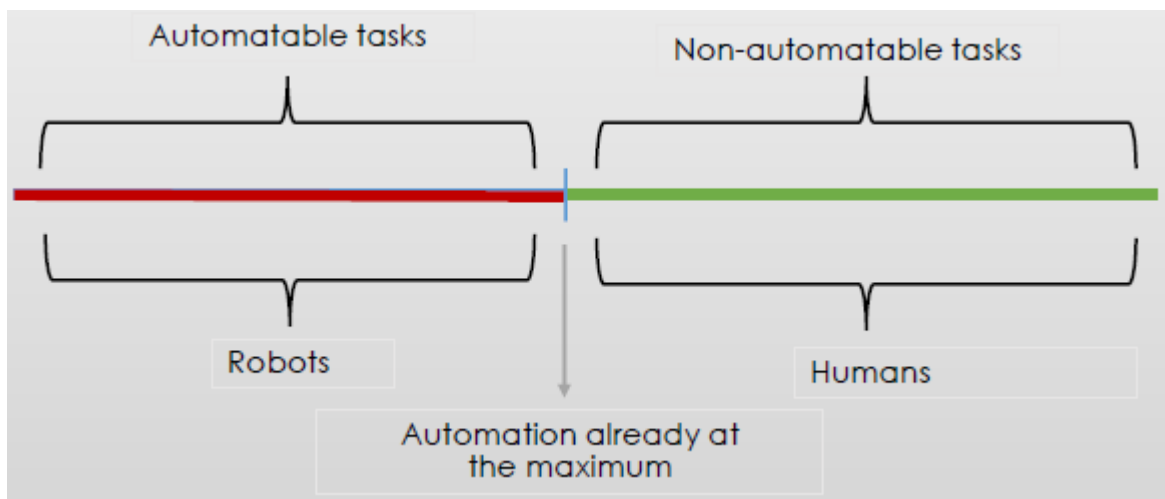
There are many parts and components imported from many different countries

Robot use increases productivity

Higher productivity promotes imports of parts and components

COMPLEX MECHANISM: IMPACT ON WORKERS

Production process (each task is point on the line)



At the frontier, workers and robots are complements

More robots → higher wages and more employment

FUTURE

In the short run, what will happen?

- Workers who change jobs will face large switching costs
- Firms will quickly need to adapt to new technologies
- Especially more so in developing countries, where social safety nets are weaker

In the long run, there are two possible scenarios:

- If new tasks emerge along with the growth of the automation frontier
→ demand for labor increases, wages & employment increase
- If new tasks do not emerge fast enough
→ demand for labor decreases, wages & employment decrease

CONCLUSION

Automation and artificial intelligence is expected to disrupt the global economic systems

The developing countries are more vulnerable than developed countries

It is impossible to predict what will happen in the future

- large technological shocks are not easy to analyze
- the most obvious conclusions are often wrong

***SHAPING THE FUTURE
OF THE DIGITAL
ECONOMY***

THE IMPACT OF DIGITAL EQUITY IN THE HEALTHCARE SECTOR ON THE SUSTAINABLE DIGITAL ECONOMY

Darijana Antonić

Public Health Institute of the Republic of Srpska, Center for Health System Development and International Cooperation, Banja Luka, Bosnia and Herzegovina, darijana.a@gmail.com

Imran Aslan

Bingöl University, Faculty of Health Science, Health Management Department, Bingöl, Turkey, imranaslan@gmail.com

Slobodan Stanić

Public Health Institute of the Republic of Srpska, Center for Health System Development and International Cooperation, Banja Luka, Bosnia and Herzegovina, slobodanstanic63@yahoo.com

ABSTRACT

The accelerating digital transformation within healthcare systems underscores the increasing importance of ensuring equal access to digital tools and services. This study explores the level of digital equity in healthcare within the broader context of a sustainable digital health economy. Exploring key dimensions such as digital access, literacy, infrastructural readiness, policy inclusion, and socio-economic disparities is essential. The research draws on a rich source of interdisciplinary literature from digital health, equity studies, sustainability, and health economics. It emphasizes the importance of aligning digital innovation with distributive justice principles and health systems' long-term resilience. The study will use critical discourse analysis from a critical realist perspective to explore the real, actual and empirical enablers and obstacles to digital equity across stakeholders, including patients, providers, and policymakers. The study will identify practical ideas for designing digital health strategies that support fair health outcomes and contribute to developing a sustainable digital health system.

KEYWORDS

Inequity, inequality, critical discourse analysis, digital health, digital gap

INTRODUCTION

Health is the most critical human capital, which is not only a prerequisite for comprehensive individual development but also a necessary prerequisite for social and economic progress. Digital health plays an innovative role in health, facilitating patient participation in the healthcare process (Iyawa et al., 2016). Patients actively participate in decision-making regarding their health care, searching for information online or using digital health applications. Today, the digital transformation in health is rapidly expanding and consolidating (Stoumpos et al., 2023). However, health still has the lowest level of digital innovation compared to other industries, such as media, finance, insurance and markets (Stoumpos et al., 2023). Active inclusion in digital health promotes social and economic justice and helps individuals thrive in a technology-driven society. The World Health Organization (WHO) believes that digital health has the potential to reach more people and make health services more accessible to them (Peterson et al., 2016). According to the WHO, digital health is “the field of

knowledge and practice associated with developing and using digital technologies to improve health. (World Health Organisation, 2021)

Digital equity is key to achieving the Sustainable Development Goals (SDGs), specifically SDGs 9 (industry, innovation and infrastructure) and 10 (reducing inequalities within and among countries). In our increasingly digitalized society, these technologies amplify and transform existing social inequalities while offering numerous benefits, leading to significant differences in access and use (Grybauskas et al., 2022). Digital health has revolutionary potential, but if principles of equity or digital equity do not guide it, marginalized communities may be left behind, exacerbating existing inequities and hindering social progress. The study of inequity means looking at the causes of health inequalities. Equity is a normative concept, while equality is an objective measure. Measured health inequalities should be viewed in light of the distribution of these inequalities across the population and whether such a distribution is socially acceptable (fair). Health system biases further fuel the spread of social injustice. In contrast, bias in practice contributes to reduced trust and leads to alienation, further reducing access even when services are theoretically available (Sieck et al., 2021). Unless we effectively address bias and inequity in access to digital health, health disparities will widen and become more challenging to mitigate.

Health inequalities have been the subject of various studies. They are manifested through several factors described in the PROGRESS PLUS framework, which is an acronym for Place of Residence, Race/Ethnicity/Culture/Language, Occupation, Gender, Religion, Education, Socioeconomic Status and Social Capital (Eriksen et al., 2023). The advancement of digital health and its integration into health systems has made it essential to ensure that technologies are accessible and equitable for all users, resulting in a greater interest in health inequalities. Health organizations, governments and health professionals increasingly consider digital health technologies to be key components in advancing medicine and health in general. Within the field of inequality in the broader sense, not only health, *“digital inequality deserves a place alongside more traditional forms of inequality in the pantheon of 21st-century inequalities”*, as it *“has the potential to shape life chances in multiple ways”* (Robinson et al., 2015). As the responsibility for managing health increasingly shifts to patients (as consumers) and technological systems, this raises questions about the potential of digital health to widen or reduce health inequalities (Rich et al., 2019). Those who experience high levels of social disadvantage are at risk of poorer health outcomes. However, they may also lack access, digital skills, and knowledge to understand digital health systems (Rich et al., 2019).

Digital health is a promising field, but it is accompanied by a few critical assessments of its implications for society, economy, politics, and the general individual. However, the current state reveals a significant gap in comprehensive research directed towards digital equity. The aforementioned additionally emphasises the need for directed research and development in this field, quantitative analysis (bibliographic analysis) of scientific publications, which can provide insight into the intellectual structure of this field, and information research on the current state of inequity in applying digital technologies. After identifying the critical discourses in the rapidly evolving digital health environment, it becomes necessary to explore the academic contours of this field to bridge knowledge gaps, which is a key prerequisite for addressing social inequalities within the development of digital technology.

The research will seek to answer the following research questions:

1. What interpretive repertoires are used in the literature to discuss inequity in digital health applications?
2. What attitudes towards inequity in digital health are considered?

3. What are the implications of these interpretive repertoires and attitudes for inequity in digital health?

METHODOLOGY

This research will include research published in the period from 2020 to 2025. After selecting articles based on titles and abstracts, the acceptance criteria will be further limited if an unexpected number of studies appear. The change in eligibility criteria will be introduced before the selection of studies in the entire text, which aims to make the screening more feasible and the future isolation of the discourse around inequity, i.e., inequality linked to digital health, which implies only the inclusion of articles evaluating digital health.

The research sample will include studies that focus on digital health, particularly those related to inequity, i.e. inequality in digital health from the perspective of end users (patients or citizens) of digital health. It will also include research on the potential causes of inequity, that is, inequality that can affect the end users of digital health but from the perspective of health professionals and policymakers. The research will be open to studies of any design, including those that collect data through surveys, interviews, or any other method of collecting primary data. It also includes research focused on secondary data, such as review papers. Data analysis may consist of descriptive or inferential analyzes of quantitative data or any analysis of interviews or other qualitative data. Research that does not report primary or secondary research will be excluded (e.g. commentaries, letters to the editor, and opinion pieces). Research identified through conference abstracts or presentations will only be included where a related text document (e.g., published paper or report) can be identified. Qualitative, quantitative and mixed methods studies will be eligible for inclusion. The research does not necessarily have to be conducted in an academic institution or published in an academic journal.

Studies published in a language other than English will be excluded; discourse analysis focuses on language, and as such, translated versions of research that are not in English would not authentically represent the results of the original researchers. We will conduct a thorough search of the literature using a combination of relevant keywords (e.g. digital equity" OR "digital divide" OR "grey digital divide" OR digital determinants of health" OR "digital economy" OR "digital access" OR "digital rights" OR "digital gap" OR "digital social barriers" OR "e-Health literacy" OR "digital engagement" OR "digitalisation in healthcare" OR "digital economy" etc.). Keywords will be agreed upon by consensus of the authors. The search will be performed in several electronic databases, such as ScienceDirect: web of science, PubMed and Google Scholar. Those studies for which there is no full text will be excluded from the study.

The database search results will be exported to RAYYAN (<https://www.rayyan.ai/>), where duplicates will be removed. Screening will be performed using TAGUETTE (<https://www.taguette.org/>). Full-text documents reporting on included studies will be imported into QDA MINER (<https://provalisresearch.com/products/qualitative-data-analysis-software/freeware/>) to facilitate coding and generating critical discourse analysis CDA themes.

Data will be analyzed and synthesized using critical discourse analysis (CDA) (Imafuku et al., 2022; Mullet, 2018). This method is informed by a critical realist (CR) perspective (“real,” “actual,” and “empirical”). The real refers to objects, structure, and their causal power. The actual refers to events and processes when the real is enacted. The empirical refers to how actors experience events. We will use the concept of discourse to explore how equality is constructed globally within digital health. Through this analysis, we will provide answers to research questions, answers to questions about how to articulate equality in digital health and what the implications are. Through critical discourse

analysis, we will investigate the values and norms of digital health, which will provide us with insight into the way of thinking about inequality in digital health. Our analysis, therefore, explores the discourses that constrain, enable, frame and enable ways of talking about equality and digital health within the selected texts.

RESULTS

This research will point to the dualism in equity in digital healthcare because the aforementioned concept is perceived differently in different contexts of the organization of the health system, different social structures (highly developed, medium and low developed countries) and differences between specific population groups (poor, marginalized and vulnerable groups) and about different socio-demographic characteristics of individuals. Therefore, the concept of digital health and inequity is no less ambiguous than other concepts implemented in healthcare. In addition to mapping conceptual dualism, discourse analysis aims to determine how digital health is interpreted in terms of contextual and individual characteristics. It is essential to analyze discourses related to inequity in digital health because digital health is described as a tool that accelerates communication, increases positive health outcomes and reduces healthcare costs. The preliminary results of the research identified several discourses around "*The claim that digital health systems to be tailored to the needs of the individual citizens with greatest needs*".

In the discourse of demand/use of health services, it indicates that with digital health, there is a growing obstacle in demand for health services among patients who live in remote and poor areas, the elderly population, that is, the population with the most significant health needs and who live in more deprived areas, as well as people with a lower socio-economic status (Hengst et al., 2023). The use of e-health technology in rural and remote areas is hampered by the lack of fast internet connections and the pronounced discomfort of the elderly when using information technology (Airola, 2021).

In the discourse of comprehensibility and applicability of digital and health information in the population with different social, economic and social status, there are differences in the relevance and comprehensibility of digital and health information. References in the literature indicate low health and digital literacy and reduced self-confidence in assessing health technologies among older people with cancer and their caregivers, with identified barriers including low socio-economic status, poor access to digital technologies, and inadequate knowledge and use (Verma et al., 2022) (Raihan et al., 2025).

In the discourse on the digital divide, the introduction of digital health means that the gap in the use of digital health between high-income and low- and middle-income countries has increased. Research even confirms a gap in the use of digital health in primary health care in highly developed countries (e.g. Sweden) (Eriksson et al., 2024). Reducing the gap in the use of digital technologies among marginalized groups, populations living in different geographic areas (urban and rural) and groups of various social statuses and ages (Chen et al., 2020; Karri & Yarra, 2022; Nakayama et al., 2023). Also, there is a digital divide between the genders, especially among women living in specific environments or countries. The gap in access to digital technologies among women in rural versus women living in urban areas arises as a result of poor digital literacy, social norms and the prohibitive cost of digital devices and mobile packages (Srinivasan et al., 2024).

CONCLUSION

All the identified discourses have the potential to indicate that inequity in digital health systematically threatens the health of already socially vulnerable population groups (poor, marginalized, and vulnerable according to gender, age, or belonging to some racial, ethnic, or

religious group) and additionally contributes to their worse health outcomes. Therefore, there is a potential problem: the already existing inequity to be replicated and even increased with the introduction of digital health.

Digital healthcare can represent a double-edged sword, with the potential to reduce inequity and the potential to increase inequity for certain groups of the population (patients). With this research, we are trying to warn against the widespread uncritical acceptance of digital health solutions, assuming that digital solutions are better and give better results.

We justify all of the above with the fact that there is evidence that some aspects of digital health can exacerbate inequalities, such as the use of mobile health apps and other mobile technologies to improve women's access to health resources in certain countries or settings. Also, digital solutions may not meet the health needs of populations living in rural areas or may not even have an impact on reducing healthcare costs (e.g. opportunity costs). It is also crucial to consider people's changing investments in health or fears of new, innovative technologies and privacy protections, as many people may find digital solutions beyond their ability to manage. Much of the discourse on digital health and inequalities is framed around the concept of the digital divide, which highlights the significant problem of equal access to the Internet, especially among populations with chronic diseases or disabilities. The digital divide can also arise regarding income, education, age groups, and those with lower or higher health needs living in underdeveloped areas or with inadequate health and digital literacy.

We must, therefore, ask critical questions about how digital technologies are negotiated, embraced and managed in the context of these broader social inequalities. Given the continued investment in digital health, a rapid response to address this knowledge gap is necessary to ensure the long-term development of digital health policy and practice. Concerns about the introduction of digital technologies are growing, considering that it is now well-understood that we have moved from inequality in healthcare to digital inequality in healthcare. Government levels and all actors who influence the design and implementation of healthcare technologies must not stay blind to this phenomenon, especially not forgetting end users. Digital healthcare is not a magic wand that makes the healthcare system equally accessible to everyone. However, it has the power to enable the majority to use it and feel comfortable using it. This can be achieved by defining special strategies, such as providing digital literacy training, ensuring affordability, and designing user-friendly interfaces to make digital healthcare more universally accessible.

The resulting model offers valuable insights for designing digital health strategies that promote equitable health outcomes and contribute to the development of a sustainable digital health system capable of effectively addressing challenges. The digital divide in healthcare is poised to be explored further through future empirical research and policy formulation, with this study providing a solid foundation.

REFERENCES

- Airola. (2021). Learning and Use of eHealth Among Older Adults Living at Home in Rural and Nonrural Settings: Systematic Review. *Journal of Medical Internet Research*, 23(12). <https://doi.org/10.2196/23804>
- Chen, X., Östlund, B., & Frennert, S. (2020). Digital Inclusion or Digital Divide for Older Immigrants? A Scoping Review. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 12209 LNCS, 176–190. https://doi.org/10.1007/978-3-030-50232-4_13
- Eriksen, J., Ebbesen, M., Eriksen, K. T., Hjermitsev, C., Knudsen, C., Bertelsen, P., Nøhr, C., & Weber, D. (2023). Equity in digital healthcare – the case of Denmark. *Frontiers in Public Health*, 11, 1225222. <https://doi.org/10.3389/FPUBH.2023.1225222/BIBTEX>

- Eriksson, J., Calling, S., Jakobsson, U., Wolff, M., Borgström Bolmsjö, B., & Milos Nymberg, V. (2024). Inequity in access to digital public primary healthcare in Sweden: a cross-sectional study of the effects of urbanicity and socioeconomic status on utilization. *International Journal for Equity in Health*, 23(1). <https://doi.org/10.1186/S12939-024-02159-7>
- Grybauskas, A., Stefanini, A., & Ghobakhloo, M. (2022). Social sustainability in the age of digitalization: A systematic literature Review on the social implications of industry 4.0. *Technology in Society*, 70, 101997. <https://doi.org/10.1016/J.TECHSOC.2022.101997>
- Hengst, T. M., Lechner, L., Dohmen, D., & Bolman, C. A. W. (2023). The facilitators and barriers of mHealth adoption and use among people with a low socio-economic position: A scoping review. *Digital Health*, 9(1). <https://doi.org/10.1177/20552076231198702>
- Iyawa, G. E., Herselman, M., & Botha, A. (2016). Digital Health Innovation Ecosystems: From Systematic Literature Review to Conceptual Framework. *Procedia Computer Science*, 100, 244–252. <https://doi.org/10.1016/J.PROCS.2016.09.149>
- Karri, K., & Yarra, P. (2022). Inequities still exist in the use of digital health technology across different sociodemographic subgroups. *Evidence-Based Nursing*, 25(1), 23. <https://doi.org/10.1136/EBNURS-2020-103355>
- Nakayama, L., Binotti, W., Woite, N., Fernandes, C. O., Alfonso, P. G., Celi, L. A., & Regatieri, C. V. (2023). The digital divide in Brazil and barriers to telehealth and equal digital health care: analysis of internet access using publicly available data. *Journal of Medical*, 5.
- Paik Id, K. E., Hicklen, R., Kaggwa, F., Puyat, C. V., Nakayama, L. F., Ong, B. A., Shropshire, J. N. I., & Villanueva, C. (2023). Digital Determinants of Health: Health data poverty amplifies existing health disparities —A scoping review. *Journals.Plos.Org*, 2(10). <https://doi.org/10.1371/journal.pdig.0000313>
- Peterson, C. B., Hamilton, C., & Hasvold, E. P. (2016). *World Health Organization. From innovation to implementation – eHealth in the WHO European Region. Ginebra (Suiza): WHO; 2016.* World Health Organisation.
- Raihan, M. M. H., Subroto, S., Chowdhury, N., Koch, K., Ruttan, E., & Turin, T. C. (2025). Dimensions and barriers for digital (in) equity and digital divide: A systematic integrative review. *Emerald.Com*, 4(2), 111–127. <https://doi.org/10.1108/DTS-04-2024-0054>
- Rich, E., Miah, A., & Lewis, S. (2019). Is digital health care more equitable? The framing of health inequalities within England’s digital health policy 2010–2017. *Sociology of Health and Illness*, 41(S1), 31–49. <https://doi.org/10.1111/1467-9566.12980>
- Robinson, L., Cotten, S. R., Ono, H., Quan-Haase, A., Mesch, G., Chen, W., Schulz, J., Hale, T. M., & Stern, M. J. (2015). Digital inequalities and why they matter. *Information, Communication & Society*, 18(5), 569–582. <https://doi.org/10.1080/1369118X.2015.1012532>
- Sieck, C. J., Sheon, A., Ancker, J. S., Castek, J., Callahan, B., & Siefer, A. (2021). Digital inclusion as a social determinant of health. *Npj Digital Medicine* 2021 4:1, 4(1), 1–3. <https://doi.org/10.1038/s41746-021-00413-8>
- Srinivasan, M., Mathew, G., Mathew, N., Kumar, M., Goyal, N., & Kamath, M. S. (2024). Technologies that empower women for better access to healthcare in India—A scoping review. *Taylor & Francis*, 19(1). <https://doi.org/10.1080/17441692.2024.2318240>
- Stoumpos, A. I., Kitsios, F., & Talias, M. A. (2023). Digital Transformation in Healthcare: Technology Acceptance and Its Applications. *International Journal of Environmental Research and Public Health*, 20(4). <https://doi.org/10.3390/IJERPH20043407>
- Verma, R., Saldanha, C., Ellis, U., Sattar, S., & Haase, K. R. (2022). eHealth literacy among older adults living with cancer and their caregivers: A scoping review. *Journal of Geriatric Oncology*, 13(5), 555–562. <https://doi.org/10.1016/J.JGO.2021.11.008>

World Health Organisation. (2021). *Global Strategy on Digital Health 2020-2025*. World Health Organization.

FRAMING DIGITAL INNOVATION AND SUSTAINABILITY NARRATIVES WITHIN THE DIGITAL ECONOMY: LESSONS FROM TOP TECHNOLOGY COMPANIES

İrge Şener

Çankaya University, Ankara, Türkiye, irge@cankaya.edu.tr

Yavuz Selim Balcıoğlu

Doğuş University, İstanbul, Türkiye, ybalcioglu@dogus.edu.tr

<https://orcid.org/0000-0001-7138-2972>

Ahmet Anıl Karapolatgil

Azerbaijan State University of Economics, Baku, Azerbaijan, aak160387hotmail.com

<https://orcid.org/0000-0003-4012-9514>

ABSTRACT

To truly build a sustainable digital economy, strategies must move beyond environmental responsibility and economic development to place inclusion, equity, and social cohesion at their core. Innovation plays a crucial role in this process—not merely as a driver of technical advancement but as a catalyst for creating digital solutions rooted in transparency, ethics, and fairness. In accordance, this study explores how leading technology companies communicate sustainable digitalization through their corporate sustainability reports. By analyzing 147 firms from the Global 100 Most Sustainable Corporations and others from their corporate sustainability reports, the study employs a mixed-methods approach combining content analysis with quantitative and qualitative evaluation and applies a five-dimensional framework focusing on geography, industry, reporting standards, narrative framing, and governance. Findings reveal distinct strategic profiles that reflect how innovation is embedded across diverse reporting contexts. By integrating digital technologies into sustainability discourse, firms not only demonstrate technical progress but also build stakeholder trust. Providing a systematic, empirically grounded analysis of sustainable digital innovation disclosure among leading global corporations, this study advances theoretical understanding and offers actionable insights. It bridges gaps in previous research by explicitly linking innovation narratives to governance structures and reporting frameworks, illuminating how organizations orchestrate their communication of sustainable digital transformation across diverse contexts. This multidimensional perspective encourages clearer, more coherent, and strategically aligned sustainability discourse, supporting the emergence of a digital economy that is not only innovative and efficient but also socially inclusive and environmentally responsible.

KEYWORDS

digital economy, digital innovation, corporate digital sustainability, mixed-methods

INTRODUCTION

The digital economy has evolved through several conceptual phases—from the “information economy” of the 1970s to the “network economy” of the 2000s (Ciocoiu, 2011). A key milestone was the 2016 G20 Hangzhou Summit, which formally recognized the digital economy as a priority in

global economic policy (Rosário & Dias, 2023). Today, digital economies are defined by hyperconnectivity, real-time data, and platform-based business models. The rapid expansion of digital economy is transforming not only global economic structures but also social systems that bind communities. For instance, Xu et al. (2024) emphasize the role of digital technologies in enhancing urban resilience, enabling cities to respond more effectively to risk.

Technologies such as ‘artificial intelligence’ (AI) and ‘Internet of Things’ (IoT), blockchain, and digital platforms have reshaped value chains and consumer behaviour while enabling agile decision-making across sectors. Such innovations are driving connectivity and economic growth (Limna et al., 2022). However, the digital shift brings not only opportunities but also ecological and social risks. The transformation is accompanied by stark challenges—digital inequality, limited access, and exclusion threaten to marginalize vulnerable groups. Digital infrastructures demand high energy, contributing to carbon emissions and electronic waste (Belkhir & Elmeligi, 2018). Although technologies like AI can optimize energy use and support climate goals (Truong, 2022), rebound effects and unequal access complicate sustainability outcomes (Freitag et al., 2021). Scholars such as Hilty & Aebischer (2015) advocate for a “sustainability-by-design” approach, urging caution against fragmented methods and weak frameworks. Thus, while digital innovation may support “environmental-social-governance” (ESG) objectives, it can also exacerbate inequality and environmental degradation if not properly governed.

Cao (2024) stresses the need to foreground the social dimension in discussions of sustainable digital economies. Thus, any serious sustainability agenda must include social dimensions of digitalization, from employment and participation to governance and inclusion (Zhang et al., 2022). A truly sustainable digital economy must integrate inclusion, equity, and social cohesion alongside environmental and economic goals. For this, innovation plays a pivotal role—not just as a technological force, but as a driver of ethical and socially responsive solutions. Limna et al. (2022) argue that when innovation aligns with values such as transparency and fairness, it creates accessible digital ecosystems and fosters broad participation. Achieving this vision requires close collaboration between governments, businesses, and civil society.

Although technologies are reshaping participation, equity, and inclusion—yet a widening digital divide, especially between developed and developing regions, threatens social sustainability. Innovation, when guided by ethical imperatives, becomes a tool to promote fairness and accessibility. Song et al. (2024) highlight how digitalization enhances quality of life and employment diversification in urban settings, with increased digital access fostering more inclusive participation in sustainable development. Innovation facilitates low-carbon transitions, energy efficiency, and inclusive services. However, for such benefits to be fully realized, innovation must be directed toward both environmental and social outcomes.

Regarding the relation of innovation and sustainable digital economy, Sarfraz et al. (2022) describe a reciprocal relationship: “innovation drives sustainability in digital economies, while a robust digital infrastructure cultivates innovation”. Technologies such as blockchain enhance transparency and trust, aligning with long-term societal goals. Yet, as Rosário and Dias (2023) note, challenges such as inadequate digital infrastructure and weak data governance persist. These barriers hinder the integration of sustainability into fast-moving digital transformations. Still, the potential is considerable. Digital tools help reduce waste, optimize resource use, and encourage sustainable business practices. Liao (2024) emphasizes measurable impacts—such as energy-efficient data

centers and improved e-waste management—while pointing to importance of collaborative innovation ecosystems involving public and private actors. Raihan (2024) offers concrete examples: smart energy systems, AI-driven urban planning, and circular economy models are already improving sustainability outcomes. Sharing platforms foster community engagement, while emerging business models place environmental and social responsibility at their core.

In sum, the digital economy holds the potential to enable a more just, equitable, and ecologically responsible future—but only if innovation is harnessed for public good, and social inclusion is placed at the heart of technological transformation. Yet the question remains: *Which innovations are truly shaping the sustainable digital economy, and how are companies communicating this transformation?* This study addresses this question by examining corporate sustainability reporting through five analytical lenses: geographic context, industry sector, reporting frameworks, narrative strategies, and governance structures. These dimensions help reveal how organizations embed innovation within their sustainability agendas and communicate their value to stakeholders. Reporting frameworks and Integrated Reporting shape how companies frame their commitments, while governance structures ensure that sustainability is not just rhetorical—but operationalized.

METHODOLOGY

Research Design

This study adopts a mixed-methods approach that integrates content analysis, quantitative measurement, and qualitative narrative assessment to investigate how companies report sustainable digital innovation. The research design follows a three-stage analytical sequence designed to provide comprehensive understanding of both the substance and presentation of innovation in corporate sustainability reports.

The methodological integration operates through sequential triangulation, where each analytical component builds upon and validates findings from the previous stage. Content analysis provides the foundational mapping of innovation-related disclosure patterns across all sample firms. Quantitative scoring transforms these patterns into measurable outcomes that enable statistical comparison and identification of disclosure leaders across different categories. Qualitative narrative analysis adds interpretive depth by examining how organizations strategically frame their sustainability efforts to engage stakeholders and build legitimacy.

This integrated design enables multi-layered understanding of how innovation is positioned within broader corporate strategies and communication efforts. The approach addresses the complexity of sustainability communication by capturing both explicit content disclosure and implicit strategic messaging, while accounting for contextual factors that influence reporting practices across geographic regions, industries, and governance structures.

Mixed-Methods Integration Framework

The study employs methodological triangulation through three interconnected analytical phases (Johnson et al., 2017). The first phase conducts systematic content analysis using keyword identification and contextual interpretation across nine categories of sustainable digital innovation.

This phase establishes the empirical foundation by documenting what innovation activities companies disclose and how comprehensively they report on different technological domains.

The second phase applies quantitative scoring using a four-level system that transforms qualitative disclosure content into numerical indicators. Scoring decisions integrate both content presence and depth of discussion, with metrics and outcomes receiving higher scores than brief mentions. When quantitative scores and qualitative interpretations presented potential conflicts, resolution followed predetermined decision rules that prioritized contextual meaning over mechanical keyword counting. This approach ensures that scoring reflects substantive communication rather than superficial mention of innovation terms.

The third phase conducts qualitative narrative analysis that categorizes dominant framing approaches and examines how organizations position their innovation efforts within broader sustainability strategies. This phase interprets the strategic intent behind disclosure choices and connects innovation communication to stakeholder engagement objectives.

The five-dimensional analytical framework operates consistently across all three methodological phases. Geographic, sectoral, reporting framework, narrative framing, and governance dimensions provide analytical structure that enables systematic comparison while preserving contextual nuance. Each dimension contributes unique insights that combine to reveal comprehensive strategic profiles of how firms communicate sustainable digital transformation.

Data Source and Sample

The selection and classification of technology-oriented firms from Global 100 list follows established methodological approaches in corporate sustainability research. Serafeim & Yoon (2022) emphasize that sample selection in sustainability studies should balance representativeness with analytical focus, particularly when examining sector-specific phenomena such as digital innovation. The decision to focus on digitally active firms aligns with calls from Pizzi et al. (2021) for more targeted analyses of sustainability communication within technology-intensive industries, where digitalization narratives are most prominent and strategically significant.

The classification methodology employed a three-tier verification process to ensure accuracy and minimize selection bias. First, firms were categorized using Global Industry Classification Standard (GICS) sectors, which provide a standardized framework for industry analysis widely accepted in corporate research (Cohen & Lou, 2012). Second, detailed business descriptions from annual reports and corporate websites were reviewed to identify companies whose core operations involve digital technologies or significant digitalization initiatives. This approach addresses the limitation identified by Refinitiv (2023) that sector classifications alone may not capture full scope of digital activity across industries. Third, Corporate Knights (2005) peer group designations were cross-referenced to validate technology orientations, as these groupings reflect sustainability performance within comparable business models.

The keyword-based identification process followed systematic content analysis protocols established by Krippendorff (2018). The search terms—"technology," "digital," "software," "artificial intelligence," "telecommunications," "data analytics," "platform," and "automation"—were selected based on previous studies examining digital economy characteristics (OECD, 2019; Bukht & Heeks, 2017). This multi-keyword approach ensures comprehensive coverage while maintaining analytical

precision. Each company's classification was independently verified by two researchers, with disagreements resolved through discussion and additional document review, achieving an inter-rater reliability of 94%. Industry expertise was incorporated through consultation with three sustainability specialists who reviewed classification framework and sample composition. Their feedback confirmed that selected firms represent most relevant organizations for analyzing digital innovation communication in sustainability contexts. This expert validation addresses concerns raised by Hahn & Kühnen (2013) about researcher subjectivity in sustainability communication studies.

The resulting sample of 147 firms represents 73.5% of Global 100 list, demonstrating that digital technologies have become central to sustainability leadership across industries. This proportion aligns with estimates from McKinsey Global Institute (2023) indicating that approximately 70% of large corporations now consider digital transformation integral to their sustainability strategies. The sample size exceeds minimum thresholds recommended for mixed-methods corporate communication studies (Tashakkori & Teddlie, 2010) and provides sufficient statistical power for both quantitative analysis and qualitative pattern identification.

Content Analysis of Digital Innovation

The core of analysis evaluates how firms report on nine key categories of sustainable digital innovation (Table 1). Each category was analyzed using keyword identification and contextual interpretation to ensure accurate and meaningful classification of disclosure content. Disclosure in each innovation category is scored using a four-level system; as **0** – no mention, **1** – brief mention, **2** – detailed discussion, **3** – detailed discussion with metrics or outcomes. Narratives are categorized by their dominant framing approach. Additional variables capture how sectoral and regional factors influence communication strategies and governance structures.

Table 1. Key Categories of Sustainable Digital Innovation

Category	Description
Blockchain	transparency and governance
Artificial Intelligence	Energy optimization and data-driven strategies
Internet of Things (IoT)	smart infrastructure and environmental monitoring
Big Data Analytics	strategic planning and efficiency gains
Smart Energy Systems	renewable integration and grid optimization
Sharing Economy Platforms	collaborative consumption and community participation
Circular Economy Technologies	waste reduction and lifecycle tracking
Social Impact Business Models	social value creation and inclusive innovation
Multi-Stakeholder Collaborations	partnerships with governments, academia, and NGOs

The study applies a five-dimensional framework (Table 2). This structure helps contextualize innovation reporting within broader strategic, cultural, and regulatory environments.

Table 2. Five-Dimensional Analytical Framework

Dimension	Description
Geographic	assesses regional variation based on company headquarters
Sectoral	examines industry-specific trends in innovation disclosure
Framework	analyzes use of reporting standards
Narrative Framing	identifies communication styles, including technological leadership, collaborative innovation, and social value creation
Governance	evaluates how innovation is embedded in decision-making structures

RESULTS

Analysis of 147 technology companies reveals that effective communication of sustainable digital transformation hinges on the strategic alignment of five key dimensions: geography, industry sector, reporting frameworks, narrative framing, and governance structures. Rather than excelling in isolated areas, leading firms integrate these dimensions to develop coherent, stakeholder-oriented innovation strategies. A strong majority—94%—disclose activities in at least six of nine innovation categories, with Information Technology (IT) companies averaging 7.2 categories, followed by Communication Services (6.8) and Technology-enabled Industrials (6.5). This suggests a holistic embrace of sustainability-driven innovation.

Based on the analysis, **Regional Patterns** show distinct integration profiles. **North American firms**, mostly in the IT sector, emphasize **technological leadership** and use **SASB** frameworks with executive innovation committees. Their communication highlights **AI**, **blockchain**, and **smart energy** as competitive advantages. **European companies** span IT and industrial sectors, using **GRI** and **TCFD** frameworks. They favor **stakeholder collaboration** narratives and board-level sustainability oversight. Their focus lies in **circular economy**, **big data**, and **social responsibility**. **Asia Pacific firms**, especially in Communication Services, apply locally adapted **GRI** standards and consensus-driven governance. They frame innovation around **IoT**, **sharing economy platforms**, and **ecosystem partnerships**. **Latin American companies** prioritize community engagement and social value, guided by basic GRI reporting and community-based governance.

Industry Sector Analysis further reflects following patterns. **IT companies**, mostly based in North America and Europe, favor **SASB** and stress **AI**, **big data**, and **circularity** through executive-led governance. **Communication Services** firms, especially in Asia Pacific, emphasize **ecosystem development** and stakeholder partnerships using **GRI** and **TCFD**. **Technology-enabled Industrials**, concentrated in Europe and Asia, focus on **operational integration** and use **TCFD** to highlight **smart energy** and **blockchain** in transparent supply chains.

Reporting Frameworks guide both the form and depth of innovation disclosure. **SASB users** (38%) focus on investor-oriented, performance-driven narratives. **GRI adopters** (45%) emphasize inclusivity and broader stakeholder engagement. **TCFD-enhanced reports** (31%) support climate-related governance and innovation disclosure. **Integrated reporting** is used by 18%, mainly in Europe, to connect innovation with business model evolution. **Narrative strategies** reflect geographic and

sectoral identities. **Technological leadership** dominates in North America's IT firms. **Stakeholder collaboration** is prevalent in Europe, with a focus on shared value. **Ecosystem development** is central in Asia Pacific, where innovation is co-created through networks. **Climate leadership** aligns with industrial firms using TCFD. **Integrated value creation** narratives connect sustainability with core business models. **Governance structures**, on the other hand, mirror these approaches. Executive-led committees dominate North American IT firms; board-level oversight characterizes European sustainability leadership; consensus committees drive Asia Pacific collaboration; and risk management structures underpin climate governance. In sum, sustainable digital transformation is not a singular effort but a coordinated strategy—where innovation, communication, and governance must work in tandem to shape credible, forward-looking sustainability narratives.

CONCLUSION

This study makes a distinctive and timely contribution to the understanding of how sustainable digital transformation is communicated through corporate sustainability reporting. While prior literature (e.g., Ștefănescu, 2024; Li, 2024) acknowledges the increasing importance of digital innovation for sustainability, these studies often treat innovation as a secondary or implicit theme. In contrast, this research explicitly centers digital innovation as a core narrative and strategic element, presenting a **comprehensive multidimensional framework** that integrates geographic context, industry sector, reporting standards, governance models, and communication strategies.

One of the most notable theoretical advances is the identification of strategic profiles that encapsulate how companies align these dimensions to position their sustainable digital innovation efforts effectively. The analysis reveals that sustainable digital transformation communication is a **complex, multifaceted process** shaped by the interplay of geography, industry, governance, reporting standards, and narrative framing. North American companies predominantly utilize **technological leadership narratives** that stress rapid innovation and competitive advantage, targeting investors and emphasizing AI and blockchain technologies. While this approach fosters cutting-edge progress, it risks marginalizing broader social and environmental considerations. In Europe, firms tend to emphasize **stakeholder collaboration and regulatory alignment**, adopting inclusive narratives around circular economy initiatives and social responsibility. This fosters comprehensive sustainability integration but may lead to more cautious innovation dynamics due to balancing multiple stakeholder demands. Asia Pacific organizations prioritize **ecosystem development and consensus governance**, supporting collaborative innovation through IoT and sharing economy platforms. Their approach reflects a strong emphasis on network value and community engagement, though it can present challenges in reconciling local and global sustainability expectations. This framework moves beyond fragmented or single-focus studies, showing that innovation disclosure is not merely about technical details but is intricately linked to governance and stakeholder engagement, thereby enriching the literature on sustainability communication and corporate reporting.

These regional and sectoral differences highlight that there is no universal blueprint for sustainable digitalization. Instead, effective strategies arise from **aligning institutional logics and organizational capacities** with stakeholder expectations and contextual realities. The identified strategic profiles offer companies a practical framework to **assess and refine their sustainability communication approaches**. By recognizing their position within these typologies, organizations can better integrate

governance, reporting, and narrative elements to enhance their innovation legitimacy and foster meaningful stakeholder relationships.

The study's findings offer critical insights for multiple stakeholders. For corporate leaders, it highlights the necessity of **tailored and integrated communication strategies** that reflect not only technological innovations but also local regulatory environments, industry norms, and governance structures. Effective alignment of reporting frameworks and governance with narrative approaches enhances the credibility of sustainability claims and builds stronger stakeholder trust—an essential factor as scrutiny of corporate sustainability intensifies. Policy makers and regulators may find the profiles useful for designing **more nuanced guidelines and standards** that accommodate the diversity of sustainability communication practices globally, thereby promoting greater transparency and comparability without imposing one-size-fits-all mandates. Investors and sustainability analysts gain from understanding these profiles as tools to interpret corporate disclosures with greater sophistication, allowing for more informed evaluation of innovation strategies, governance effectiveness, and potential risks.

Importantly, the research underscores the role of *inclusive, ethical, and socially responsible innovation* as integral to sustainable digital transformation. The profiles illustrate that such innovation is not an afterthought but a strategic driver requiring comprehensive coordination across communication, governance, and operational domains. This challenges organizations to see innovation as a multidimensional narrative asset—one that balances economic competitiveness with social and environmental stewardship.

Apart from the contributions, several limitations are acknowledged. First, the focus on top-performing companies may not reflect average industry practices. The cross-sectional design prevents analysis of temporal changes. Subjectivity in narrative coding and reliance on public documents may overlook non-disclosed or informal innovation practices. Moreover, regional aggregation can mask important country-level nuances. These constraints suggest caution in generalizing findings, though the study offers valuable insights into the current state of digital innovation communication among sustainability leaders.

REFERENCES

- Belkhir, L., & Elmeligi, A. (2018). Assessing ICT global emissions footprint: Trends to 2040 & recommendations. *Journal of Cleaner Production*, 177, 448–463. <https://doi.org/10.1016/j.jclepro.2017.12.239>
- Bukht, R., & Heeks, R. (2017). Defining, conceptualising and measuring the digital economy. Development Informatics Working Paper, No. 68, University of Manchester.
- Ciocoiu, C. N. (2011). Integrating digital economy and environmental sustainability: Key challenges and opportunities. *Theoretical and Empirical Researches in Urban Management*, 6(1), 33–43.
- Cohen, L., & Lou, D. (2012). Complicated firms. *Journal of Financial Economics*, 104(2), 383–400.
- Corporate Knights (2025). 2025 Global 100 List: World's most sustainable companies are still betting on a greener world. Corporate Knights Inc. Retrieved June 25, 2025, from <https://www.corporateknights.com/issues/2025-01-global-100-issue/100-most-sustainable-companies-still-betting-greener-world/>
- Freitag, C., Berners-Lee, M., Widdicks, K., Knowles, B., Blair, G., & Friday, A. (2021). The climate impact of ICT: A review of estimates, trends and regulations. *Patterns*, 2(9), 100340. <https://doi.org/10.1016/j.patter.2021.100340>

- Hahn, R., & Kühnen, M. (2013). Determinants of sustainability reporting: A review of results, trends, theory, and opportunities in an expanding field of research. *Journal of Cleaner Production*, 59, 5-21.
- Hilty, L. M., & Aebischer, B. (Eds.). (2015). *ICT innovations for sustainability*. Springer.
<https://doi.org/10.1007/978-3-319-09228-7>
- Johnson M., O'Hara, R., Hirst, E., Weyman, A., Turner, J., Mason, S., Quinn, T., Shewan, J., & Siriwardena, A. N. (2017). Multiple triangulation and collaborative research using qualitative methods to explore decision making in pre-hospital emergency care. *BMC Medical Research Methodology*, 17(11), Article 11.
<https://doi.org/10.1186/s12874-017-0290-z>
- Krippendorff, K. (2018). *Content analysis: An introduction to its methodology* (4th ed.). Sage Publications.
- Li, K. (2024). Enterprise innovation and sustainable development strategy in the era of digital economy. *International Journal of Global Economics and Management*, 4(2), 389–396.
- Liao, J. (2024). Enabling a sustainable digital transformation. *Journal of Latin American Sciences and Culture*, 6(9), 33-43.
- Limna, P., Kraivanit, T., & Siripipatthanakul, S. (2022). The growing trend of the digital economy: A review article. *International Journal of Computing Sciences Research*. 6, 1-11.
- McKinsey Global Institute. (2023). *The age of AI: How artificial intelligence is transforming business and society*. McKinsey & Company.
- OECD. (2019). *Measuring the digital transformation: A roadmap for the future*. OECD Publishing.
- Pizzi, S., Corbo, L., & Caputo, A. (2021). Fintech and SMEs sustainable business models: Reflections and considerations for a circular economy. *Journal of Cleaner Production*, 281, 125217.
- Raihan, A. (2024). A review of the potential opportunities and challenges of the digital economy for sustainability. *Innovation and Green Development*, 3(4). 100174
<https://doi.org/10.1016/j.igd.2024.100174>
- Refinitiv. (2023). *Global ESG data and technology trends report*. Refinitiv, an LSEG Business.
- Rosário, A., & Dias, Á. (2023). Digital economy and sustainability: A systematic literature review and future research agenda. *Sustainability*, 15(4), 3441. <https://doi.org/10.3390/su15043441>
- Sarfraz, M., Ivascu, L., & Abdullah, M. I. (2022). Editorial: Sustainable digital economy, entrepreneurship, and blockchain technology role in industrial-organizational psychology. *Frontiers in Psychology*, 13, 974415.
<https://doi.org/10.3389/fpsyg.2022.974415>
- Serafeim, G., & Yoon, A. (2022). Which corporate ESG news does the market react to? *Financial Analysts Journal*, 78(1), 59-78.
- Ștefănescu, C. A., & Nistor, C. S. (2024). Is digitalization a good roof for sustainability reporting? *Present Environment and Sustainable Development*, 18(2), 307–329.
- Tashakkori, A., & Teddlie, C. (2010). *Sage handbook of mixed methods in social & behavioral research* (2nd ed.). Sage Publications.
- Truong, H. (2022). The impact of digital transformation on environmental sustainability. *Advances in Multimedia*, Article ID 6324325. <https://doi.org/10.1155/2022/6324325>
- Xu, Q., Zhong, M., & Dong, Y. (2024). Digital economy and risk response: How the digital economy affects urban resilience. *Cities*, 155, Article 105397. <https://doi.org/10.1016/j.cities.2024.105397>
- Zhang, J., Zhao, W., Cheng, B., Li, A., Wang, Y., Yang, N., & Tian, Y. (2022). The impact of digital economy on the economic growth and the development strategies in the post-COVID-19 era: Evidence from countries along the “Belt and Road.” *Frontiers in Public Health*, 10, Article 856142.
<https://doi.org/10.3389/fpubh.2022.856142>

THE DIGITALIZED ECONOMY AND THE TRANSFORMATION OF E-COMMERCE: DRIVERS AND RESEARCH TRENDS

Fulya Taşel

Maltepe University, İstanbul, Türkiye, fulyataasel@maltepe.edu.tr
<https://orcid.org/0000-0001-6959-5776>

Ebru Beyza Bayarçelik

Maltepe University, İstanbul, Türkiye, ebrubeyzabayarcelik@maltepe.edu.tr
<https://orcid.org/0000-0003-4886-5719>

ABSTRACT

E-commerce plays a pivotal role in the digital economy by driving economic growth, promoting financial inclusion, and reshaping traditional business models. As digital technologies evolve, e-commerce has become integral to trade, enabling businesses to operate efficiently and reach broader markets. The COVID-19 pandemic significantly accelerated the adoption of e-commerce, underscoring its critical role in sustaining economic activity amid periods of crisis. Particularly in developing countries, e-commerce contributes to welfare improvements by supporting digital transformation, creating employment opportunities, and facilitating the development of digital platforms and services. This study employs bibliometric analysis to examine the existing body of literature on the investigation and application of e-commerce within the context of the digital economy. A total of 302 articles published between 2001 and 2025 were retrieved and analyzed from the Web of Science database. The findings indicate a significant increase in academic interest in the concepts of e-commerce and the digital economy, both in publication volume and across diverse disciplines. Furthermore, future research in the field of e-commerce is expected to expand upon existing knowledge by incorporating emerging technologies and exploring new frontiers, including the impact of artificial intelligence, big data, blockchain, fintech solutions and cryptocurrencies such as Bitcoin.

KEYWORDS

Digital Economy, E-Commerce, Bibliometric Analysis, Research Trends

INTRODUCTION

The term 'digital economy' refers to an economy shaped by digital innovations and internet-based technologies, which includes diverse sectors ranging from e-commerce to web-based services (Cai, Wang, Ji, & Xu, 2024).

The digital economy can be defined as a form of economic organization that emerges from the comprehensive integration of modern digital technologies into all areas of national economic activity. It encompasses economic processes driven by next-generation information technologies, where digital platforms facilitate transactions and communication, and robust digital infrastructure ensures reliable support (Jin, Xu, Zhu, & Li, 2023).

The advancement of digital technologies and electronic communication has led to the emergence of a digital economy, reshaping how economic and commercial activities are carried out. The digital economy is a constantly changing system that affects many areas of society, including the economy,

culture, and social life. With the growth of digital technology and electronic communication, economies around the world are shifting toward digital forms of interaction. This transformation is characterized by the increasing digitization of business activities and the transition from traditional to online and network-based operations (Xia, Baghaie, & Sajadi, 2024).

Digital technologies have significantly contributed to the process of globalization by enabling the worldwide distribution and exchange of intellectual labor and capital, thereby reducing geographic constraints and creating a more interconnected global environment. Technologies such as AI, Big Data, 5G, and robotics are closely tied to information and communication technologies (ICT), which functions as the backbone of the digital economy and continues to grow through strategic investments (Rehman & Nunzianta, 2023). The digital economy includes all forms of economic activity that depend on data-driven insights to manage resources effectively and foster productivity growth (Ma & Gu, 2024).

The transition from an industrial to a digital economy has introduced significant changes, such as new production mechanisms, organizational forms, and business environments. Advances in technology have long played a critical role in driving economic growth. The rise of the digital economy, with information and communication technologies (ICT) at its core, has further reinforced this relationship, acting as a catalyst for industrial transformation across multiple sectors (Rong, 2022).

By utilizing advanced technologies, the digital economy creates value by fostering innovation, enhancing operational efficiency and giving rise to new, often revolutionary, business models (Cai, Wang, Ji, & Xu, 2024).

E-commerce is a key component and one of the most visible aspects of the digital economy. While the digital economy includes all economic activities driven by digital technologies, E-commerce refers to the buying and selling of goods and services over the internet through various online platforms and digital transactions. With platforms such as Amazon, Alibaba, and eBay transforming the online shopping experience, the rise of e-commerce has significantly reshaped the retail sector and led to the emergence of new technologies and business models (Costa & Rodrigues, 2024). In this context, e-commerce has become a fundamental component of the digital economy, particularly in response to the growing impact of digital competition in the labor market (Hendricks & Mwapwele, 2024).

E-commerce and digital transformation play a significant role in both supply-side and consumer-side applications. On the supply side, the impact of digital transformation on the retail value chain is primarily reflected in the ability to offer multi-channel interaction points, facilitating the management of multi-level competitors. On the consumer side, innovative advancements in e-commerce and the digital economy are believed to enhance customer experience amid growing competition and contribute to the protection of consumers' personal data (Olusanya & Isinkaye, 2025). E-commerce encompasses every aspect of a transaction, including commercial market creation, ordering, supply chain management, and money transfer. It also includes a wide range of digital activities such as e-information exchange, e-capital movement, e-money, e-marketing, e-banking, e-insurance services, and more (Albshaier, Almarri, & Rahman, 2024).

This study conducts a systematic bibliometric evaluation of existing research that explores the connection between e-commerce and the digital economy. This study analyzes the evolution of the literature by tracking key developments, publication patterns, highlighting major contributors and new research frontiers. This study aims to fill current gaps in the literature and offer practical insights for academics, decision-makers, and professionals in the field. The research applies a detailed bibliometric approach gathering data from sources like Scopus and Web of Science. To examine

patterns of co-citation, keyword associations, and collaboration networks, the analysis is carried out with the support of the VOSviewer software.

METHODOLOGY

Bibliometric analysis facilitate the identification and comparison of academic contributions by transforming bibliographic details into analyzable data (Cancino, Amirbagheri, Merigo, & Dessouky, 2019). This approach offers researchers a structured way to explore major trends by analyzing collections of academic publications (Laengle, et al., 2021). In addition, it helps researchers assess the present landscape of a research field and the potential directions a field may take (Donthu, Kumar, Mukherjee, Pandey, & Lim, 2021).

The results of this study are intended to assist researchers, scholars, and policymakers by highlighting key areas of interest and detecting new developments in the fields of the digital economy and e-commerce. These findings offer a strategic basis for shaping future research efforts and encouraging innovation within the field.

Given that few studies offer a combined perspective on e-commerce and the digital economy, this research aims to contribute to the field by exploring four key research questions:

RQ1: What developments can be identified in terms of the number of publications and the contributions of different countries and institutions to research on e-commerce in the digital economy over the period 2001–2025?

RQ2: What bibliometric insights can be drawn regarding authorship, including the most influential authors and the most cited countries?

RQ3: What are the key bibliometric findings related to the documents, particularly in terms of the most globally cited publications?

RQ4: What insights can be derived about the conceptual structure of the field, focusing on aspects such as co-authorship networks and bibliographic coupling?

Within this research the data collection process began with the keyword “digital economy,” which initially yielded 9,146 records in the Web of Science database. A more refined search combining “digital economy” and “e-commerce” reduced the number of results to 380. When filtered to include only journal articles, the dataset was further narrowed to 302 articles. Data were collected from the Web of Science database using a targeted search query applied to the titles, keywords, and abstracts fields.

The selection was limited to articles published between 2001 and 2025, drawn from all available records in the database. The subsequent analysis was conducted based on these 302 selected articles. The results are given in Table 1.

Table 1 Data Set between 2001-2025 (Source: Numbers are gathered from WoS database)

Title/Abstract/Author Keywords	Total Documents	Document Type Article
“Digital Economy”	9146	6812
“Digital Economy” and “e-commerce”	380	302

This subject is not limited to one field. The topic of the digital economy and e-commerce is widely studied across many different academic fields. This topic engages scholars from a variety of academic backgrounds. As it is shown in Figure 1 while economics, business, and management disciplines seems the primary disciplines where most research efforts are conducted, the study of digital economy and e-commerce has expanded to include computer science, information systems, environmental sciences, and sustainable technologies. Furthermore, these topics are frequently examined through the perspectives of international relations and law, highlighting their broad implications for global policymaking and regulations about the subject.

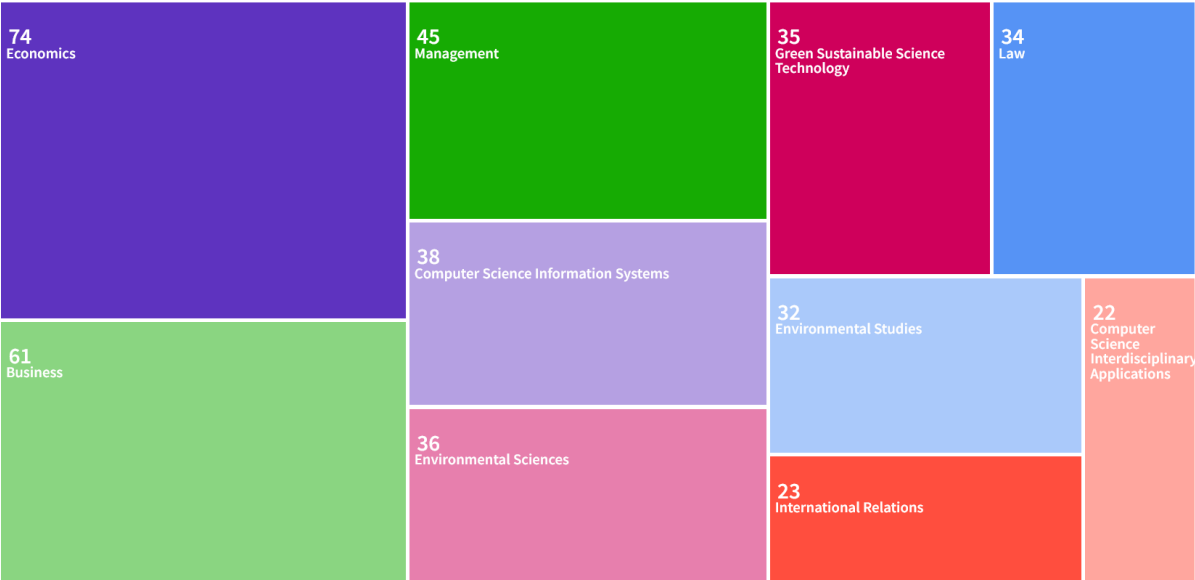


Figure 1 Distribution of total articles “Digital Economy” and “e-commerce” within Web of Science Categories between 2001-2025 years (Source: Numbers are gathered from Web of Science database)

As it is shown in Figure 2 the number of publications in this field has shown an upward trend and has been steadily increasing over recent years, reflecting growing scholarly interest and the expanding importance of the topic. This increase highlights the rising popularity of the subject and growing academic interest.

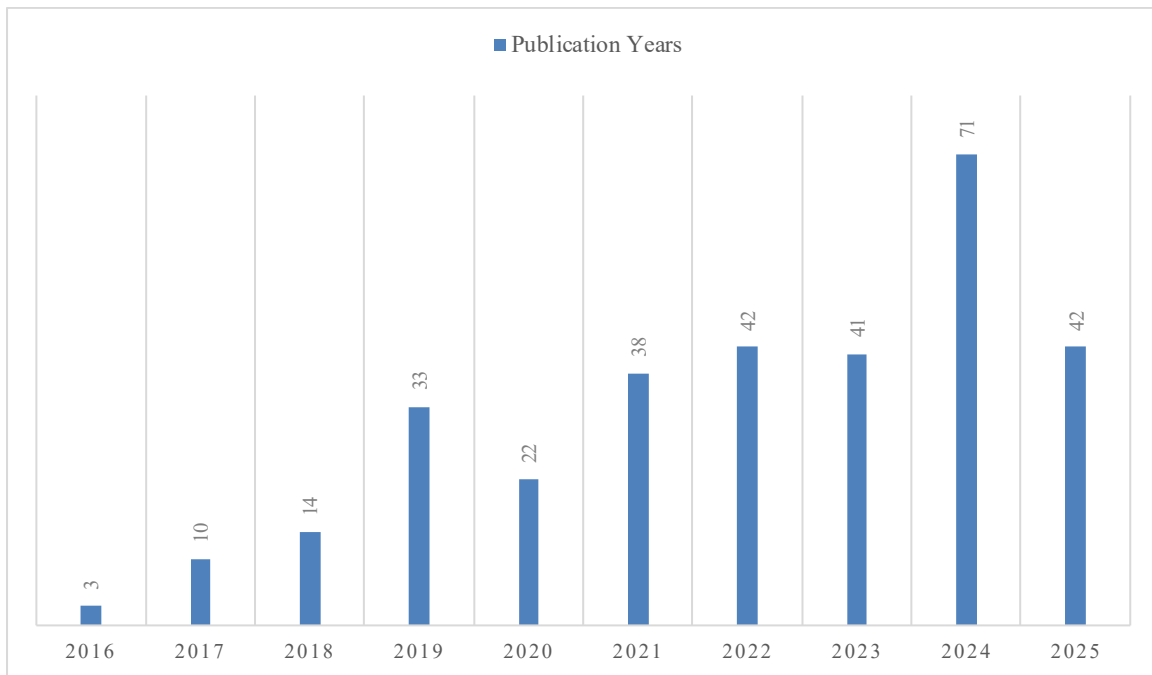


Figure 2 Distribution of publication years of total articles “Digital Economy” and “e-commerce” between 2016-2025 years (Source: Numbers are gathered from Web of Science database)

Table 2 Top ten countries of total articles “Digital Economy” and “e-commerce”

Countries/Regions	Number
Peoples Republic of China	129
USA	21
Ukraine	20
Russia	19
Poland	15
India	14
England	13
Malaysia	10
Indonesia	9
Australia	7

(Source: Numbers are gathered from Web of Science database)

This topic has become a major focus of academic inquiry across different countries. China currently leads in terms of research output, followed by the United States. Other countries with a strong presence in this area include Ukraine, Russia, Poland, and India. The diversity of contributing nations reflects the global relevance and interdisciplinary nature of the digital economy and e-commerce. This international distribution of research highlights not only the widespread relevance of the subject

but also the value of cross-national perspectives in understanding how digital transformation is implemented across different economic, cultural, and regulatory environments.

As it is shown in Figure 3 which displays the first ten journals publishing on this topic, the top three journals are Sustainability (27 Articles), Baltic Journal of Economic Studies (7 Articles) and Journal of the Knowledge Economy (6 Articles).

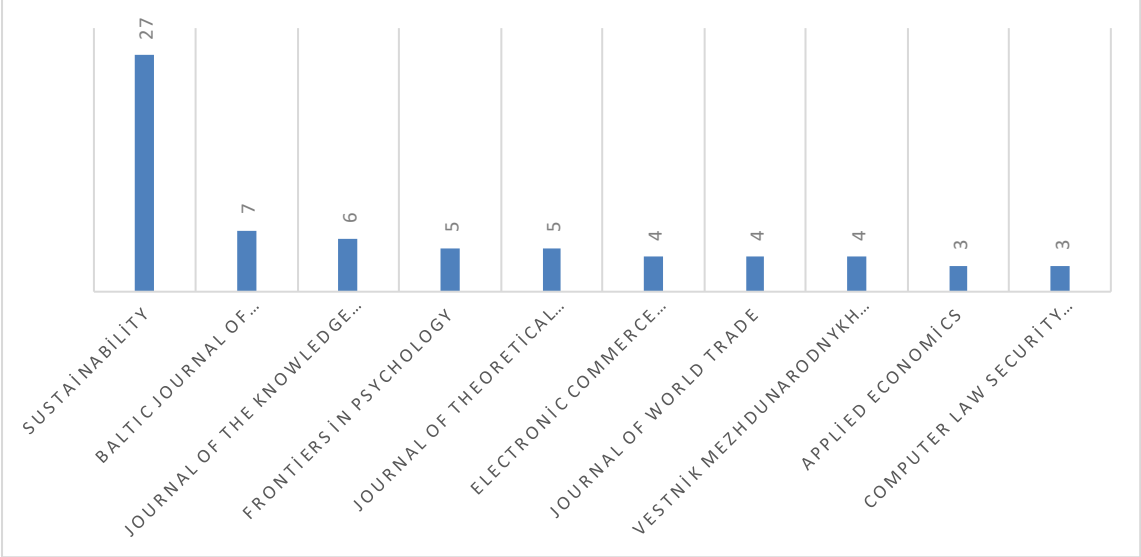


Figure 3 Journals with the highest publication in “digital economy” and “e-commerce”

(Source: Numbers are gathered from Web of Science database)

Co-authorship refers to a group of researchers who collaboratively publish the outcomes of their shared research interests through various formats such as journal articles, conference proceedings, and books. A co-authorship network represents these collaborations, where each node signifies a researcher and the connections (edges) illustrate their collaborative relationships. Understanding and predicting co-authorship patterns requires analyzing a variety of data extracted from scholarly publications. This includes metadata such as article titles, keywords, abstracts, institutional affiliations, research performance indicators (like citation counts or h-index), publication dates and years, the venues where the work appeared (journals, conferences), and the bibliographic references cited within the publications. These factors together help reveal the structure and dynamics of academic collaboration across disciplines and institutions (Yuliansyah, Othman, & Bakar, 2025). Figure 4 shows the co-authorship analysis about the topic digital economy and e-commerce, which highlights the collaborative relationships among researchers and the structure of their academic network.

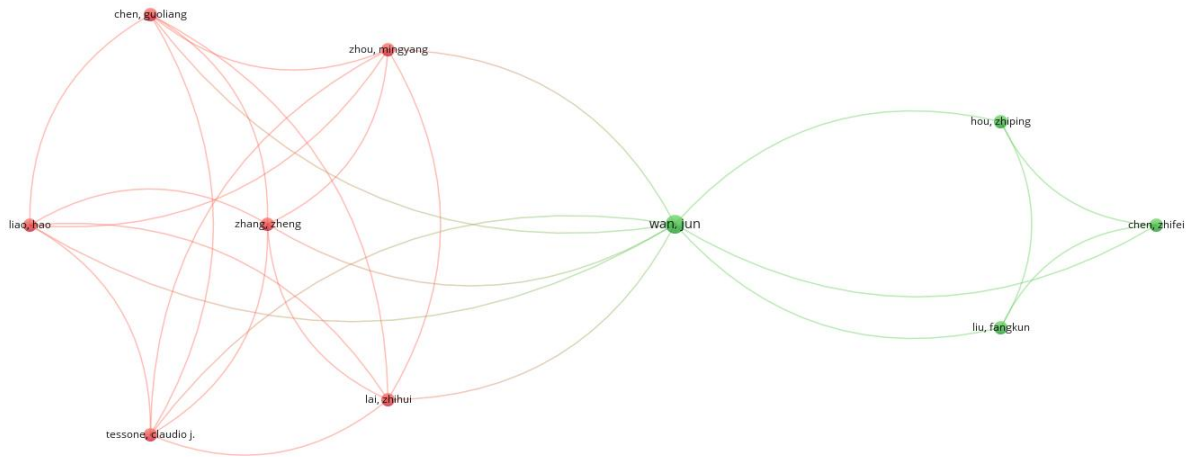


Figure 4 Co-authorship analysis of the keywords “Digital Economy” and “e-commerce”

(Source: Web of Science database and VOSviewer)

In a bibliographic coupling network, a relationship is formed between two documents when they cite one or more of the same references. This connection signifies a potential similarity in subject matter or research focus. The strength of the link between these documents referred to as the degree of bibliographic coupling is measured by the number of references they have in common. The greater the number of shared citations, the stronger the implied connection between the two papers, suggesting that they may address related topics or draw from a similar body of prior research. This method is widely used to analyze thematic relationships and intellectual structures within a specific field of study (Li, Wu, Wang, & Zeng, 2022). Figure 5 shows the bibliographic coupling analysis about the topic digital economy and e-commerce, which highlights the earlier cited publications that summarize what's already been done in the field.

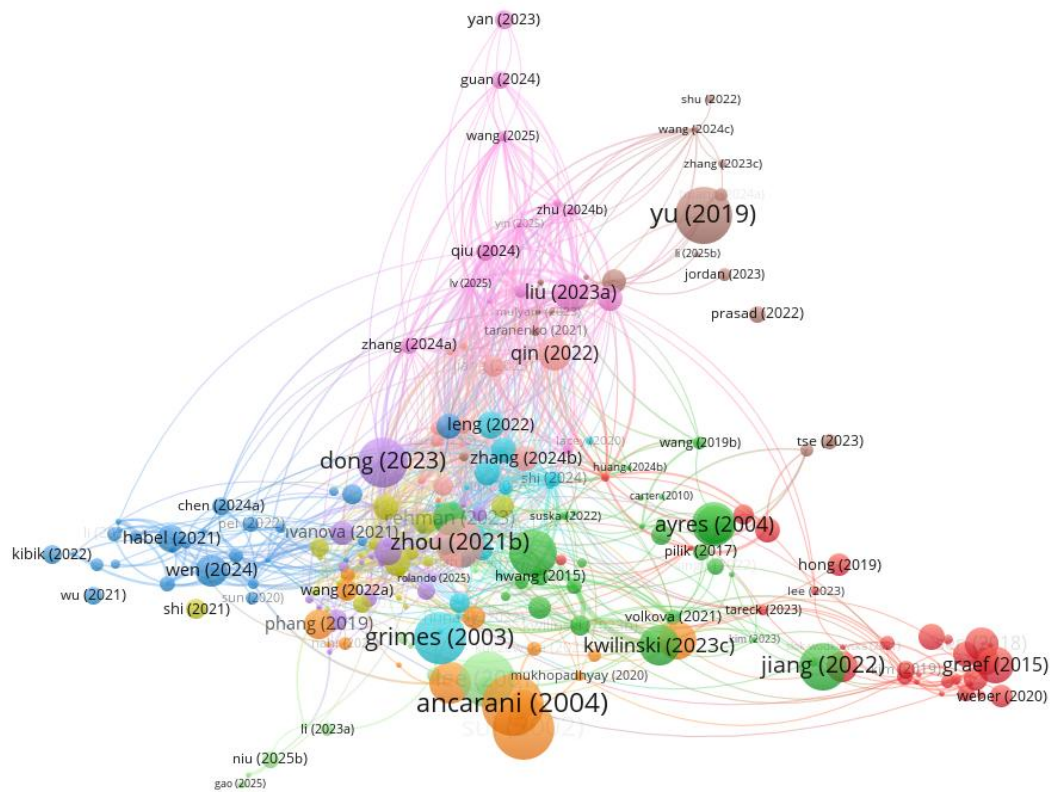


Figure 5 Bibliographic coupling analysis of the keywords “Digital Economy” and “e-commerce”

(Source: Web of Science database and VOSviewer)

As it is shown in Figure 6 since 2018, there has been a noticeable and consistent rise in academic engagement with the topic, as demonstrated by a steady increase in both the volume of related publications and the frequency of citations. This upward trend reflects the topic’s expanding relevance across academic and research communities. Over time, this interest continued and accelerated, reflecting broader developments in the field and the emergence of new research opportunities. The trend reached its highest point in 2024, marking a peak year in terms of scholarly output and impact. The peak in 2024 may also indicate the convergence of technological advancements, policy relevance, or interdisciplinary applicability that moved the topic into the academic spotlight.

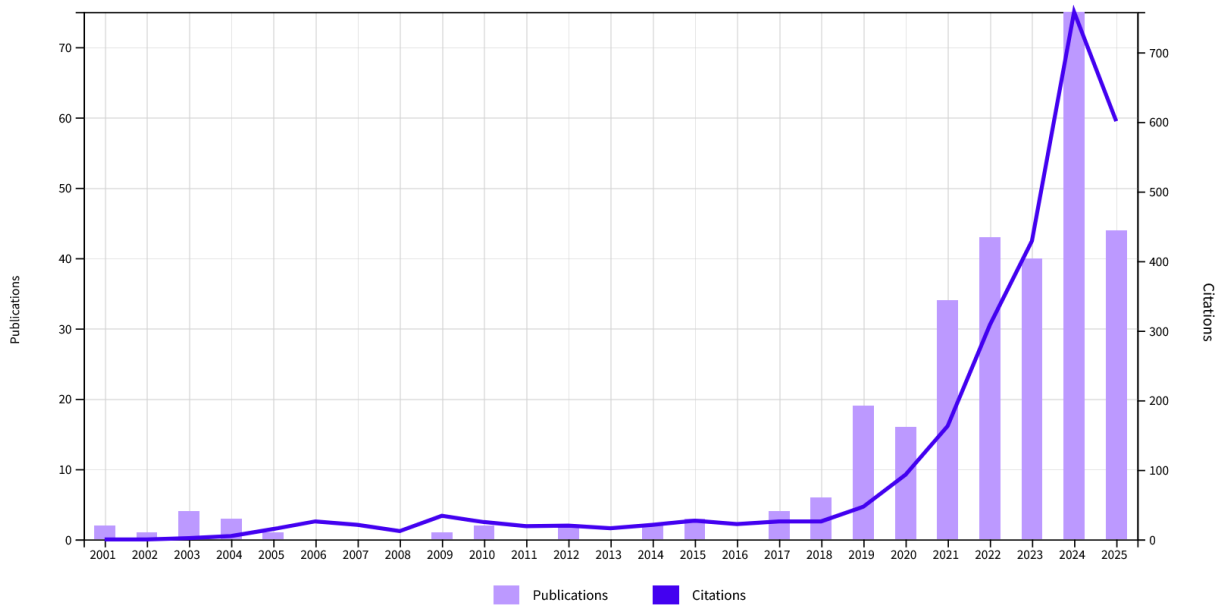


Figure 6 Times Cited and Publications Over Time
(Source: Web of Science database)

CONCLUSION

The bibliometric literature collectively reveals a dynamic and rapidly expanding research domain at the intersection of e-commerce and the digital economy, characterized by significant growth in publication volume and diversification of thematic interests over recent decades. The field has evolved from foundational explorations of e-commerce technology trends to complex analyses encompassing digital marketing, emerging technologies such as artificial intelligence and blockchain, sustainable business models, and supply chain management. This evolution reflects the ongoing digital transformation reshaping commerce and economic structures globally.

The literature consistently identifies key thematic clusters including digital marketing, business model innovation, consumer behavior, platform ecosystems, and sustainability, indicating a multidisciplinary approach that integrates technological, economic, and social dimensions. The topic of the digital economy and e-commerce is inherently interdisciplinary, attracting scholarly attention from a wide range of academic fields including economics, business, management, computer science, information systems, environmental sciences, sustainable technologies, international relations, and law. As illustrated in various figures, research output in this domain has shown a consistent upward trend in recent years, reflecting growing academic interest and the increasing relevance of the subject.

China currently leads in research output, followed by the United States, with significant contributions also emerging from Ukraine, Russia, Poland, and India—underscoring the global and cross-national nature of the field. Journals such as *Sustainability*, *Baltic Journal of Economic Studies*, and *Journal of the Knowledge Economy* are among the most frequent publication outlets.

The study also analyzes patterns of academic collaboration and knowledge structure through co-authorship and bibliographic coupling networks. Co-authorship analysis reveals the collaborative dynamics among researchers, while bibliographic coupling highlights thematic similarities across publications. Since 2018, both the number of publications and citation rates have risen steadily,

reaching a peak in 2024, likely driven by technological advancements and increasing policy and interdisciplinary relevance.

The future of e-commerce in the digital economy will be smarter, faster, more personalized, and more inclusive. It will rely on a mix of cutting-edge technologies and consumer-centric strategies, making it a vital engine of economic growth, especially in the post-pandemic world. E-commerce is expected to play an increasingly important role in the digital economy, becoming more advanced, efficient, tailored to individual needs, and accessible to a broader audience. Supported by innovative technologies and strategies focused on the consumer, it will remain a crucial driver of economic development, especially in the post-pandemic world.

The limitation of this study lies in its potential dependence on a single bibliographic database (Web of Science), which may lead to a restricted literature scope by excluding relevant studies from other sources or grey literature. This limitation may compromise the external validity and comprehensiveness of the findings. Additionally, the dominance of English-language publications and the focus on specific countries such as China and the United States introduce linguistic and geographic biases. These factors limit the generalizability of the results to non-English-speaking regions or less-represented countries. Moreover, an overreliance on quantitative metrics such as publication and citation counts, without integrating qualitative assessments, may overlook the contextual depth and practical implications of the research, thereby reducing the overall richness and applicability of the bibliometric analysis.

Future studies could expand the scope beyond the Web of Science databases by incorporating additional international sources, such as Scopus, to ensure broader literature coverage. Furthermore, as this research was limited to documents categorized as *articles*, subsequent investigations could include diverse document types—such as books, book chapters, and conference proceedings—to provide a more comprehensive and multidimensional understanding of the field.

Overall, the literature highlights that the interaction between e-commerce and the digital economy is significantly shaped by technological progress, with policy environments and geographic contexts serving as important moderating factors. Despite this, there is a noticeable lack of comprehensive theoretical models and policy-focused research. To fill these gaps, future studies should emphasize interdisciplinary approaches that integrate technological, economic, social, and regulatory perspectives. This will be crucial for supporting evidence-based policymaking and facilitating adaptive business strategies in the face of ongoing digital transformation.

REFERENCES

- Albshaier, L., Almarri, S., & Rahman, M. (2024). A Review of Blockchain's Role in E-Commerce Transactions: Open Challenges, and Future Research Directions. *Computers*, 13(1), 1-42.
- Cai, H., Wang, Z., Ji, Y., & Xu, L. (2024). Digitalization and innovation: How does the digital economy drive technology transfer in China? *Economic Modelling*, 136.
doi:<https://doi.org/10.1016/j.econmod.2024.106758>
- Cancino, C., Amirbagheri, K., Merigo, J., & Dessouky, Y. (2019). A bibliometric analysis of supply chain analytical techniques published in *Computers & Industrial Engineering*. 106015.
- Costa, P., & Rodrigues, H. (2024). The ever-changing business of e-commerce-net benefits while designing a new platform for small companies. *Review of Managerial Science*, 18, 2507–2545.
doi:<https://doi.org/10.1007/s11846-023-00681-6>
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*(133), 285-296.

- Hendricks, S., & Mwapwele, S. D. (2024). A systematic literature review on the factors influencing e-commerce adoption in developing countries. *Data and Information Management*. doi:<https://doi.org/10.1016/j.dim.2023.100045>
- Jin, C., Xu, A., Zhu, Y., & Li, J. (2023). Technology growth in the digital age: Evidence from China. *Technological Forecasting & Social Change*, 187. doi:<https://doi.org/10.1016/j.techfore.2022.122221>
- Laengle, S., Lobos, V., Merigo, J., Herrera-Viedma, E., Cobo, M., & De Baets, B. (2021). Forty years of Fuzzy Sets and Systems: A bibliometric analysis. *Fuzzy Sets and Systems*(402), 155-183.
- Li, H., Wu, M., Wang, Y., & Zeng, A. (2022). Bibliographic coupling networks reveal the advantage of diversification in scientific projects. 16. doi:<https://doi.org/10.1016/j.joi.2022.101321>
- Lim, W., Kumar, S., & Donthu, N. (2024). How to combine and clean bibliometric data and use bibliometric tools synergistically: Guidelines using metaverse research. *Journal of Business Research*(182), 114760.
- Ma, X., & Gu, X. (2024). New marketing strategy model of E-commerce enterprises in the era of digital economy. *Heliyon*, 10. doi:<https://doi.org/10.1016/j.heliyon.2024.e29038>
- Olusanya, M. O., & Isinkaye, F. (2025). A Review and Bibliometric Study on the Trends anE-Commerce Recommenders. *International Journal of Knowledge Management (IJKM)*, 21(1), 1-26.
- Rehman, N. U., & Nunziante, G. (2023). The effect of the digital economy on total factor productivity in European regions. *Telecommunications Policy*, 47. doi:<https://doi.org/10.1016/j.telpol.2023.102650>
- Rong, K. (2022). Research agenda for the digital economy. *Journal of Digital Economy*, 1. doi:<https://doi.org/10.1016/j.jdec.2022.08.004>
- Xia, L., Baghaie, S., & Sajadi, S. M. (2024). The digital economy: Challenges and opportunities in the new era of technology and electronic communications. *Ain Shams Engineering Journal*, 15. doi:<https://doi.org/10.1016/j.asej.2023.102411>
- Yuliansyah, H., Othman, Z. A., & Bakar, A. A. (2025). Co-authorship prediction method based on degree of gravity and article keywords similarity. *Physica A: Statistical Mechanics and its Applications*, 665. doi:<https://doi.org/10.1016/j.physa.2025.130511>

***DIGITAL MARKETING
STRATEGIES AND
CONSUMER INSIGHTS
ACROSS SECTORS***

USER INTERFACE EVALUATION OF SALES APPLICATIONS IN THE TELECOMMUNICATION SECTOR

Huseyin Selcuk KILIC

Department of Industrial Engineering, Marmara University, Istanbul, Türkiye, huseyin.kilic@marmara.edu.tr
<https://orcid.org/0000-0003-3356-0162>

Zeynep Tugce KALENDER

Department of Industrial Engineering, Marmara University, Istanbul, Türkiye, tugce.simsit@marmara.edu.tr
<https://orcid.org/0000-0002-9491-7252>

Nur BESER

Department of Industrial Engineering, Marmara University, Istanbul, Türkiye, nur.beser@marmara.edu.tr
<https://orcid.org/0009-0006-0189-7675>

Sevan KATRANCIOGLU

Turkcell Technology, Istanbul, Türkiye, sevan.katrancioglu@hotmail.com

ABSTRACT

The interface design plays a vital role in meeting the requirements of usability, which is the essence of user experience. With the growing trend of digitalization in nearly every process within any system, the quality of human-system interaction has become much more important than ever. There are many evaluation methods that address various aspects of user experience, with usability being at the core of these evaluations. However, the evaluation is conducted at a higher level, often including general questions in most of the techniques. In this study, the evaluation of user interfaces for sales applications in the telecommunication sector is considered. By utilizing fundamental techniques, namely the System Usability Scale (SUS), the User Experience Questionnaire (UEQ), Nielsen's heuristics for usability, and the relevant parts of the ISO 9241 standard, a user interface evaluation questionnaire is proposed. The presented questionnaire structure consists of five sections, including "General satisfaction evaluation", "Visual evaluation", "Content evaluation", "Connection evaluation" and "Open-Ended Questions", and it is applied in a company in the telecommunication sector.

KEYWORDS

User Experience, Usability, SUS, UEQ, Nielsen's heuristics, ISO 9241

INTRODUCTION

Human-system interaction plays a crucial role in the success of applications. User experience and usability are the two key concepts at the heart of this interaction. User experience, which encompasses all types of functional and emotional interactions between the user and the system, is a holistic and comprehensive concept. However, usability is just one aspect that focuses on effectiveness, efficiency, and satisfaction while accomplishing the specified goals (Santoso et al., 2022; Lewis, 2018).

The topics of user experience and usability gained popularity in the 1980s and 1990s with the works of researchers such as Chin et al. (1988) and Brooke (1996) and a clear definition of usability was provided with the publication of the ISO 9241-11 standard in 1998 (ISO, 1998). Usability was defined as "The extent to which a product can be used by specified users to achieve specific goals with effectiveness, efficiency and satisfaction in a specified context of use". However, in the last version of the standard, "product" in the original definition is changed with "system, product or service" (ISO, 2018). On the other hand, the definition of user experience is provided as "user's perceptions and responses that result from the use and/or anticipated use of a system, product or service". Hence, usability can be regarded as a component of user experience, and as Boothe et al. (2024)

state, usability is a key component of a good user experience and without usability, it is difficult to achieve a positive user experience. The factors that usability does not satisfy but are required for user experience are mainly hedonic quality criteria, which show how the product establishes an emotional connection with the user (Bevan et al., 2015). In contrast, pragmatic quality criteria are at the core of usability.

It is important to consider the expectations of users within the developed applications. The reflections of user-centered design can be observed via user experience and usability evaluations. Accordingly, various evaluation methods are used to analyze the human-system interaction and reveal the points to be improved. An important component of this interaction is the design of the user interfaces and requires to be examined thoroughly. As stated in the studies of Boothe et al. (2024) and Prasetyo and Soliman (2021), since UI design is the first and ongoing point of interaction between the user and a product or service, it significantly shapes UX. Hence, a well-designed user interface will enable a positive user experience.

This study aims to develop a user interface evaluation questionnaire for the sales applications in a company within the telecommunications sector. While developing the evaluation structure, existing approaches are examined and utilized. Although the questionnaire is specifically designed for the related company, it can easily be modified and generalized for similar processes in other sectors. The factors are developed by considering both pragmatic and hedonic quality aspects.

The rest of the study is mapped as follows: A brief theoretical background about user experience and usability evaluation methods is provided in the second section. The third section includes the proposed user interface evaluation questionnaire and application. There are the results in the fourth section, and finally, in the fifth section, the conclusion is provided.

BRIEF THEORETICAL BACKGROUND ABOUT USER EXPERIENCE AND USABILITY EVALUATION METHODS

Questionnaires are commonly employed in the evaluation of user experience and usability, with over 30 distinct questionnaires identified in the existing literature (Boothe et al., 2024). However, not all of these questionnaires are used with the same frequency. The three most widely utilized questionnaires for user experience evaluation are AttrakDiff, "User Experience Questionnaire (UEQ)", and meCUE (Díaz-Oreiro et al., 2021), while for usability evaluation, the most used are "The System Usability Scale" SUS and "The Post-Study System Usability Questionnaire (PSSUQ)" (Díaz-Oreiro et al., 2019). Hence, brief theoretical background information will be provided for each based on their popularity. Additionally, the relevant sections of ISO 9241 and Nielsen's heuristics, which were utilized in the developed questionnaire, will be discussed.

In the context of user experience applications, the first thing to focus on is the Attrakdiff questionnaire. The questionnaire consists of 28 questions, which are single words. These questions ask the user to make observations about 28 features of the tested product and ask them to evaluate them on a 7-point scale (Díaz-Oreiro et al., 2021). Another widely used test type is the UEQ questionnaire. There are 3 different versions of this questionnaire. The long form UEQ+ consists of 26 questions, as presented in Figure 1, which allows for more detailed evaluations, while the short form UEQ-S is designed for rapid applications and consists of 8 questions. Only hedonic and pragmatic features are examined with UEQ-S in UEQ questionnaires; similar question types to Attrakdiff are created with a 7-point scale. As a result of the analysis of the UEQ questionnaire, the system evaluation is completed by obtaining "Attractiveness, Novelty, Acoustics, Value, Trustworthiness of Content, Quality of Content" scores (Boothe et al., 2024). In addition, the meCUE questionnaire consists of 5 question modules (AttrakDiff, 2025). These modules are named as "Perception of instrumental qualities, Perception of non-instrumental qualities, User emotions, Consequences of use, Overall evaluation" (Díaz-Oreiro et al., 2019). These sections allow for a general analysis by evaluating the relevant features separately and each section addresses different features.

SUS, one of the usability measurement questionnaires, was presented by Brooke in 1996 (Lewis, 2018). It has been one of the most used usability measurement tools since the day it was presented (Lewis, 2018). It's a 10-question and 5-scale structure as presented in Figure 1 and provides fast and easy use (Kortum and Bangor, 2013). It has two versions with positive and negative tones. This questionnaire stands out because it can be easily analyzed with a simple score calculated after the questionnaire. Another usability assessment questionnaire is PSSUQ which examines the product under 3 subheadings as System Usefulness, Information Quality, and Interface Quality (Lewis, 1992). This type of questionnaire allows for more detailed analysis compared to SUS (Lewis, 1992). Addressing ISO 9241 while working on user experience and usability is inevitable. In this context, ISO 9241-11 is one of the most important standards, especially in the field of software usability (ISO 9241-11, 1998).

UEQ QUESTIONNAIRE		SUS QUESTIONNAIRE	
No		No	
UEQ1	annoying – enjoyable	SUS1	I think that I would like to use this system frequently.
UEQ2	not understandable – understandable	SUS2	I found the system unnecessarily complex.
UEQ3	creative – dull	SUS3	I thought the system was easy to use.
UEQ4	easy to learn – difficult to learn	SUS4	I think that I would need the support of a technical person to be able to use this system.
UEQ5	valuable – inferior	SUS5	I found the various functions in this system were well integrated.
UEQ6	boring – exciting	SUS6	I thought there was too much inconsistency in this system.
UEQ7	not interesting – interesting	SUS7	I would imagine that most people would learn to use this system very quickly.
UEQ8	unpredictable – predictable	SUS8	I found the system very cumbersome to use.
UEQ9	fast – slow	SUS9	I felt very confident using the system.
UEQ10	inventive – conventional	SUS10	I needed to learn a lot of things before I could get going with this system.
UEQ11	obstructive – supportive		
UEQ12	good – bad	NIELSEN'S HEURISTIC	
UEQ14	unlikable – pleasing	No	
UEQ15	usual – leading edge	N1	Visibility of system status
UEQ16	unpleasant – pleasant	N2	Match between system and the real world
UEQ17	secure – not secure	N3	User control and freedom
UEQ18	motivating – demotivating	N4	Consistency and standards
UEQ19	meets expectations – does not meet expectations	N5	Error prevention
UEQ20	inefficient – efficient	N6	Recognition rather than recall
UEQ21	clear – confusing	N7	Flexibility and efficiency of use
UEQ22	impractical – practical	N8	Aesthetic and minimalist design
UEQ23	organized – cluttered	N9	Help users recognize, diagnose, and recover from errors
UEQ24	attractive – unattractive		
UEQ25	friendly – unfriendly		
UEQ26	conservative – innovative		

Figure 1: Usability Measurement Tools

The questionnaires mentioned so far evaluate the features that overlap with this standard and support the implementation of the standard as a measurement tool. In the end, unlike question-based approaches, Nielsen's heuristic method evaluates approaches and aims to find usability errors in the system by presenting 10 principles as presented in Figure 1 (Nielsen, 1992). These principles allow the user interface to be evaluated and the bottlenecks of the working system to be detected.

THE PROPOSED USER INTERFACE EVALUATION QUESTIONNAIRE AND APPLICATION

While designing the user interface evaluation questionnaire, usability and user experience factors were evaluated together. With this approach, the user interface questionnaire allows us to interpret the interactions between them. The presented questionnaire is based on currently used and proven valid studies and is shaped specifically for the applied case. Therefore, it was not only based on general criteria; content adaptations were also made by considering the needs specific to the case context, the structure of the system, and the user profile. Thus, an evaluation tool that is both scientifically valid and provides meaningful data for application in a practical context was created.

In the initial section of the questionnaire, demographic information of the evaluator is included as presented in Figure 2. In this section, information such as the age, gender, education level, and years of experience of the participants is collected, and the answers are aimed to be evaluated

contextually. In addition to demographic information, the questionnaire consists of five thematic sections. These sections include evaluations regarding different features of the product.

SALES USER INTERFACE EVALUATION SURVEY						
Name/Surname:		Gender:		Experience (years):		What device do you use screens on most often? Computer <input type="checkbox"/> Mobile <input type="checkbox"/> Tablet <input type="checkbox"/>
Visit Date:		Age:		RATING SCALE		
Visited Location:		Education Level:		Very Bad	Very Good	

Figure 2: Demographic Information

The first of the main sections of the presented survey is structured under the title of “General Evaluation” and consists of five questions (see Figure 3). The main purpose of this section is to enable users to quantitatively evaluate the general experience they encounter during their interactions with the system. In this context, questions were asked to the participants regarding basic issues such as processing speed, interface design, system stability and frequency of encountering errors. In section B, more detailed questions were prepared regarding the visual structure of the screens and the opinions of the employees were collected on this subject and are presented in detail in Figure 3.

		UEQ	SUS	ISO	Nielsen	Explanation
A. GENERAL SATISFACTION EVALUATION						
A1	Are you happy with the screens used?	✓	✓			UEQ4, UEQ16, SUS1
A2	Do the menus on the screens speed up your operations?		✓			SUS3, SUS10
A3	Are the screens designed to prevent you from making mistakes?	✓			✓	UEQ11, N5
A4	Can important information be seen as noticeable?				✓	N5
A5	Does the return feature on the screens work properly?				✓	N3
B. VISUAL EVALUATION						
B1. FONT AND FONT STYLE						
B11	Does the font used on the screen ensure the readability of all text?	✓		✓		UEQ2, UEQ16
B12	Is the hierarchy between different font types (heading, subheading, text) appropriate?	✓		✓		UEQ23
B13	Does the font style (e.g., bold, italic) help distinguish elements?	✓		✓	✓	UEQ21
B14	Is the text legible enough?	✓		✓		UEQ2, UEQ16
B2. USE OF COLOR						
B21	Do screen colors strain the eyes?			✓	✓	N8
B22	Do colors hinder the overall readability of the screen?	✓		✓		UEQ2
B23	Do the primary colors clearly indicate the main message or action goal on the screen?	✓		✓		UEQ2
B24	Can colors be used for long periods without tiring the eyes?			✓	✓	N8
B25	Does the order of colors allow the user to focus on the elements on the screen in the correct order?	✓		✓		UEQ2, UEQ13, UEQ23
B26	Do color contrasts ensure that important elements attract attention?		✓	✓		SUS2, SUS3
B3. USE OF ICONS AND GRAPHICS						
B31	Are the visual elements sufficiently descriptive?		✓	✓		SUS3
B32	Are the icons used appropriate for the purpose of the screen and understandable?		✓	✓	✓	SUS2, N3, N2
B33	Do the icon sizes allow users to click comfortably?		✓	✓		SUS3
B34	Does the placement of icons and graphics contribute to the overall layout of the screen?	✓	✓	✓		UEQ23, SUS3
B35	Does the use of icons add complexity or simplify the screen?	✓	✓	✓	✓	UEQ13, UEQ23, SUS7, N8
B4. SCREEN LAYOUT AND PLACEMENT						
B41	Does the overall layout of the screen show that elements are grouped correctly?	✓		✓		UEQ13, UEQ23
B42	Does the layout of the screen's title and content have a logical and natural flow?	✓	✓	✓		UEQ11, SUS7
B43	Is there enough space between elements on the screen? (Does it give a sense of density or crowding?)			✓	✓	N8
B44	Are the distinctions between the contents on the screen clear?	✓		✓		UEQ11, UEQ23
B45	Is the screen design user-friendly?	✓	✓	✓	✓	UEQ16, UEQ25, SUS7, N8
B46	Are the buttons easily accessible?		✓	✓		SUS3
B5. VISUAL BALANCE						
B51	Can the user easily notice the visual changes (active/passive states) between elements as the screen is used?			✓	✓	N1
B52	Is the level of information density appropriate for the overall design of the screen?			✓	✓	N8
B53	Are there any distracting elements?	✓		✓	✓	UEQ22, N8
B54	Are transitions between screens easy?	✓	✓	✓		UEQ22, SUS3

Figure 3: General Satisfaction and Visual Evaluation

This section, consisting of 25 questions in total, is grouped under 5 subheadings, each of which is aimed at evaluating a different visual element. The questions prepared in this section allowed for more detailed analyses to be conducted in order to determine the extent to which the employees were satisfied with the screens they used. Sections C and D (see Figure 4), which were created within the scope of the survey, include questions specifically designed for the selected application. The previous sections are structured differently in terms of being the basic questions in the evaluation of

an application in general. In this respect, the analyses made for Sections C and D are of critical importance in terms of being directly related to the application itself.

C. CONTENT EVALUATION		UEQ	SUS	ISO	Nielsen	Explanation
C1	Do the menus have a logical order?	✓		✓		UEQ23
C2	Does the system support sales processes correctly?		✓	✓	✓	SUS5, N2
C3	Is customer information always visible?			✓	✓	N1
C4	Is all the information needed accessible?		✓	✓	✓	SUS5, SUS10, N10
C5	Can product searches and filtering be done quickly?		✓	✓		SUS10
C6	Is incorrect or incomplete data entry prevented?			✓	✓	N10
C7	Is price information easily accessible?		✓	✓	✓	SUS5, SUS10, N10
C8	Is price information presented in different sections of the screen in a way that will cause confusion?	✓	✓	✓		UEQ21, SUS6
C9	Is price information sufficiently and clearly displayed on the screen?	✓		✓	✓	UEQ21, N9
C10	Is price information presented in a confusing or contradictory format that will mislead the user?	✓		✓		UEQ21, UEQ23
C11	Can the products and prices in the basket be easily viewed?	✓		✓	✓	UEQ21, N10
C12	Is the screen stability disrupted when basket information is updated (add/remove products)?	✓		✓		UEQ20
D. CONNECTION EVALUATION						
D1	Does the system freeze/hang while performing a transaction?	✓		✓	✓	UEQ20, N1
D2	Are there any connection problems?	✓		✓		UEQ20
D3	Do the screens respond quickly?	✓	✓	✓		UEQ9, SUS8
D4	Are page load times sufficient?	✓	✓	✓		UEQ9, SUS8

Figure 4: Content and Connection Evaluation

In the final part of the survey, open-ended questions are designed as presented in Figure 5. The main purpose of the open-ended questions included in the survey is to allow participants to express their opinions freely without being limited to pre-structured questions. In this way, it is possible to cross-check the consistency of the participants' answers to the quantitative questions and to collect additional opinions and suggestions that were not previously foreseen but may be important in terms of user experience. Open-ended questions, in particular, pave the way for users to express their expectations, criticisms and ideas for improvement in more detail.

E. OPEN-ENDED QUESTIONS	
E1. Please indicate the first 5 items you want to improve by writing the question code in order. If there is an additional issue that you consider important other than the current questions, please state it clearly.	
E2. In case of a connection loss, is the last information entered on the screens returned? If not, is the entire process restarted?	
E3. If you were responsible for the screen design, which areas would you do differently? Why?	

Figure 5: Open-Ended Questions

DATA ANALYSIS

This study was conducted to evaluate the sales screens used by customer representatives in one of the leading companies in the telecommunications sector in Türkiye. The main objective of the research is to analyze the current status of the screens in terms of usability, user experience and visual representation, and to determine possible areas of improvement that will increase user satisfaction. An online survey method was used therefore quick and efficient access to participants across different locations, resulting in a broad and diverse sample. This method provided the opportunity to assess user experience in conditions similar to real-world work environments, in line with the purpose of the fieldwork. The survey results are analyzed by using SPSS program for detailed statistical analysis, including validity and reliability analyses. In general skewness values were negative, indicating that participants generally gave high scores. High kurtosis values observed for some items indicate that these high scores were concentrated at more extreme values (generally around 5).

It was observed that 57.1% of the participants are between the ages of 25-34 and 24.5% are between the ages of 18-24, indicating that the company has a young and technologically inclined employee base. 98% interacted with screens using computers, increasing the consistency of visual assessments in Section B. 36.7% of employees were from Erzurum, 36.7% from Izmir, and 26.5% from Diyarbakır,

providing a balanced representation of diverse locations. Additionally, 65.3% had 2-3 years of experience, supporting a young workforce.

In the detailed analysis of Section A, it is seen that 49% of the survey participants are satisfied with the new screens used (See Figure 6a). When the new screens are considered in terms of speeding up the processes, this rate increases to 61.2% (See Figure 6b). But, in terms of preventing mistakes, a proportional decrease (44.9%) is observed compared to other questions.

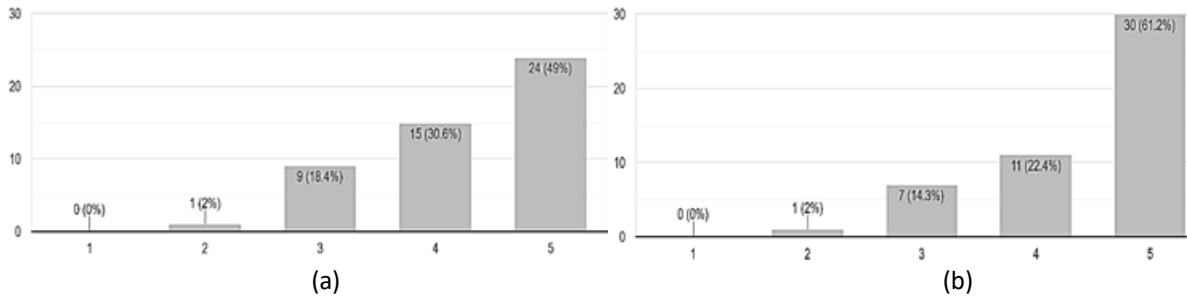


Figure 6: Analysis for Section A

Section B shows that users reacted positively to the new screens' visual design, aesthetics, and accessibility. This situation once again reveals how critical a role visual representation plays in user interface design. In each sub-section, cross-questions were created to check the answers' consistency. For example, both questions B21 and B24 address the issue from an ergonomic perspective. Therefore, responses for B21 (79.6%) and B24 (75.5%) showed a similar distribution. In the open-ended E1 responses, one participant prioritized the B21 issue, while E3 responses highlighted the dark mode option. This suggests that customizable color options would add value for users.

Section C analyzed the application menus' content, order, and price-related sections in terms of customer impact, revealing generally high satisfaction levels per question. The answers given to the open-ended questions also show consistency in this regard. There are some suggestions for the positioning of customer information, situations encountered regarding some information needed, and product search and filtering (especially in terms of ranking). Questions were directed to the study to perform cross-validation on price information, especially from different perspectives. The main purpose of this is the criticality of the price issue, which has a direct impact on customer satisfaction. In particular, it is important to display the latest price information correctly and to transfer the correct information to the customer at once.

Within the scope of Section D, the lowest satisfaction levels were obtained compared to other sections. It is seen that the general satisfaction level is 38.8% within the scope of D1 and even remains proportionally below when levels 1, 2, and 3 are taken into consideration (61.2%). Additionally, 53% of users reported overall dissatisfaction due to connection problems. They stated that having to start over when there is a connection problem creates great dissatisfaction in the eyes of the customers. In the D3 analysis, while overall satisfaction with screen transitions was 57.2%, the high level 3 response rate (30.6%) indicates a clear need for system improvement. Similarly, page loading times examined with D4 were generally found to be sufficient (55.1%). However, 32.7% of the participants were moderately satisfied with the screens, which indicates the need for improvements.

RESULTS

The results of the survey revealed that users were generally satisfied with the new screens. The vast majority of participants did not report any significant negatives regarding the screen design in particular and provided positive feedback on issues such as visual aesthetics and user interface. This situation shows that the technological solutions developed to increase the operational efficiency of

the system are in the right direction. High satisfaction rates for visual design, accessibility, and ergonomics elements highlight the importance of these elements in user interface design and suggest that greater investment in these areas is necessary in future design decisions.

However, there are some important areas for the development of content and connection. When the answers given to open-ended questions are examined, it is seen that users have various expectations regarding the up-to-dateness, accessibility, and presentation format of the content. In addition, the occasional disconnection of connections or the system's unstable operation stand out as the most urgent problems. Findings also show that users expect an improved experience not only in terms of design but also functionality and information presentation. These improvements will positively impact not only technical performance but also users' sense of confidence. Users also expect the information presented on screens to be complete, accurate, relevant, and easily accessible when needed. Therefore, making functions like search, filtering, and sorting more functional and intuitive, tailored to user needs, will significantly enhance the customer experience. In particular, errors encountered during the process, incomplete information, or insufficient guidance to the user are among the main points that negatively affect the experience. Simultaneous implementation of infrastructure-focused technical improvements along with design and content improvements aimed at increasing user satisfaction will support the holistic success and sustainability of the system.

Analysis showed that the success of platform will be shaped not only by its fast and error-free transaction capacity, but also by innovations in user experience personalization and accessibility. It is well-known fact that in today's business environment strategic management should prioritize the employee experience, combining innovation, robust technology infrastructure, and data-driven decisions. Providing a user-friendly design and seamless work environment increases employee productivity and forms the foundation of organizational success. This approach supports organizations in achieving their digital transformation goals by increasing their agility and competitiveness.

CONCLUSION

The user interface evaluation survey is not only a measurement tool for determining the strengths and weaknesses of the current interface; it also provides an analytical framework that reveals the interaction between usability and user experience. The data obtained is an important resource for developing improvement strategies based on user-centered design principles, shaping design decisions based on data, and determining priority intervention areas for future system updates.

The survey form was structured based on measurement tools whose validity and reliability have been scientifically proven in the literature. However, these tools were not directly copied, but adapted in terms of content and context, considering the original structure of the system, usage scenarios and target user audience. Thus, an evaluation tool that is both scientifically sound and capable of producing meaningful and functional results in practical application was developed. In this context, widely accepted methods and standards in the field such as the System Usability Scale (SUS), User Experience Questionnaire (UEQ), Nielsen's intuitive principles on usability and the relevant sections of the ISO 9241 standard were used in the creation of the survey. Thanks to this multi-source approach, a user interface evaluation survey with theoretical and practical validity that can measure both usability and user experience in a holistic manner was created.

The conducted analysis is based on the experiences of users actively working in the field, and the findings obtained offer important implications for system design and sectoral applications. The study is a valuable example, especially in terms of revealing how effective digital interfaces are in sales processes. As future studies, an in-depth analysis of user segmentation-based interface personalization can be developed. Users can be classified according to their demographic and behavioral characteristics and the expectations, priorities, and satisfaction levels of each segment regarding interface design can be examined. In line with the findings obtained, special design

suggestions can be developed for different user groups, aiming to offer personalized user interfaces instead of a single type of experience. This approach can not only increase user satisfaction but also positively affect system usage efficiency and digital interaction quality.

REFERENCES

- Bevan, N., Carter, J., & Harker, S. (2015). ISO 9241-11 revised: What have we learnt about usability since 1998? In *Human-Computer Interaction: Design and Evaluation: 17th International Conference Proceedings, Part I* 17 (pp. 143-151). Springer International Publishing.
- Boothe, C. S., Strawderman, L., Smith, B. K., Bethel, C. L., & Holmes, K. (2024). Generalized User Experience Questionnaire (UEQ-G): Holistic Measurement of Multimodal UX. *Journal of User Experience*, 19(2).
- Brooke, J. (1996). SUS-A quick and dirty usability scale. *Usability evaluation in industry*, 189(194), 4-7.
- Chin, J. P., Diehl, V. A., & Norman, K. L. (1988). Development of an instrument measuring user satisfaction of the human-computer interface. *Proceedings of the SIGCHI conference on Human factors in computing systems* (pp. 213-218).
- Díaz-Oreiro, I., López, G., Quesada, L., & Guerrero, L. A. (2019). Standardized questionnaires for user experience evaluation: A systematic literature review. *Proceedings*, 31(1), MDPI.
- Díaz-Oreiro, I., López, G., Quesada, L., & Guerrero, L. A. (2021). UX evaluation with standardized questionnaires in ubiquitous computing and ambient intelligence: a systematic literature review. *Advances in Human-Computer Interaction*, 2021(1), 5518722.
- AttrakDiff (2025). AttrakDiff Work Model. (Achieved: 14.05.2025) Available at: <https://attrakdiff.de/science-en.html>
- ISO 9241-11 (1998) (Achieved: 14.05.2025) Available at: <https://standards.iteh.ai/catalog/standards/sist/c4f936de-9ec3-4eae-91ee->
- ISO. (1998). Ergonomic requirements for office work with visual display terminals (VDTs), Part 11, Guidance on usability (ISO 9241-11:1998E). Geneva, Switzerland.
- ISO. (2018). ISO 9241-11:2018(En): Ergonomics of Human-System Interaction — Part 11: Usability: Definitions and Concepts. (Achieved: 14.05.2025) Available at: <https://www.iso.org2:v1:en>
- Kortum, P. T., & Bangor, A. (2013). Usability Ratings for Everyday Products Measured with the System Usability Scale. *International Journal of Human-Computer Interaction*, 29(2), 67–76.
- Lewis, J. R. (1992). Psychometric evaluation of the post-study system usability questionnaire: The PSSUQ. In *Proceedings of the human factors society annual meeting* (Vol. 36, No. 16, pp. 1259-1260). Sage CA: Los Angeles, CA: Sage Publications.
- Lewis, J. R. (2018). The System Usability Scale: Past, Present, and Future. *International Journal of Human-Computer Interaction*, 34(7), 577–590.
- Nielsen, J. (1992). Finding Usability Problems through Heuristic Evaluation. In P. Bowersfield, J. Bennet, & G. Lynch (Eds.), *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 373-380). New York: Academic Press.
- Prasetyo, Y. T., & Soliman, K. O. S. (2021). Usability evaluation of ERP systems: A comparison between SAP S/4 Hana & Oracle Cloud. In *2021 IEEE 8th International Conference on Industrial Engineering and Applications (ICIEA)* (pp. 120-125). IEEE.
- Santoso, H. B., Schrepp, M., Hasani, L. M., Fitriansyah, R., & Setyanto, A. (2022). The use of User Experience Questionnaire Plus (UEQ+) for cross-cultural UX research: evaluating Zoom and Learn Quran Tajwid as online learning tools. *Heliyon*, 8(11).

PERCEPTIONS OF INSTAGRAM POSTS IN KUWAIT'S BANKING SECTOR: INSIGHTS FROM BANK MARKETING MANAGERS AND CONSUMERS

Marcelle de la Roche

Australian University, Kuwait, m.roche@au.edu.kw
<https://orcid.org/0000-0003-1428-481X>

Faidon Theofanidis

Australian University, Kuwait, f.theofanidis@au.edu.kw
<https://orcid.org/0000-0001-7060-5409>

Fatima Allougman

Australian University, Kuwait, f.allougman@au.edu.kw
<https://orcid.org/0000-0003-2980-5542>

Aleksandra Jovanovic

Australian University, Kuwait, a.jovanovic@au.edu.kw
<https://orcid.org/0000-0002-6027-392X>

Vladimir Simovic

Australian University, Kuwait, v.simovic@au.edu.kw
<https://orcid.org/0000-0002-6441-833X>

ABSTRACT

This study investigates the perceptions of bank marketing managers and bank consumers regarding Instagram posts, utilizing Rosenberg and Hovland's components of attitude (affect, cognition, behavior) and Lavidge and Steiner's Hierarchy of Effects model. Instruments were developed to measure and compare perceptions, using parametric (T-tests) and non-parametric (Mann-Whitney U) tests. The findings reveal differences in perceptions between managers and consumers regarding emotional appeal (e.g. music in posts) and the likelihood of reading, liking or commenting on these posts. Furthermore, differences in perception were noted for video content and commenting behavior, Instagram Reels for likes, and positive messages for reading and commenting. These findings provide valuable insight to bank marketing managers in Kuwait for creating effective Instagram posts that resonate with their customers and enhance engagement and interaction. This study offers practical recommendations for bank marketing managers in Kuwait to align their content management strategies with consumer preferences in the digital environment, specifically on Instagram.

KEYWORDS

Instagram Bank Posts, Readability, Likeability, Engagement, Kuwait,

INTRODUCTION

In today's digitally interconnected world, social media has become a powerful tool for businesses to engage with consumers. The increased social media usage is particularly relevant in Kuwait, where mobile adoption rates exceed 150%, and over 85% of the population is active on social media (Hisham, 2024). According to Statista, Kuwait has an Instagram audience reach of 73.9% and an estimated 2.8 million users in 2025 (Statista Research Department, 2025). The banking sector, traditionally conservative, is increasingly leveraging platforms like Instagram to communicate, build relationships, and influence consumer perceptions. Growth in Instagram usage is evident in Kuwait's banking industry as shown in Table 1.

Table 1 - Kuwait Banks: Instagram Followers – Growth 2022 - 2025

Bank	Followers 2022	Followers 2025	Growth Rate (%)
National Bank of Kuwait	638,000	765,000	20
Gulf Bank KSCP	244,000	287,000	18
Commercial Bank of Kuwait	116,000	149,000	28
Al Ahli Bank of Kuwait	119,000	150,000	26
Ahli United Bank - Kuwait	142,000	<i>(merged with KFH in 2024)</i>	
Kuwait International Bank	97,800	115,000	18
Burgan Bank	104,000	126,000	21
Kuwait Finance House	445,000	543,000	22
Boubyan Bank	410,000	512,000	25

(Source: Author's analysis of bank Instagram accounts, data collected in 2022 and 2025.)

Despite the growth in the adoption of social media in the banking sector, challenges still persist in understanding and aligning bank marketing managers' and target consumers' perceptions of the effectiveness of social media content. This research addresses these perceptual gaps by applying well-established attitude theories to the context of social media marketing effectiveness.

The theoretical foundation of this research is grounded in classical models of attitude and advertising. Rosenberg and Hovland's (1960) tripartite model of attitude states that attitudes have three components, namely affect (emotions or feelings towards an object), cognition (beliefs or thoughts about an object) and behavior (actions or intentions towards an object) (Rosenberg & Hovland, 1960). Building upon this theoretical framework, Breckler (1984) provided empirical validation of the model's construct validity, demonstrating the measurable distinctiveness of the affective, cognitive, and behavioral dimensions. In the context of social media marketing, this can be translated into emotional reaction to a post (liking the post), cognitive processing (reading and understanding the post), and behavioral intentions (commenting on the post). The Hierarchy of Effects (HOE) model by Lavidge and Steiner (1961) aligns with this approach, as it defines how advertising influences consumer behavior in sequential stages. The HOE model states that consumers first become aware of and obtain knowledge (cognitive), then move to liking or preference (affect), and finally to conviction which results in a behavioral action. By applying these models, we aim to provide a framework for analyzing how various aspects of Instagram posts (tone, format and message) influence consumer attitudes and engagement in the banking industry.

Current research stresses the importance of social media in consumer engagement and brand communication. Studies increasingly focus on the relationship between specific content characteristics and their corresponding influence on consumer engagement and attitude. Studies have shown that visual content, particularly photos and videos, is important in attracting consumer attention and driving engagement on social media platforms (Pletikosa Cvijikj & Michahelles, 2013; Rietveld et al., 2020; Son & Park, 2023). For instance, Pletikosa Cvijikj and Michahelles (2013) found that photos were the most favored media type and that entertaining content, especially vivid videos, significantly impacted likes and interactions. Along similar lines, Gkikas et al.(2022) and Yu et al.(2024) highlighted the importance of content readability. Their studies noted that content rated as "Easy to Read" generated higher engagement rates than content rated "Difficult" (Gkikas et al., 2022; Yu et al., 2024). Furthermore, Talreja and Chaturvedi (2024) established that short-form videos such as Reels performed best in captivating attention and stimulating engagement. Following this line of reasoning, Mardhatilah et al. (2023) determined that Reels yielded the most significant impact on

emotional responses and engagement. Finally, Schultz (2017) further advises marketing managers to differentiate between likes, comments, and shares as distinct consumer interactions (Schultz, 2017).

Research on Instagram post characteristics and their impact on cognitive, affective, and behavioral engagement has increased significantly, combined with the increasing adoption of social media strategies in the banking industry. However, a notable gap remains in understanding how consumers and bank marketing managers align or differ in their perceptions of what constitutes effective social media content. The objectives of this study are to address this gap and are threefold: First to conduct a comprehensive literature review on social media post effectiveness and user engagement metrics. Second, to develop and validate measurement instruments capable of assessing perceptions of Instagram post characteristics while collecting comparative data from both consumers and bank marketing managers. Third, to empirically examine and quantify the perceptual differences between bank marketing managers and their customers regarding the impact of social media content characteristics on post readability, likeability, and user responsiveness (specifically commenting).

METHODOLOGY

This study employed a quantitative research approach to investigate the perceptions of bank marketing managers and bank consumers regarding Instagram posts. The research design involved the development of instruments to measure perceptions related to the affect (likeability), cognition (readability), and behavior (commenting) components of attitude. Scales were adapted from similar studies for content readability (Davis et al., 2019; Gkikas et al., 2022; Pancer et al., 2018; She et al., 2021), likeability (Copeland et al., 2021; De Vries et al., 2012; Pletikosa Cvijikj & Michahelles, 2013; Schreiner et al., 2019) and engagement (Hamzah et al., 2021; Schultz, 2017; Shahbaznezhad et al., 2021). These instruments were designed to capture the nuances of how different content features (text length, text tone, domain specificity), caption features (exclamation, colon, question mark, sentiment, title length), and media types (image, audio, video, text) influence consumer attitude to Instagram content.

This study utilized two integrated theoretical frameworks to address distinct methodological needs, namely design and interpretation. Rosenberg and Hovland's (1960) tripartite model of attitude, grounded in psychology, provided the theoretical foundation for instrument design, ensuring participant responses were structured according to established attitude measurement principles in communication and persuasion research. Conversely, Lavidge and Steiner's (1961) Hierarchy of Effects model, a seminal marketing communication framework, served as the interpretive guide for analyzing and understanding how Instagram content characteristics influence consumer engagement. The use of both models was methodologically necessary to bridge psychological rigor in measurement with marketing relevance in interpretation, thereby enhancing the theoretical validity of the instrument while ensuring that findings remain relevant to marketing applications.

All scales were adapted to ensure consistency with Likert scale measurement standards and adjusted for linguistic and cultural clarity in the Kuwaiti context. Prior to administration, each question was reviewed and, where necessary, simplified by the research team to accommodate English second-language speakers. This process included review by three team members who are English second-language speakers to ensure comprehension across diverse language backgrounds. A pilot study with ten consumer participants assessed clarity and usability. Participant feedback led to rewriting several items for greater clarity and resequencing questions to improve logical flow and user experience. For further contextual validation, the questionnaire was reviewed by a marketing industry expert to ensure its relevance and alignment with the professional practices of the local banking sector. To facilitate participation among bank marketing managers, appointments were scheduled, and on-site meetings conducted to explain the research rationale and obtain formal consent before administering the instrument.

The instrument was administered in English without translation; no formal translation or back-translation procedures were required. English is a commonly used language in both the Kuwaiti private sector and society. All participating bank marketing managers demonstrated fluency in English during the scheduled appointments and on-site meetings while consumers completed the English-language online survey independently.

Online data collection from 1/09/23 - 31/05/24 involved surveying both bank marketing managers and bank consumers in Kuwait. Consumer data was collected through convenience sampling, yielding 108 responses. Out of the 108 consumers 50 did not follow a bank's Instagram Page, therefore the final consumer sample is 58 consumers. For bank marketing managers, meetings were conducted to explain the purpose of the research and rationale before administering the survey. Although the sample size of bank managers was relatively small ($n = 13$), it provided strong representation of the local commercial banking sector in Kuwait, with participants drawn from 5 out of 8 local commercial banks operating in the country. The total study's sample is 71 (58 consumers and 13 bank marketing managers). On average, 58 participants (consumers) reported using the internet for 7.46 hours per day. In terms of engagement with their bank's Instagram page, participants visited the page on average 4.01 times per month and interacted with its content (e.g., liking, reading, or commenting) 4.43 times per month. Out of the 58 consumers, 24 were males and 34 females. The study was anonymous, and participants were informed that they had given consent to participate in the study by clicking the 'Continue' button on the online questionnaire. Prior to data analysis, missing value analysis was conducted to identify and address any non-response errors, ensuring the integrity and reliability of the dataset.

For data analysis, the researchers used appropriate statistical tests, which were selected based on the nature of the data distribution. Because all the customer related variables were not normally distributed, non-parametric tests were considered to identify statistically significant differences in perceptions between the two groups (bank managers and consumers). More specifically, the Mann-Whitney test was used for the non-normally distributed data (McClenaghan, 2024) and especially due to the relatively small sample size of bank managers (Nachar, 2008).

RESULTS

This study utilized Rosenberg and Hovland's (1960) components of attitude (Rosenberg & Hovland, 1960) and Lavidge and Steiner's (1961) Hierarchy of Effects model (Lavidge & Steiner, 1961) to categorize attitudes into cognition (readability), affect (likability), and behavior (commenting). The relationships between these constructs such as content features, caption features, and media types were measured. The empirical analysis, primarily through Mann-Whitney U tests, revealed several statistically significant differences in perceptions between bank marketing managers and consumers, as well as areas of congruence.

Key Findings from Mann-Whitney U Test Analysis:

Analysis of the Mann-Whitney U test results indicates significant perceptual disparities between bank managers and consumers on several key aspects of Instagram content. A significance level of $p < 0.05$ was used to determine statistical significance, leading to the rejection of the null hypothesis, which proposed no difference in distribution across respondent categories.

Areas of Divergence (Reject Null Hypothesis, $p < 0.05$):

1. Emotional Appeal: There were statistically significant differences in perceptions regarding the impact of emotional appeals, such as music, on consumer engagement. Specifically, consumers' likelihood to read ($p = 0.001$, $r = 0.38$ medium effect), like ($p = 0.007$, $r = 0.32$ medium effect), and comment ($p = 0.015$, $r = 0.29$ medium effect) on bank posts using emotional appeals showed significant differences between the two groups. This suggests that managers and consumers may have differing views on the effectiveness of emotionally charged content in driving all three components of attitude (cognition, affect, and behavior).

2. Video Content: While there was no significant difference in the perception of whether customers would watch ($p = 0.173$) or like ($p = 0.717$) a bank post in video format, a significant difference emerged concerning commenting on video posts ($p = 0.046$, $r=0.24$ medium effect). This indicates that while both groups might agree on the general appeal of video, their expectations or experiences with behavioral engagement (comments) on video content diverge.
3. Instagram Reel: A notable difference was found in the perception of customers liking Instagram Reels ($p = 0.034$, $r=0.25$ medium effect). This highlights a potential mismatch in how managers perceive the affective response to this specific media format compared to actual consumer behavior. However, no significant difference was observed for reading ($p = 0.205$) or commenting ($p = 0.065$) on Instagram Reels.
4. Positive Message: Perceptions significantly differed regarding customers reading ($p = 0.017$, $r=0.28$ medium effect) and commenting ($p = 0.011$, $r=0.30$ medium effect) on bank posts with a positive message. This suggests that the perceived impact of positive messaging on cognitive processing (reading) and behavioral response (commenting) varies between managers and consumers.

Areas of Congruence (Retain Null Hypothesis, $p > 0.05$):

Conversely, the analysis also revealed several areas where there were no statistically significant differences in perceptions between bank managers and consumers. These include perceptions related to:

1. Informational Content: Both groups generally agreed on the impact of posts being a good source of up-to-date bank product information on customers' likelihood to read ($p = 0.185$), like ($p = 0.911$), or comment ($p = 0.511$).
2. Image Content: There was no significant difference in perceptions regarding customers reading ($p = 0.866$), liking ($p = 0.738$), or commenting ($p = 0.741$) on bank posts containing images.
3. Hashtags: The presence of hashtags did not lead to significant perceptual differences in customers' likelihood to read ($p = 0.617$), like ($p = 0.938$), or comment ($p = 0.735$) on bank posts.
4. Caption Length: Perceptions were consistent regarding the impact of long captions (more than 3 lines) on customers' likelihood to read ($p = 0.556$), like ($p = 0.407$), or comment ($p = 0.268$).
5. Difficult Terminology: Both groups showed no significant difference in perceptions concerning customers reading ($p = 0.217$), liking ($p = 0.309$), or commenting ($p = 0.189$) on bank posts with difficult terminology.

CONCLUSION

This study provides important insights into the similarities and differences in the perceptions of bank marketing managers and bank consumers regarding the effectiveness of Instagram content. Utilizing established theoretical frameworks, specifically the components of attitude (affect, cognition, behavior) and the Hierarchy of Effects model, alongside an analysis of Instagram content characteristics, this research identifies specific areas where managerial assumptions may not align with actual consumer responses. The most notable gaps between manager and consumer perspectives emerged around specific Instagram features: emotional content, video posts, Reels, and positive messaging approaches. These results offer practical guidance for Kuwaiti banks looking to improve their Instagram content. The data suggests that successful social media marketing requires moving beyond managerial assumptions toward strategies that reflect how consumers actually engage with content.

Implications for Banks and Managerial Practice:

The findings of this research indicate that bank managers should not rely on generalized assumptions regarding social media content. Instead, the study advocates a data-driven approach to inform

content decisions. The study highlights significant differences between the perceptions of managers and consumers regarding emotional content, specifically, managers tend to overestimate the influence of such posts on customer attitude including reading, liking and commenting. It is important for banks to obtain a better understanding of what emotional messages resonate with their audiences, which can be done through experimentation of different content strategies coupled with ongoing customer feedback. Furthermore, the study indicates that managers do not fully comprehend how consumers respond to video posts and Instagram Reels. Although there is acknowledgement of the importance of these formats, key insights are missing about specific user behaviors. Banks would benefit from investing in proper analytics to track real engagement across different content types and adjusting their approach based on what the data shows. Moreover, the differences in how both groups view positive messaging reveal another important point: Banks need to create content that not only has positive messaging, but that motivates consumers to read posts and leave comments. These insights provide bank managers with a distinct framework for building better social media content strategies. By focusing on interactive content and visual elements that truly engage customers on cognitive, emotional, and behavioral levels, banks can strengthen their brand communication and customer relationships.

Originality Value:

From a methodological standpoint, this research offers significant originality by directly comparing the perceptions of social media content between two distinct stakeholder groups: bank marketing managers and bank consumers. According to the current body of knowledge, we found no previous studies that directly compare these perspectives, especially within Kuwait's banking sector. This comparative approach reveals important gaps that may be undermining banks' marketing efforts on social media. The application of established psychological and marketing models (Rosenberg and Hovland's attitude components and Lavidge and Steiner's Hierarchy of Effects model) to the specific domain of Instagram marketing for banks further contributes to the theoretical originality of the study.

Contribution:

This study contributes both academically and practically. Academically, the findings contribute to the current body of knowledge by advancing understanding of the nuances and challenges related to the creation of social media content specifically in the Kuwaiti banking context. Second, the study offers practical guidance that banking professionals can use to improve how they create social media content. By understanding which content elements drive specific consumer responses (reading, liking, commenting) and where their perceptions diverge from their customers, banks can optimize their Instagram strategies for higher engagement and interactivity. This ultimately leads to a more effective allocation of marketing resources and a stronger connection with consumers on Instagram.

APPENDIX A- INSTRUMENT DEVELOPMENT

Overview of Constructs

Construct	Questions measured	5-Point Likert Scale
Informativeness of post	Readability, Likeability, Comment	Strongly disagree, Disagree, Neutral, Agree, Strongly agree
Tone of Posts	Readability, Likeability, Comment	Strongly disagree, Disagree, Neutral, Agree, Strongly agree
Media Type: Video, Image, Reels	Readability, Likeability, Comment	Strongly disagree, Disagree, Neutral, Agree, Strongly agree
Punctuation: Hashtags	Readability, Likeability, Comment	Strongly disagree, Disagree, Neutral, Agree, Strongly agree
Text: Length, Tone, Sentiment, Complexity	Readability, Likeability, Comment	Strongly disagree, Disagree, Neutral, Agree, Strongly agree

Sample questions administered to consumers and bank marketing managers with sources of information.

Construct and Variable	Question (All responses were measure using a 5-point Likert Scale)	Source
Punctuation: Hashtags	<i>Bank Marketing Managers Question</i> Customers will read a bank post that has hashtags. <i>Consumers Question</i> I will read a bank post that has hashtags.	Adapted from: Gkikas, D. C., Tzafilkou, K., Theodoridis, P. K., Garmpis, A., & Gkikas, M. C. (2022). How do text characteristics impact user engagement in social media posts: Modeling content readability, length, and hashtags number in Facebook.
Media Type: Images	<i>Bank Marketing Managers Question</i> Customers will like a bank post which contains images. <i>Consumers Question</i> I will like a bank post which contains images.	Adapted from: She, J., Zhang, T., Chen, Q., Zhang, J., Fan, W., Wang, H., & Chang, Q. (2022). Which social media posts generate the most buzz? Evidence from WeChat.
Media Type: Instagram Reels	<i>Bank Marketing Managers Question</i> Customers will like a bank post which includes Instagram Reels <i>Consumers Question</i> I will like a bank post which includes Instagram Reels.	Adapted from: She, J., Zhang, T., Chen, Q., Zhang, J., Fan, W., Wang, H., & Chang, Q. (2022). Which social media posts generate the most buzz? Evidence from WeChat.
Text language: Complexity	<i>Bank Marketing Managers Question</i> Customers will comment on a bank post that has difficult terminology. <i>Consumers Question</i> I will comment on a bank post that has difficult terminology	Adapted from: Shahbaznezhad, H., Dolan, R., & Rashidirad, M. (2021). The role of social media content format and platform in users' engagement behavior.

REFERENCES

- Breckler, S. J. (1984). Empirical validation of affect, behavior, and cognition as distinct components of attitude. *Journal of Personality and Social Psychology*, 47(6), 1191–1205. 10.1037/0022-3514.47.6.1191
- Copeland, L., Lyu, J., & Han, J. (2021). Does Familiarity Matter? Examining Model Familiarity in Instagram Advertisements. *Journal of Internet Commerce*, 22(1), 97. 10.1080/15332861.2021.2011600
- Davis, S. W., Horváth, C., Gretry, A., & Belei, N. (2019). Say what? How the interplay of tweet readability and brand hedonism affects consumer engagement. *Journal of Business Research*, 100, 150. 10.1016/j.jbusres.2019.01.071
- De Vries, L., Gensler, S., & Leeflang, P. S. H. (2012). Popularity of Brand Posts on Brand Fan Pages: An Investigation of the Effects of Social Media Marketing. *Journal of Interactive Marketing*, 26(2), 83. 10.1016/j.intmar.2012.01.003
- Gkikas, D. C., Tzafilkou, K., Theodoridis, P. K., Garmpis, A., & Gkikas, M. C. (2022). How do text characteristics impact user engagement in social media posts: Modeling content readability, length, and hashtags number in Facebook. *International Journal of Information Management Data Insights*,

2(1)10.1016/j.jjimei.2022.100067

- Hamzah, Z. L., Abdul Wahab, H., & Waqas, M. (2021). Unveiling drivers and brand relationship implications of consumer engagement with social media brand posts. *Journal of Research in Interactive Marketing*, 15(2), 336. 10.1108/jrim-05-2020-0113
- Hisham, P. (2024, -11-04). Kuwait's 158% mobile subscription rate reflects high tech adoption - Passant Hisham. Retrieved Jun 15, 2025, from <https://kuwaittimes.com/article/20856/kuwait/other-news/kuwait-158-mobile-subscription-rate-reflects-high-tech-adoption/>
- Lavidge, R. J., & Steiner, G. A. (1961). A Model for Predictive Measurements of Advertising Effectiveness. *Journal of Marketing*, 25(6), 59. 10.2307/1248516
- Mardhatilah, D., Omar, A., Thursamy, R., & Juniarti, R. P. (2023). Digital Consumer Engagement: Examining the Impact of Audio and Visual Stimuli Exposure in Social Media. *Information Management and Business Review*, 15(4), 94–108.
- McClenaghan, E. (2024, March). Mann-Whitney U Test: Assumptions and Example. *Technology Networks*. Retrieved Jun 5, 2025, from <http://www.technologynetworks.com/informatics/articles/mann-whitney-u-test-assumptions-and-example-363425>
- Nachar, N. (2008). The Mann-Whitney U: A test for assessing whether two independent samples come from the same distribution. *Tutorials in Quantitative Methods for Psychology*, 4(1), 13–20.
- Pancer, E., Chandler, V., Poole, M., & Noseworthy, T. J. (2018). How Readability Shapes Social Media Engagement. *Journal of Consumer Psychology*, 29(2), 262. 10.1002/jcpy.1073
- Pletikosa Cvijikj, I., & Michahelles, F. (2013). Online engagement factors on Facebook brand pages. *Social Network Analysis and Mining*, 3(4), 843–861. 10.1007/s13278-013-0098-8
- Rietveld, R., Van Dolen, W., Mazloom, M., & Worrying, M. (2020). What you Feel, Is what you like Influence of Message Appeals on Customer Engagement on Instagram. *Journal of Interactive Marketing*, 49(1), 20. 10.1016/j.intmar.2019.06.003
- Rosenberg, M. J., & Hovland, C.I. (1960). Cognitive, affective and behavioral components of attitudes. In C. I. Hovland & M. J. Rosenberg (eds). *Attitude Organization and Change: An Analysis of Consistency among Attitude Components* (pp. 1-14). New Haven: Yale University Press.
- Schreiner, M., Fischer, T., & Riedl, R. (2019). Impact of content characteristics and emotion on behavioral engagement in social media: literature review and research agenda. *Electronic Commerce Research*, 21(2), 329. 10.1007/s10660-019-09353-8
- Schultz, C. D. (2017). Proposing to your fans: Which brand post characteristics drive consumer engagement activities on social media brand pages? *Electronic Commerce Research and Applications*, 26, 23. 10.1016/j.elerap.2017.09.005
- Shahbaznezhad, H., Dolan, R., & Rashidirad, M. (2021). The Role of Social Media Content Format and Platform in Users' Engagement Behavior. *Journal of Interactive Marketing*, 53(1), 47. 10.1016/j.intmar.2020.05.001
- She, J., Zhang, T., Chen, Q., Zhang, J., Fan, W., Wang, H., & Chang, Q. (2021). Which social media posts generate the most buzz? Evidence from WeChat. *Internet Research*, 32(1), 273. 10.1108/intr-12-2019-0534
- Son, H., & Park, Y. E. (2023). Predicting user engagement with textual, visual, and social media features for online travel agencies' Instagram post: evidence from machine learning. *Current Issues in Tourism*, 27(22), 3608. 10.1080/13683500.2023.2278087
- Statista Research Department. (2025, March). Kuwait: social media users 2020-2029. Statista. Retrieved Jun 14, 2025, from <https://0-www-statista-com.oasis.unisa.ac.za/forecasts/1144332/social-media-users-in-kuwait>
- Talreja, M., & Chaturvedi, V. (2024). The Impact of Social Media Advertising Content Formats on Consumer Engagement: A Study on Instagram. *International Journal of Applied Social Science*, 210.36537/IJASS/11.7&8/297-309
- Yu, J., Hong, W. C. H., & Egger, R. (2024). The Art of Post Captions: Readability and User Engagement on Social Media. *Journal of Travel Research*, 64(4), 853. 10.1177/00472875241228822

THE EFFECTS OF DIGITAL MARKETING STRATEGIES ON PURCHASE INTENTION: MEDIATING ROLE OF BRAND AWARENESS IN THE AVIATION INDUSTRY

Melike Zehir

Ibn Haldun University, Istanbul, Turkey, melike.zehir@ihu.edu.tr
<https://orcid.org/0000-0003-4700-8678>

Mustafa Kemal Yilmaz

Ibn Haldun University, Istanbul, Turkey, mustafa.yilmaz@ihu.edu.tr
<https://orcid.org/0000-0001-6036-0559>

Haddy Faal

Ibn Haldun University, Istanbul, Turkey, haafaalbelle22@gmail.com
<https://orcid.org/0000-0003-3955-2817>

ABSTRACT

Digital marketing strategies (DMS) are increasingly making their impact felt on brand awareness (BA) and purchase intention (PI) as competition in the aviation industry increases and digitalization accelerates. This study examines the direct effects of DMS on PI and the role of BA as a mediating variable in these relationships. In order to measure this relationship, comprehensive DMS, BA and PI scales were developed, pilot tests were conducted with 70 airline passengers and all validation criterias were met. Focusing on the airline industry in the Gambia, the study uses survey data collected from 240 passengers flying out of Banjul International Airport. The analyses were conducted using the PLS-SEM method. The results reveals that DMS have a significant impact on BA and PI, especially through tools such as search engine optimization (SEO), social media marketing (SMM), email marketing (EM) and mobile marketing (MM). In addition, BA shows partial mediation effect in the effect of DMS on PI. These findings provide important insights to better understand the effectiveness of DMS in the aviation industry and to optimize airlines' digital strategies. This study has made a significant contribution to the literature by developing a comprehensive DMS scale for BA and PI. The study provides valuable insights for airlines operating in Gambia to enhance their DMS, offering a localized perspective within the unique context of development in aviation.

KEYWORDS

Aviation Industry, Brand Awareness, Customer Satisfaction, Digital Marketing, Social Media

INTRODUCTION

Digital transformation, as in many other areas, is also reshaping the field of marketing by enriching the tools companies use in their relationships with consumers and facilitating their interactions with customers (Sridhar & Fang, 2019; Ahmad Wani & Wajid Ali, 2015). Digital marketing, defined as the use of digital channels, platforms, and technologies to promote or market products and services to consumers and businesses, is recognized as one of the most important tools companies use to reach both their target and existing customers, introduce their products and services, and shape their brand image (Chaffey & Chadwick, 2019).

The importance of digital marketing tools in the aviation industry has considerably increased in recent years as airlines reach more people and improve customer interaction by employing diverse DMS (Ahmad Wani & Wajid Ali, 2015). Airlines use DMS extensively to reach large audiences and increase BA at lower costs compared to traditional marketing methods (Tumer et al., 2019). Real-

time campaigns through social media platforms enable airlines to interact directly with customers and create BA (Heiets et al., 2024). While traditional marketing methods are less time and cost efficient, digital platforms offer instant access and personalized communication (Durmaz & Efendioğlu, 2016; Ali et al., 2025). With e-mail campaigns and mobile applications, they accelerate purchasing decisions by offering special offers to customers. Online reservation systems, social media advertising and search engine marketing facilitate airlines' access to different market segments by increasing BA (Karaagaoglu & Cicek, 2019; Xia et al., 2024).

The impact of DMS on customer satisfaction and PI is not adequately explored in the aviation industry although they are more successful than traditional strategies (Chatterjee, 2022; Kannan, 2017). DMS enables airlines to increase BA through direct engagement with their target audience, understand customer preferences through data analytics, and strengthen purchase intent through personalized campaigns (Abdullah, 2020; Xia et al., 2024). However, the lack of comprehensive academic studies on the specific effects of these strategies on BA and PI limits the full assessment of the potential of DMS in the industry.

This study aims to examine how DMS affect purchasing behavior of customers in the airlines operating in Gambia. In this study, a comprehensive scale was developed to measure DMS, BA and PI. Existing scales in the literature deal with DMS in a narrower scope and focus on certain dimensions. For instance, previous scale development studies have predominantly focused on the SMM dimension (Khan & Jan, 2019; Varela-Neira et al., 2023). There have also been studies that concentrated on influencer marketing (IM) (Wang et al., 2025), MM (Waheed & Yang, 2018), EM (Hasouneh & Alqeed, 2010). Each study provides important measurement tools related to the specific dimension it addresses; however, there is a need in the literature for a comprehensive approach that integrates all sub-dimensions of digital marketing.

The developed scale provides a comprehensive measurement of DMS across six dimensions— SEO, SMM, EM, affiliate marketing (AM), MM, and IM—capturing their influence on consumer behavior in the aviation industry, particularly in terms of BA and PI. The SEO dimension evaluates how frequently consumers use search engines to explore airline services, the influence of rankings on brand trust, and how relevant results drive purchasing decisions. SMM assesses consumers' use of social media platforms for airline-related searches and purchases, their perceptions of an airline's social media presence as a signal of quality, and its role in shaping decisions and encouraging positive word-of-mouth. EM focuses on consumers' engagement with airline emails, the impact of content relevance and frequency on interaction, and the perceived effectiveness of email campaigns in reaching target audiences. AM examines how often consumers make purchases through affiliate links, the level of trust and perceived relevance they attribute to such content, and its ability to influence both trial and purchase. MM addresses consumer perceptions of mobile-friendly platforms, their responses to mobile advertisements, and the overall impact of mobile engagement on purchasing behavior. Finally, IM evaluates how influencer credibility, authenticity, and follower count shape consumer trust and interest in airline services, highlighting the growing role of social influence in travel-related decision-making.

Although DMS have gained more importance with the developing technological applications and have a wide place in the academic literature, empirical studies in the aviation industry are limited (Heiets et. al., 2024; Tumer et. al., 2019). In this respect, the study fills an important gap in the literature.

METHODOLOGY

In this study, a structured process was followed to develop a reliable and valid scale. A mixed-method approach, incorporating both qualitative and quantitative analyses, was employed. The data collection process consisted of four main stages. In the first stage, a comprehensive literature review was conducted to establish the theoretical framework. Additionally, interviews were held with 10 experts and managers working at the airport to gather practical insights and deepen the

understanding of the subject matter. In the second stage, the information gathered from the literature review and interviews was thoroughly analyzed. Based on this analysis, a multidimensional conceptual framework was created, the key dimensions of the construct were identified, and relevant survey questions were developed. In the third stage, a pilot test was conducted to assess the validity and reliability of the scale. The pilot version of the scale was administered to 75 airport passengers to gather preliminary data. The results of the pilot test were analyzed using exploratory factor analysis to evaluate the underlying factor structure. In the final stage, the validated scale was applied to a larger sample. The data collected were analyzed using the PLS software. Structural equation modeling (SEM) was employed to test the study's hypotheses. Table 1 provides a detailed overview of the methodological process.

Table 1. Overview of the Methodological Process.

Stages	Method	Details
<i>Stage 1: Conceptualization</i>	Qualitative and Content Analysis	<ul style="list-style-type: none"> • Comprehensive literature review • 10 in depth interviews with airport experts and managers
<i>Stage 2: Item generation</i>	Qualitative and Content Analysis	<ul style="list-style-type: none"> • Content analysis of interview results • Development of a scale with 4 main dimensions, 6 sub-dimensions, and a total of 41 questions
<i>Stage 3: Pilot Test, Construct Validity and Reliability</i>	Quantitative, Survey	<ul style="list-style-type: none"> • Pilot test applied to 75 airline passengers for 38 items. • Conducted Exploratory Factor Analysis (EFA) to assess factor structure • 33 items meet the criteria for validity tests
<i>Stage 4: Scale Application and Model Testing</i>	Quantitative, Survey	<ul style="list-style-type: none"> • Scale applied to a larger sample of 240 airline passengers • Conducted Confirmatory Factor Analysis (CFA) • Tested Structural Equation Modeling (SEM)

Sample and Data Collection

In this study, primary data collection was conducted using interviews and surveys. The analysis focuses on a single country, i.e., Gambia, and includes both domestic and international carriers operating at Banjul International Airport (BIA). For selecting participants for the semi-structured interviews, the purposive sampling method (Lincoln & Guba, 1986) was used. In this method, researchers select individuals whom they believe have relevant knowledge about the subject matter (Rahi, 2017). This method is considered an effective and cost-efficient approach for identifying key

themes that provide comprehensive information, which helps in generating field-specific knowledge (Patton, 1990), and is recognized for saving time and resources (Taylor & Ramsey, 2005). The interviews were conducted with 10 experts and managers working in passenger and customer services at the Gambia airport.

Based on the comprehensive literature review and the information obtained from the interviews, survey questions were developed. In the application of the survey questions, a stratified random sampling method was used to obtain a representative sample. Strata were created among the passengers to ensure that different passenger groups were represented.

In the pilot study, 75 survey responses were collected, and for the analyses following the pilot study, 250 survey responses were gathered. After excluding the inappropriate surveys, 70 responses were included in the pilot study, and 240 responses were included in the main study.

The necessary ethical approvals for the study were obtained from the university's ethics committee and are indicated in the consent form. Every participant provided their consent for voluntary involvement. We also ensured the privacy and anonymity of the respondents.

Measures

This study developed a scale for measuring SMM, PI, and BA. Each item in the scale is measured using a 5-point Likert scale. The dimensions and subdimensions of the developed scale are presented in Table 2.

Table 2. Details of the Developed Scale

Dimensions	Sub-dimensions	Number of Questions
DMS	SEO	4
	SMM	4
	EM	4
	AM	5
	MM	3
	IM	6
BA	-	3
PI	-	4

RESULTS

Exploratory Factor Analysis (EFA)

A pilot test was conducted to assess the validity and reliability of the developed scale. Survey data collected from 70 passengers using Gambia Airways were used for the pilot test analysis. To calculate the internal consistency of the factors in the developed scale, an Explanatory Factor Analysis (EFA) with Principal Component Analysis and Promax rotation was performed using SPSS Version 25. Factor loadings greater than 0.50 (Hair et al., 2010), were considered. The initial scale developed contained a total of 38 items. After conducting the Exploratory Factor Analysis (EFA), 5 items were removed based on the established criteria due to not fitting the distribution (1 item from SMM, 2 items from MM, 1 item from BA, and 1 item from CS). As a result, a total of 8 factors and 33 items were identified, explaining 78.3% of the total variance, which exceeds the 60% requirement. The Kaiser-Meyer-Olkin (KMO) coefficient and Bartlett's test of sphericity were analyzed to determine the appropriateness of the data for factor analysis. The KMO value was 0.70 and Bartlett's test of

sphericity yielded a significant chi-square value ($\chi^2 = 1936.51, p < 0.001$), indicating that the data were suitable for factor analysis.

Table 3. The results of EFA

	1	2	3	4	5	6	7	8
SEO1				.851				
SEO2				.906				
SEO3				.739				
SEO4				.719				
SMM1						.885		
SMM2						.897		
SMM3						.580		
SMM4						.838		
EM1			.812					
EM2			.846					
EM3			.841					
EM4			.897					
AM1		.752						
AM2		.911						
AM3		.848						
AM4		.805						
AM5		.855						
MM1								.869
MM2								.844
MM3								.685
IM1	.765							
IM2	.776							
IM3	.937							
IM4	.938							
IM5	.910							
IM6	.804							
BA1					.642			
BA2					.964			
BA3					.784			
PI1							.921	
PI2							.689	
PI3							.659	
PI4							.680	

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

Confirmatory Factor Analysis

After confirming the validity and reliability of the scale through the pilot test, the scale was applied to a larger sample. New data collected from 240 passengers using Gambia Airport,

Confirmatory Factor Analysis (CFA) was conducted using Smart PLS 4 to test the developed scale's construct validity, reliability, and dimensionality. The maximum likelihood (ML) method was used to estimate the model parameters. To avoid model misspecifications, no correlated error terms or

cross-loadings were allowed, meaning items were not permitted to load on multiple factors. Items were retained in the CFA based on factor loadings greater than 0.50 (Hair et al., 2010). To assess the internal consistency of the factors, Cronbach's Alpha values were calculated. Cronbach's Alpha indicates the reliability level of the questions under each factor in the scale, with a value greater than 0.70 being considered acceptable (Field, 2018). The results of the CFA analysis are presented in Table 4 . In our analysis, the Cronbach's Alpha values for the seven dimensions ranged between 0.80 and 0.93, surpassing the threshold value of 0.70 (Nunnally & Bernstein, 1994).

Table 4. Confirmatory factor analysis, reliability and validity test results for research model

Dimensions	Factor Loadings	AVE	CR	Cronbach's α
Digital Marketing				
<i>Search Engine Optimization</i>		.762	.928	.896
SEO1	.860			
SEO2	.871			
SEO3	.886			
SEO4	.874			
<i>Social Media Marketing</i>		.771	.931	.901
SMM1	.877			
SMM2	.890			
SMM3	.885			
SMM4	.860			
<i>Email Marketing</i>		.773	.932	.902
EM1	.824			
EM2	.905			
EM3	.904			
EM4	.883			
<i>Affiliate Marketing</i>		.800	.952	.938
AM1	.895			
AM2	.889			
AM3	.918			
AM4	.889			
AM5	.881			
<i>Mobile Marketing</i>		.725	.887	.806
MM1	.907			
MM2	.885			
MM3	.754			
<i>Influencer Marketing</i>		.823	.965	.957
IM1	.884			
IM2	0.896			
IM3	0.898			
IM4	0.914			
IM5	0.927			

IM6	0.924			
<i>Brand Awareness</i>		.798	.922	0.873
BA1	0.854			
BA2	0.925			
BA3	0.901			
<i>Purchase Intention</i>		.764	.928	0.897
PI1	0.871			
PI2	0.856			
PI3	0.889			
PI4	0.880			

Discriminant validity refers to the power of a measurement tool to distinguish the concept it measures from other similar concepts. According to Fornell and Larcker (1981), for a construct to have discriminant validity, its Average Variance Extracted (AVE) value should be greater than the squares of its correlations with any other construct. In Table 5, diagonal values represent the square root of the AVE. In order to determine whether there is a discriminant validity problem, the square root values of AVE (average variance explained) on the diagonals in Table 5 were compared with the correlation coefficients on the horizontal and vertical axes and it was seen that the square root of the AVE value of each factor was higher than the correlation value on the horizontal and vertical axis.

Table 5. Discriminant validity (fornell-lacker criterion) and correlation coefficients between variables.

	Mean	Std. dev.	AM	BA	EM	IM	MM	PI	SEO	SMM
AM	3.87	0.87	0.894							
BA	4.55	0.71	0.333	0.894						
EM	3.77	0.83	0.493	0.299	0.879					
IM	4.05	0.88	0.632	0.429	0.397	0.907				
MM	4.06	0.83	0.463	0.386	0.262	0.419	0.851			
PI	4.58	0.68	0.373	0.589	0.381	0.443	0.391	0.874		
SEO	4.44	0.74	0.367	0.519	0.286	0.467	0.342	0.447	0.873	
SMM	4.43	0.77	0.396	0.546	0.370	0.453	0.377	0.498	0.473	0.878

Heterotrait-monotrait ratio (HTMT) stands out as a newer and more reliable method to assess discriminant validity (Henseler, Ringle, & Sarstedt, 2015). This method calculates the correlation between different concepts and the correlation between the elements of the same concept in order to better distinguish the relationships between concepts. HTMT ratios below 0.85 mean that each concept is sufficiently separated from each other and that their measurements accurately reflect the different concepts (Henseler et al., 2015). As seen in Table 6, all HTMT ratios are below 0.85 and discriminant validity is achieved.

Table 6. Discriminant validity (heterotrait-monotrait ratio).

	AM	BA	EM	IM	MM	PI	SEO	SMM
AM								

BA	0.362							
EM	0.532	0.336						
IM	0.663	0.465	0.426					
MM	0.530	0.457	0.306	0.475				
PI	0.402	0.662	0.421	0.473	0.456			
SEO	0.399	0.583	0.317	0.503	0.400	0.495		
SMM	0.422	0.613	0.410	0.485	0.440	0.549	0.525	

The research model, direct and indirect effects were analyzed by PLS-SEM method. PLS-SEM is a variance-based approach that has been widely used for path analytical models in recent years (Kock 2019). Compared to traditional covariance-based SEM, it has the advantage of analyzing complex models with smaller sample sizes and utilizing both formative and reflective structures. It is also more effective in explaining complex relationships and overcomes problems such as incompatible solutions and factor uncertainty (Dubey et al. 2019; Peng and Lai 2012). In order to determine the significance of the estimates, bootstrap analysis was performed with 5,000 resampling. Table 7 shows the results of PLS-SEM analysis, direct and indirect effects. According to the results of the analysis, DMS has a significant direct impact on BA ($\beta = 0.667$, $p < .01$) providing support for H1. BA has a significant direct impact on PI ($\beta = 0.311$, $p < .01$) providing support for H2. DMS has a significant direct impact on PI ($\beta = 0.416$, $p < .01$) providing support for H3. In the direct effect of DMS on PI, the path coefficient (Beta) is 0.667, while in the specific indirect effect, the path coefficient (Beta) in the relationship between digital marketing, brand awareness, and PI decreased to 0.208. However, the relationship is still significant, which indicates that BA shows a partial mediation effect in the relationship between DMS and PI ($\beta = 0.208$, $p < .01$).

Table 7. Model Testing, Direct and Indirect Effects

Hypohoteses	Paths	Beta	SE	T	P	Result
H1	DM \longrightarrow BA	0.667	0.071	9.360	0.000	Supported
H2	BA \longrightarrow PI	0.311	0.082	3.804	0.000	Supported
H3	DM \longrightarrow PI	0.416	0.080	5.173	0.000	Supported
H4	DM \longrightarrow \longrightarrow BA PI	0.208	0.058	3.568	0.000	Supported (Partial Mediation)

CONCLUSION

In this study, a scale was developed and tested to examine the effects of DMS on BA and PI. The analysis reveals that DMS positively affects BA and PI. Moreover, the effect of DMS on PI is partially

mediated through brand awareness. These findings suggest that DMS is an important tool in influencing consumer behavior as well as its role in creating BA.

The findings reveal that DMS, especially search engine optimization, social media marketing, email marketing, mobile marketing, influencer marketing and affiliate marketing are effective in increasing BA and that this awareness directly translates into PI. This study contributes to the previous literature on digital marketing and offers a new perspective on how these strategies can be used effectively in specific sectors such as airport passenger services.

Implications of the Study

This study makes a significant contribution by developing a comprehensive scale related to DMS, BA, and PI. The scale has a multidimensional structure, enabling the conduction of comprehensive and in-depth measurements. In particular, the DMS dimension consists of many sub-dimensions such as SEO, SMM, EM, MM, AM and IM. When the scales in the literature are examined, it is observed that they focus on only one or a few of the sub-dimensions included in this scale. For instance, Shareef et al. (2019) focus on SMM, while Le (2024) focuses on AM. This multidimensional structure developed in this study allows for a deeper examination of the effects of various aspects of DMS on consumers.

The study not only developed new scales for digital marketing, BA and PI, but also tested these scales in the context of a specific industry, airport passenger services. Understanding the dynamics in this sector has created an important opportunity to measure the effectiveness of DMS, especially for service-oriented businesses such as airports and airlines. The scale developed in this context, unlike other scales, focuses on sectoral applications, making it possible to measure the sector-specific effects of digital marketing more accurately. In particular, surveys were conducted with airport passengers to examine how DMS can be effective in the aviation sector and their tangible effects on consumer behavior. This offers a more specialized approach compared to the more general and broad studies that are usually conducted in the literature.

The study clearly demonstrated the impact of DMS on brand awareness. In particular, the role of tools such as SEO, SMM, IM and MM in increasing BA is consistent with previous studies in the literature (Schivinski & Dabrowski, 2016; Deng et al., 2021).

This study reveals that DMS are one of the important factors affecting direct PI. This finding is in line with previous studies in the literature. Kim et al. (2011) found that digital marketing, especially through social media and email marketing, increases PI of consumers. Bacik et al. (2025) found that DMS increases consumer PI in the tourism industry. Pinca et al. (2024) also found that digital marketing, especially social media marketing, mobile marketing and affiliate marketing positively affect consumer PI in the fast-food industry.

Another important theoretical contribution of this study is that the impact of DMS on PI is partially mediated through brand awareness. Siddiqui et al. (2025), in their study applied to the textile industry, found that email and social media marketing were particularly effective and that BA served as a moderating factor in increasing PI. Similarly, Hien and Nhu (2022) found that BA serves as a moderating variable that not only increases the effectiveness of DMS but also strengthens the relationship between DMS and PI.

REFERENCES

- Abdullah, M. M. H. H. (2020). The impact of digital marketing communication on brand awareness and purchase intention: does customer engagement mediate the relationship between brand awareness and purchase intention?. *International Journal of Islamic Marketing and Branding*, 5(4), 288-299.
- Ahmad Wani, T., & Wajid Ali, S. (2015). Innovation diffusion theory review & scope in the study of adoption of smartphones in India. *Journal of General Management Research*, 3, 101–118.
- Ali, F., Hacioglu, U., & Zehir, M. (2025). Building brand loyalty through digital marketing: insights from young

- airline travelers. *Bussecon Review of Social Sciences* (2687-2285), 7(1), 22-31.
- Chaffey, D., & Ellis-Chadwick, F. (2019). *Digital marketing*. Pearson uk.
- Chatterjee, R. (2022). An Overview of the Role of Digital Marketing in Airline Industry. *International Journal of All Research Education and Scientific Methods (IJARESM)*, 10(3).
- Deng, Q., Wang, Y., Rod, M., & Ji, S. (2021). Speak to head and heart: The effects of linguistic features on B2B brand engagement on social media. *Industrial Marketing Management*, 99, 1–15.
- Dubey, R., Gunasekaran, A., Childe, S. J., Papadopoulos, T., Luo, Z., Wamba, S. F., & Roubaud, D. (2019). Can big data and predictive analytics improve social and environmental sustainability?. *Technological forecasting and social change*, 144, 534-545.
- Durmaz, Y., & Efendioglu, I. H. (2016). Travel from traditional marketing to digital marketing. *Global journal of management and business research*, 16(2), 34-40.
- Field, A. (2018). *Discovering Statistics Using IBM SPSS Statistics* (5th ed.). SAGE Publications.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), 39-50.
- Hair Jr, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis*. In *Multivariate data analysis* (pp. 785-785).
- Hasouneh, A. B. I., & Alqeed, M. A. (2010). Measuring the effectiveness of e-mail direct marketing in building customer relationship. *International journal of marketing studies*, 2(1), 48.
- Heiets, I., La, J., Zhou, W., Xu, S., Wang, X., & Xu, Y. (2022). Digital transformation of airline industry. *Research in Transportation Economics*, 92, 101186.
- Heiets, I., Ng, S., Singh, N., Farrell, J., & Kumar, A. (2024). Social media activities of airlines: What makes them successful?. *Journal of the Air Transport Research Society*, 2, 100017.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science*, 43, 115-135.
- Kannan, P. K. (2017). Digital marketing: A framework, review and research agenda. *International journal of research in marketing*, 34(1), 22-45.
- Karaağaoğlu, N., & Çiçek, M. (2019). An evaluation of digital marketing applications in airline sector. *Journal of Human Sciences*, 16(2), 606-619.
- Le, M. T. (2024). Enhance the effectiveness of affiliate marketing on Tiktok for young people. *International Journal of Technology Marketing*, 18(2), 162-184.
- Lincoln, Y. S., & Guba, E. G. (1986). But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. *New directions for program evaluation*, 1986(30), 73-84.
- Nunnally, J. C., & Bernstein, I. (1978). *Psychometric theory*. New York: MacGraw-Hill.
- Peng, D. X., & Lai, F. (2012). Using partial least squares in operations management research: A practical guideline and summary of past research. *Journal of operations management*, 30(6), 467-480.
- Schivinski, B., & Dabrowski, D. (2016). The effect of social media communication on consumer perceptions of brands. *Journal of Marketing Communications*, 22(2), 189-214.
- Shareef, M. A., Mukerji, B., Dwivedi, Y. K., Rana, N. P., & Islam, R. (2019). Social media marketing: Comparative effect of advertisement sources. *Journal of Retailing and Consumer Services*, 46, 58-69.
- Sridhar, S., & Fang, E. (2019). New vistas for marketing strategy: digital, data-rich, and developing market (D 3) environments. *Journal of the Academy of Marketing Science*, 47, 977-985.
- Taylor, P. D., & Ramsey, M. H. (2005). Sampling strategies for contaminated brownfield sites. *Soil Use and Management*, 21, 440-449.
- Tumer, M., Aghaei, I., Oney, E., & Yahya, N. E. (2019). The impact of traditional and social media marketing on customers' brand trust and purchase intentions in the Turkish airline market. *Journal of Research in Emerging Markets*, 1(4), 55.

Wang, C. C., Chang, S. C., & Hsieh, I. H. (2025). Motives for following social media influencers: Scale development and validation. *Information Development*, 02666669241309014

Xia, L., Xu, Y., Zhang, Y., Jiang, H., & Cui, B. (2024). Impact of airline social media marketing on purchase intention: Evidence from China using PLS-SEM. *Transport Economics and Management*, 2, 249-262.

LEADERSHIP FOR TRANSFORMATION

DIGITAL LEADERSHIP AS A CATALYST FOR DIGITAL TRANSFORMATION AND SUSTAINABLE DIGITAL ECONOMIES: A BIBLIOMETRIC ANALYSIS

Bora YILDIZ

Istanbul University, Istanbul, Türkiye, borayildiz@istanbul.edu.tr
<https://orcid.org/0000-0002-0373-6457>

Zeynep KAPTAN

Istanbul University, Istanbul, Türkiye, zeynepkaptan21@ogr.iu.edu.tr
<https://orcid.org/0000-0002-4877-430X>

ABSTRACT

In this study—drawing on the resource-based view—the phenomenon of digital leadership, which plays a critical role in terms of the digital transformation and sustainability of digital economies, was examined thematically in 164 studies (spanning from 1989 to 2025) published in Web of Science (WOS). Accordingly, the aim of this study is to determine the prominent themes in the existing literature on digital leadership, which is one of the leadership styles that are vital for digital transformations and sustainable digital economies, and to determine whether these themes are relevant in Türkiye. First, the main themes that the relevant studies focused on were determined based on secondary data retrieved from WOS by using R (bibliometrix). The findings revealed that most of the studies were conducted in America, England, China, Germany, and Russia. Similarly, based on the secondary data, we determined that digital transformation, sustainability, performance, and innovation were trend themes. Managerial and further research directions, as well as future research directions, are also provided.

KEYWORDS

Digital Economy, Digital Leadership, Digital Transformation, Sustainability

INTRODUCTION

Digital transformation is among the most fundamental issues on the agenda of countries and organizations today. However, at the same time, the adaptation capacity of organizations in this transformation process, their readiness for innovations, and the challenges they encounter remain critical for managing this process effectively. Although digitalization and its effects and importance on organizations have accelerated with the development of information technologies, during the COVID-19 period, these effects have become more evident with remote working, data-based forecasting, and the subsequent practical use of artificial intelligence (Kirchner et al., 2021; Tigre et al., 2023; Wang et al., 2020). The recent shifts and developments have underscored the need to modify current leadership approaches to align with the new normal. Thus, the need for organizations to use resources effectively and efficiently in accordance with evolving circumstances to attain their objectives has highlighted the demand for new leadership paradigms, such as digital leadership.

There are different but overlapping definitions of digital leadership available in the existing literature. According to Avolio et al., digital leadership is defined as “a social influence process mediated by information technology that brings about a change in attitudes, feelings, thinking, behavior, and/or performance in individuals, groups, and organizations” (2000, p. 617). As it can be seen in this definition, this definition focused on the transformational nature of the digital leadership. In this

transformation process digital leaders not only use technological tools as a supportive mechanism but also, they use as mediators that conveys the influence of the behavioural and cultural change.

Another definition of digital leadership is “the capacity of leaders to formulate a well-defined and purposeful vision for the digitalization process, coupled with the ability to effectively implement strategies aimed at accomplishing digital objectives” (Chen & Zhao, 2024; de Araujo et al., 2021). In contrast to Avolio et al. (2020)’s definition, this definition emphasizes the strategic and visionary dimensions of digital leadership. According to this definition leaders not only design digital transformation but also perform as a change agent. As can be understood from these definitions, digital transformation is one of the concepts closely related to digital leadership. Therefore, it can be said that digital leadership is one of the leadership paradigms that digital transformation has revealed or a leadership paradigm that has become more important in this period. According to Feroz et al. (2021), “digital transformation refers to the unprecedented disruptions in society, industry, and organizations stimulated by advances in digital technologies such as artificial intelligence, big data analytics, cloud computing, and the Internet of Things (IoT). “Digital transformation transforms organizations by forcing them from their current situation to a new situation. At this point, DL is a type of leadership that makes the process of coping with these difficulties as clear as possible, reduces uncertainty, and facilitates the modernization of organizations in the digital transformation process (Tigre et al., 2023).

One of the sources of inspiration for this research is the article titled “Digital Transformation Is Not About Technology,” published in the Harvard Business Review (Tabrizi et al., 2019). According to the relevant study, a survey conducted on managers revealed that the most significant risk faced by companies is the investment made in digital transformation. Similarly, the same study found that 70% of investments in digital transformation either failed or did not achieve their goals. Specifically, it was stated that 900 billion of the 1.3 trillion dollars spent on digital transformation in 2018 was wasted. This high failure rate draw attention to vital importance of aligning technological investments with human capital, strategic agility, and organizational culture. In this regard, the authors indicate that the success of digital transformation relies not only on the use of modern technology but also on strong leadership that fosters internal alignment, encourages experimentation, and facilitates organisational learning. Therefore, the following question arises regarding digital transformation; why are some organizations' digital transformation investments successful while others fail? At this point, the authors offer the following suggestions to minimize the aforementioned failure: Investments should be made according to a strategy, focusing on internal resources (employees) rather than external experts (leveraging insiders); designing the customer experience from the outside in (if customer satisfaction is the goal, then listening to customers first); recognizing employees' fears and concerns about transformation; being able to make agile decisions, like in Silicon Valley; being able to prototype quickly; and having flat structures.

In this context, the strategic role of leaders becomes paramount. Especially when looking at the issue from the perspective of the effective use of internal resources, leaders play a strategically important role in guiding employees towards a common strategy for the efficient and effective use of resources, identifying strengths and weaknesses, and developing the necessary strategies to address potential opportunities and threats (Ülgen & Mirze, 2010). A supporting view states that “for the vast majority of firms, the problem is not getting people started—it’s getting everyone moving in the same direction.” Both challenges are the domain of leadership. Leadership capabilities are essential to achieving true digital transformation; they turn digital investment into digital advantage.” (Westerman et al., 2014, p. 95). Similarly, various researchers argue that digitalization is a factor that shapes the new world and facilitates globalization and economic expansion beyond national borders (Sassen, 1998). Therefore, digitalization, specifically digital transformation, has the potential to create new opportunities in terms of economic, environmental, and social sustainability by transforming consumption and labor structures, despite the risks it entails (Brennen & Kreiss, 2016).

When examined from a strategic management perspective, the resource-based view (Barney, 1991) provides a comprehensive theoretical lens for explaining the intersection between digital transformation, digital leadership, and the sustainability of digital economies. According to the resource-based view, the valuable, rare, and inimitable nature of the resources that companies possess plays a critical role in their ability to achieve sustainable competitive advantage (Barney, 1991). This approach enables organizations to gain a competitive advantage over their rivals and sustain this advantage. On the other hand, digital transformation is not only a concept related to the use of technologies but also a holistic transformation process in which the processes, structures, and cultures of organizations change. Therefore, the skills, capacity, technological competencies, and data analytics skills acquired during this transformation become the core competencies that distinguish organizations from other organizations (Wade & Hulland, 2004).

Within this framework, digital leadership plays a pivotal role in identifying, orchestrating, and mobilizing these resources. As mentioned above, digital leadership is not only about technological and managerial issues but also indicates the capacity for cultural transformation. To emphasize the importance of digital leadership, Westerman et al. (2014) assert that leaders are more than technology, and the success of digital transformation depends on the leadership. The soft skills of the leader, such as gathering followers around his visionary thought, directing the organization, and adapting to changes, can be seen as valuable, rare, and inimitable "human resources" in terms of resource dependency.

When the above information is summarized, digital transformation is an important and comprehensive process, but without effective leadership, the success rate is low. At this point, it can be said that digital leaders are leaders who reduce uncertainty and use resources effectively to successfully implement and facilitate digital transformation. Moreover, digital leaders both implement digital transformation through their efforts and principles and ensure the sustainability of these economies. As a result, sustainable digital economies are only possible with visionary digital leadership and deep-rooted digital transformation efforts.

METHOD

The bibliometric analysis approach was used in present research to ascertain the predominant themes that are present in the existing body of literature on digital leadership. Digital leadership is one of the forms of leadership that is essential for digital transformations and sustainable digital economies. The main themes on which the prominent themes focus are based on secondary data obtained from the Web of Science (WoS) database using R software (Aria & Cuccurullo, 2017).

Plan of Research and Data Collection Process

The research that was conducted for this study was based on bibliometric analysis. The purpose of the bibliometric analysis approach is to expose the profile of the literature on digital leadership, to identify significant subjects that are present in the relevant literature, and to assess the validity of these themes in Türkiye.

Bibliometric Analysis

During the first phase of the research, the Web of Science, which is a significant bibliographic database (Fetscherin & Heinrich, 2015; Prancutè, 2021), was selected as the ideal database for determining digital leadership research. The keywords were picked with great care, and a thorough search was carried out so that an efficient search strategy could be developed. To conduct a search inside the WoS database (by selecting All Fields), the phrases ("digital leadership") AND ("digital transformation") AND ("strategic management") AND ("sustainability") were taken into consideration. As a result of the search criteria meticulously created in the first stage, 172 studies were reached, and the data collection process was completed on June 10, 2025. In the next stage, six studies published in languages other than English and two duplicate studies were identified and

removed from the dataset. As a result, the total number of studies included in the bibliometric analysis was finally 164 (see Figure 1).

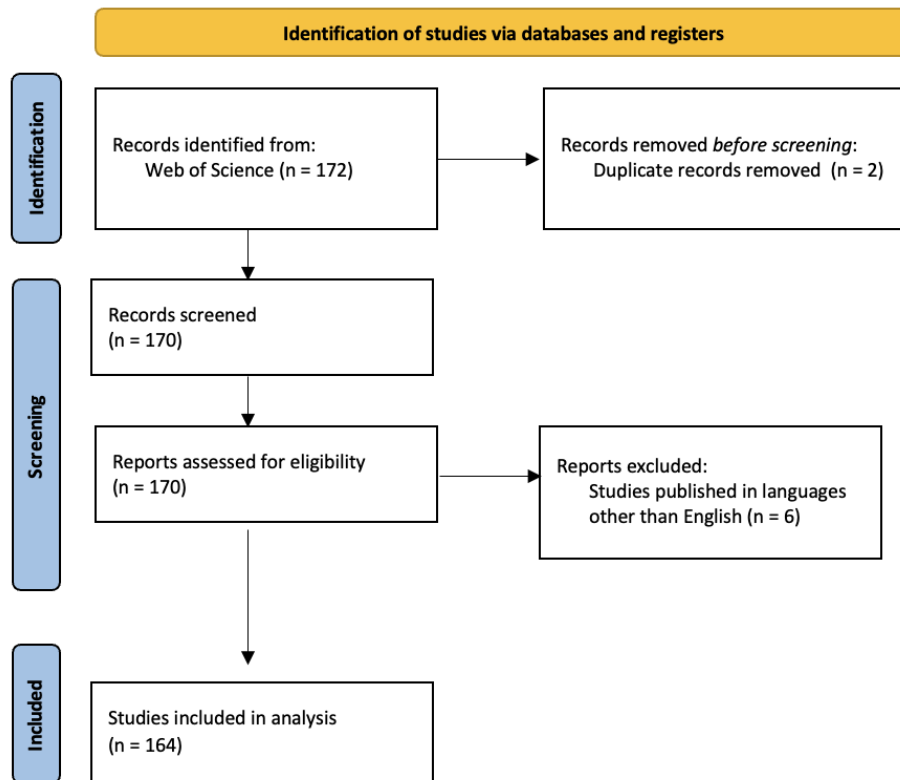


Figure 1. PRISMA Flow Diagram

FINDINGS

In this section, the findings regarding the bibliometric analysis are presented.

Bibliometric Analysis

The sources of digital leadership, strategic management, and sustainability literature examined through the WoS database consist of studies between 1989 and 2025. The annual growth rate of the relevant literature, which consists of 164 studies in total, is 9.47%, while the average citation rate per study is 16.82%. The current 164 studies were written by 665 authors, while 31 authors published 33 studies as single authors. The international author collaboration rate in the field was 28.66%, and 430 keywords were included in the studies. When the annual scientific production rates of the relevant literature are examined, the highest production is in 2024 (33 articles), while an increase in the number of publications is observed since 2021 (11 articles). This shows that the interest of researchers in digital leadership, strategic management, and sustainability literature has increased in the last 5 years. In addition, countries such as the USA, China, Germany, Portugal, Russia and the UK stand out as the countries that contribute the most to the relevant literature. The prominent concepts in the keyword analysis are “digital transformation, sustainability and industry 4.0”. In line with the research purpose of this study, the publication distribution of the digital leadership, strategic management and sustainability field by year, thematic mapping, and country-based publication analysis will be discussed in the following sections.

Distribution of Publication by Year in the Relevant Field

According to Figure 7, the number of publications in the relevant literature started in 1989 (1 article), but the number of publications remained quite limited until 2010. The years 1989-2010 can be interpreted as the first stages of the publication process and the relevant literature has just begun to be investigated by researchers. After 2010, a significant increase in the number of publications is observed. An increase in the number of publications is observed especially since 2016, and this number reaches 28 in 2021 (11 publications) and 2022. The reason for this can be associated with the fact that digitalization has become more prominent in business life (Domniku & Ahmeti, 2024; Paul et al., 2024).

The highest production in the relevant field was in 2024 (33 publications). This situation shows that both the importance of digitalization in corporate life and the important role it plays in the process of stepping into digital economies have attracted the attention of researchers in the relevant literature as it has increased over time. Although the year 2025 (26 publications) has not yet been completed, the continuing interest supports this idea.

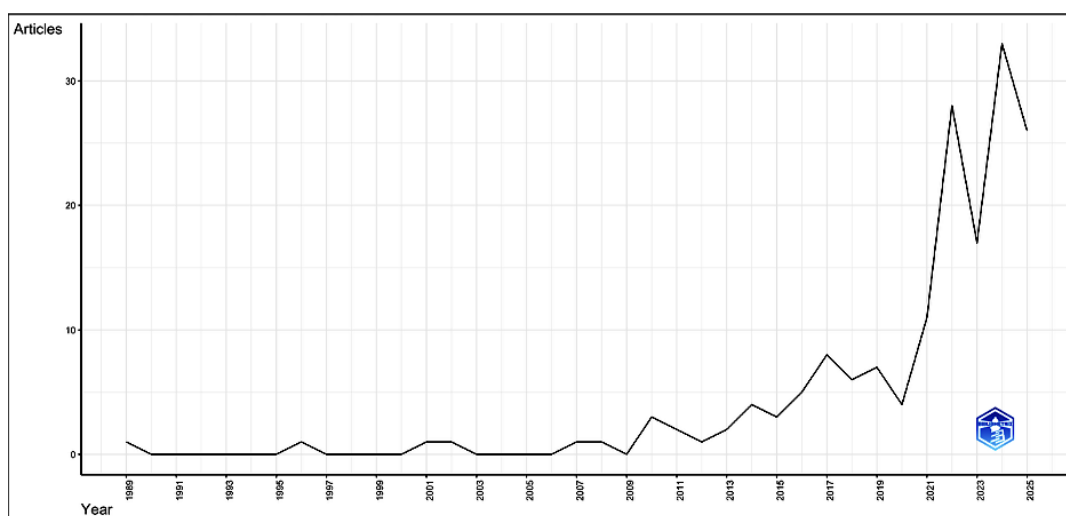


Figure 7. Distribution of publication by year

Thematic Mapping in the Relevant Field

Figure 8 presents a thematic map of studies in the field of digital leadership, strategic management and sustainability. According to the data obtained from the bibliometric analysis, “digital transformation” in the motor themes is the concept with the most central and powerful structure in the field. In addition, concepts such as “industry 4.0, big data, digital, e-government, digital leadership, and leadership”, which have high centrality and density levels in the field, support the concept of digital transformation and come to the fore by attracting the attention of researchers in the relevant field. This situation also indicates that the concepts in this theme are central and mature topics in the relevant field. “Sustainability” is another striking concept and has a fundamental position in the literature with its strong centrality levels, expanding with concepts such as “sustainable development, collaboration, artificial intelligence”.

Other themes, such as “digital capability, knowledge management, genetic algorithm, digital economy, and digital readiness”, stand out with their low density and centrality values. This shows that they are research areas that have not yet received sufficient attention from researchers in the relevant literature or have lost their importance. However, such themes can fill gaps in the literature and guide researchers to discover areas that can make original contributions.

As a result, the concept of “digital transformation” is the focus of research, while “sustainability and industry 4.0” are emerging terms in the field. This thematic map provides a framework that guides researchers in understanding research trends in the current literature and identifying new research areas.

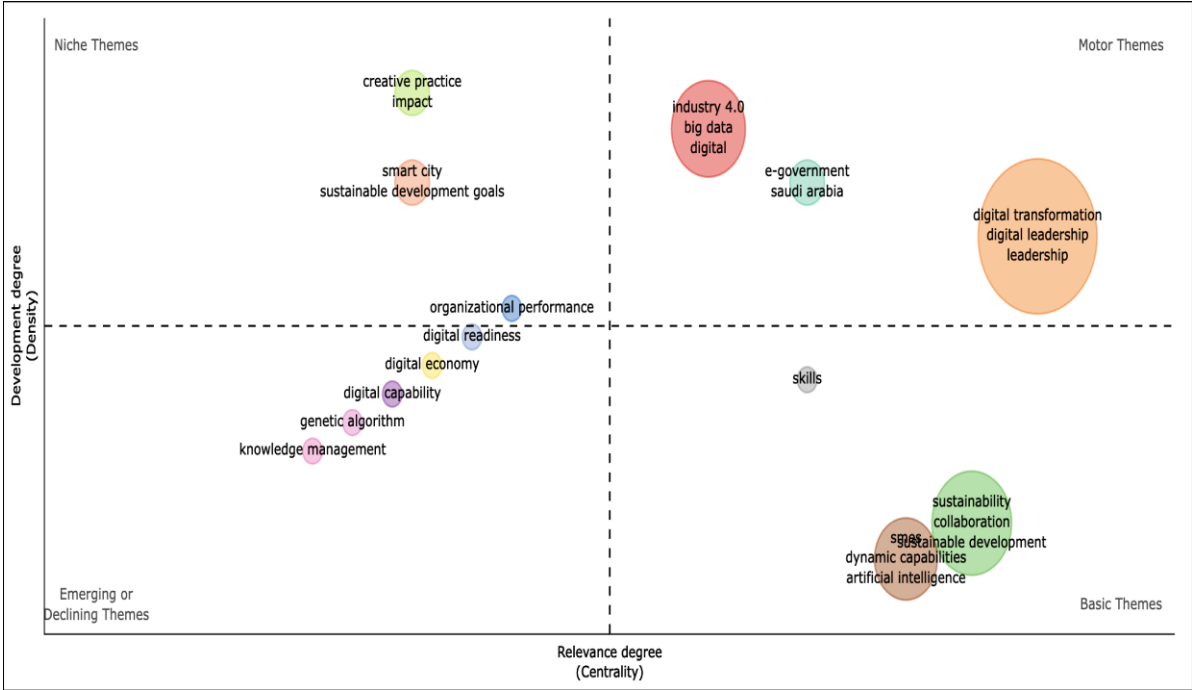


Figure 8. Thematic mapping of the relevant field

Country-Based Publication Analysis

When 164 publications were examined, it was determined that a total of 45 countries contributed to the field of digital leadership, strategic management and sustainability (see Table 1). When we examine Table 1, the USA stands out as the country that contributed the most to the literature with a contribution rate of 15.9%. After the USA, China (9.8%) stands out as the most productive country, followed by Germany, Portugal, Russia, and the United Kingdom with a contribution rate of 4.9%. The SCP and MCP rates of countries provide us with the levels of national and international collaboration. In light of this information, the USA is the leader among the top 20 most productive countries, with 26.9% international collaboration (7 out of 26 publications). In addition, countries such as Germany, Türkiye, Korea, Romania and Saudi Arabia have 0% MCP rates. This shows that all of the research conducted in these countries is produced only by domestic researchers and there is no international collaboration.

Another important point is that Brazil, Serbia, Singapore (each with 66.7% MCP rate), Slovenia (100%) and Egypt (100%) have carried out international collaboration in the majority or all of their publications; thus, it has been concluded that these countries have contributed to the literature in the field of digital leadership, strategic management and sustainability on a multinational basis.

Table 1. Countries contributing to the relevant field

	Country	Articles	Articles %	SCP	MCP	MCP%
1	USA	26	15.9	19	7	26.9
2	China	16	9.8	10	6	37.5
3	Germany	8	4.9	8	0	0.0
4	Portugal	8	4.9	6	2	25.0
5	Russia	8	4.9	6	2	25.0
6	United Kingdom	8	4.9	6	2	25.0
7	Italy	7	4.3	4	3	42.9
8	Malaysia	5	3.0	3	2	40.0
9	Canada	4	2.4	3	1	25.0
10	Netherlands	4	2.4	3	1	25.0
11	Türkiye	4	2.4	4	0	0.0
12	Brazil	3	1.8	1	2	66.7
13	Egypt	3	1.8	0	3	100.0
14	Korea	3	1.8	3	0	0.0
15	Romania	3	1.8	3	0	0.0
16	Saudi Arabia	3	1.8	3	0	0.0
17	Serbia	3	1.8	1	2	66.7
18	Singapore	3	1.8	1	2	66.7
19	Slovenia	3	1.8	0	3	100.0
20	Greece	2	1.2	1	1	50.0

Notes: SCP, single country publications; MCP, multiple country publications

DISCUSSION AND CONCLUSION

This study reviewed the literature on the relationships between digital transformation, digital leadership, and sustainable digital economies and identified themes that emerged from the bibliometric analysis. Next, we will look at the data gathered from participants using a set of open-ended questions and compare it to the qualitative study that will be done. Thereby, the themes in the literature and those related to these concepts in a developing country like Turkey will be identified and compared. This will allow for a thorough analysis of Turkish workers' awareness of these concepts and the literature. The results obtained not only provide theoretical contributions to the literature but also aim to guide practitioners and policymakers.

Considering the trend in publications, a significant increase has been observed since 2020. On the other hand, it is noteworthy that a large proportion of publications originate from large and developed countries such as the USA and China. The findings obtained from the bibliometric analysis

reveal that concepts such as digital transformation, digital leadership, e-government, Industry 4.0, big data, and digitalisation are highly centralised and concentrated in the literature, acting as motor themes. Niche themes—creative practice, smart cities, sustainable development tools, and organisational performance—were identified. Similarly, themes such as “digital readiness”, “digital economy”, “digital capability”, “genetic algorithm”, and “information management” have emerged or are fading. Finally, it is noteworthy that sustainability, sustainable development, dynamic capabilities, and artificial intelligence are prominent in the core themes. The qualitative research findings to be compared with these findings will be presented after the interview discussions.

When evaluated as a whole, the concepts of digital transformation and digital leadership are essential components for achieving sustainable economies, which are central to these efforts. On the other hand, it is understood that the use of artificial intelligence, technology and data in digital transformation and other such capabilities and potentials play a critical role in the sustainability of organisations in terms of dynamic capabilities. In other words, these factors are believed to play a critical role in an organisation's ability to adapt to rapidly changing environmental conditions, evaluate opportunities, and cope with threats. Therefore, according to the dynamic capabilities perspective (Teece et al., 1997), these capabilities, capacities, and competencies, which have become the core competencies of companies, need to be changed and transformed, and new resources should be created to be sustainable in changing environmental conditions.

REFERENCES

- Aria, M., & Cuccurullo, C. (2017). bibliometrix : An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, 11(4), 959-975.
- Avolio, B.J., Kahai, S., & Dodge, G.E. (2000). E-leadership: Implications for theory, research, and practice. *Leadership Quarterly*, 11, 615-668.
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99-120.
- Brennen, J.S., & Kreiss, D. (2016). Digitalization. *The International Encyclopedia of Communication Theory and Philosophy*, 1-11.
- Chen, L., & Zhao, X. (2024). The impact of digital leadership on safety performance—a moderated mediation model. *International Journal of Occupational Safety and Ergonomics*, 30(4), 1179-1187.
- de Araujo, L.M., Priadana, S., Paramarta, V., & Sunarsi, D. (2021). Digital leadership in business organizations. *International Journal of Educational Administration, Management, and Leadership*, 45-56.
- Domniku, M., & Ahmeti, M. (2024). Digital transformation and its influence on modern business strategies. *Pakistan Journal of Life and Social Science*, 22(2), 11559-11571.
- Feroz, A.K., Zo, H., & Chiravuri, A. (2021). Digital transformation and environmental sustainability: A review and research agenda. *Sustainability*, 13(3), article 1530.
- Fetscherin, M., & Heinrich, D. (2015). Consumer brand relationships research: A bibliometric citation meta-analysis. *Journal of Business Research*, 68(2), 380-390.
- Kirchner, K., Ipsen, C., & Hansen, J.P. (2021). Covid-19 leadership challenges in knowledge work. *Knowledge Management Research & Practice*, 19(4), 493-500.
- Paul, J., Ueno, A., Dennis, C., Alamanos, E., Curtis, L., Foroudi, P., Kacprzak, A., Kunz, W.H., Liu, J., Marvi, R., Nair, S.L.S., Ozdemir, O., Pantano, E., Papadopoulos, T., Petit, O., Tyagi, S., & Wirtz, J. (2024). Digital transformation: A multidisciplinary perspective and future research agenda. *International Journal of Consumer Studies*, 48(2), e13015.
- Pranckutė, R. (2021). Web of Science (WoS) and Scopus: The titans of bibliographic information in today's academic world. *Publications*, 9(1), article 12.
- Sassen, S. (1998). *Globalization and its discontents: Essays on the new mobility of people and money*. New York, NY: New Press.
- Tabrizi, B., Lami E., Girard, K., & Irvin, V. (2019). Digital transformation is not about technology. Harvard

Business Review, 13(March), 1-6.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509-533.

Tigre, B., Curado, C., & Henriques, P.L. (2023). Digital leadership: A bibliometric analysis. *Journal of leadership & organizational studies*, 30(1), 40-70.

Ülgen, H., & Mirze, S.K. (2010). *İşletmelerde stratejik yönetim* (5. Baskı). İstanbul: Beta Yayınları.

Wade, M., & Hulland, J. (2004). The resource-based view and information systems research: Review, extension, and suggestions for future research. *MIS Quarterly*, 28(1), 107-142.

Wang, B., Schlagwein, D., Cecez-Kecmanovic, D., & Cahalane, M.C. (2020). Beyond the factory paradigm: Digital nomadism and the digital future (s) of knowledge work post-COVID-19. *Journal of the Association for Information Systems*, 21(6), 10.

Westerman, G., Bonnet, D., & McAfee, A. (2014). *Leading digital: Turning technology into business transformation*. Harvard Business Press.

SPARKING LEADERSHIP'S ROLE IN ENHANCING GEN Z EMPLOYEES' INNOVATION AND SELF-EFFICACY

Elif Bilginođlu

Istanbul Niřantaşı University, İstanbul, Türkiye, elif.bilginoglu@nisantasi.edu.tr
<https://orcid.org/0000-0003-1481-0170>

Uđur Yozgat

Istanbul Niřantaşı University, İstanbul, Türkiye, ugur.yozgat@nisantasi.edu.tr
<https://orcid.org/0000-0001-9893-3551>

ABSTRACT

In the dynamic landscape of today's business environment, effective leadership stands as the linchpin for both corporate and non-corporate entities grappling with the challenges of a turbulent ecosystem. This study embarks on a compelling exploration of leadership paradigms amid chaos, offering a roadmap for leaders to navigate through uncertainty and drive organizational success. Within the scholarly discourse, various leadership models, from servant and transformative to innovative leadership, have emerged. However, as we traverse this era of turbulence, there is a burgeoning need for leaders to transcend traditional frameworks. This study extends an invitation to authors to delve into a novel realm of leadership, one that fosters value co-creation within and across organizations. Amidst the myriad leadership styles, this study highlights "sparking leadership" (Bilginođlu & Yozgat, 2020a) and its profound impact on Generation Z employees. As the generational torch passes, leaders must adapt and understand the unique dynamics of this emerging workforce. The study encapsulated in this study delves into the transformative influence of sparking leadership on the self-efficacy and innovative work behavior of Generation Z. By unraveling these intricate connections, the researchers aim to contribute valuable insights that equip leaders with the foresight and skills required to steer their organizations through the storm of contemporary business challenges.

KEYWORDS

Leadership, sparking leadership, self-efficacy, innovative work behavior, Gen Z.

INTRODUCTION

In the dynamic landscape of today's business environment, effective leadership stands as the linchpin for both corporate and non-corporate entities grappling with the challenges of a turbulent ecosystem. This study embarks on a compelling exploration of leadership paradigms amid chaos, offering a roadmap for leaders to navigate through uncertainty and drive organizational success. Various leadership models have emerged within the scholarly discourse, from servant and transformative to innovative leadership. However, as we traverse this era of turbulence, there is a burgeoning need for leaders to transcend traditional frameworks. This study extends an invitation to authors to delve into a novel realm of leadership, one that fosters value co-creation within and across organizations.

Amidst the myriad leadership styles, this study shines a spotlight on "sparking leadership" (Bilginođlu & Yozgat, 2020a) and its profound impact on Generation Z employees. As the generational torch passes, leaders must adapt and understand the unique dynamics of this emerging workforce. The study encapsulated in this study delves into the transformative influence of sparking leadership on the self-efficacy and innovative work behavior of Generation Z. By unraveling these intricate connections, the researchers aim to contribute valuable insights that equip leaders with the foresight and skills required to steer their organizations through the storm of contemporary business challenges.

Over time, the definition of a leader and the qualities illustrating leadership have evolved (Hunt & Fedynich, 2019). Nevertheless, the demand for leadership has endured. Effective leaders connect with employees on an empathetic level, addressing their core aspirations, hopes, dreams, and values (Kingl, 2020: x). As Generation Z assumes a prominent role in the workforce, organizations must understand and align with the expectations of these younger employees (General Assembly, 2021). This generation introduces distinct priorities, values, and needs that differ significantly from previous ones (Stahl, 2019). Generation Z is pivoting away from common millennial behaviors and attitudes and is setting new standards (Seemiller & Grace, 2019). The findings of generational studies reveal that the ways that leaders typically managed older generations will not work with Generation Z (Dorsey & Villa, 2020). Generation Z calls for a new management style (Schlotter & Hubert, 2020: 2). Organizational leaders face the challenge of understanding not only the most effective ways to manage these young and relatively inexperienced employees but also the distinctive characteristics of a generation shaped by its unique experiences (Schroth, 2019; Seemiller & Grace, 2019: 215; Witt & Baird, 2018: 18). Leaders who understand Generation Z and their drive and motivation will be well-positioned to ensure their successful inclusion within workplaces and reap the benefits they bring to the workforce (Jenkins, 2022; Monster, 2016). Generational studies show that coaching is the most effective way to lead Generation Z (Jenkins, 2017) and that 35 percent of Generation Z expects motivating behaviors from their leaders (Bresman & Rao, 2017). Leaders who provide support for the needs of Generation Z, act as mentors, and create an environment where employees can express their authentic selves are more likely to retain their workforce for a longer duration and motivate them to excel in their work (Workforce Institute & Kronos, 2019).

THEORETICAL BACKGROUND

Generation Z

A generation can be defined as a social cohort consisting of individuals born within a specific period. Analyzing the social occurrences, technological advancements, and demographic shifts that took place during the developmental years of a generation provides valuable insights into the factors influencing the expectations, behaviors, and perspective of these communal groups (Madden, 2019: 10).

Comprised of individuals born roughly between 1995 and 2010, Generation Z (aka Gen Z, iGen, Tweens, Baby Boomers, The Founders, Plurals, Generation 9/11, Homelanders, Pivotal, Post-Millennials or Centennials) ranges from grade schoolers to workers ready for their first promotion (Fromm, 2017; Fry & Parker, 2018; Knowles, 2020; Mender, 2018; Merriman, 2015; Williams et al., 2010). They are described as entrepreneurial, innovative, and passionate (Robert Half, 2015).

Generation Z is entering the workforce. Studies reveal that this new emerging workforce will represent the greatest generational shift the workplace has ever seen (J. Walter Thompson Intelligence, 2023; Tulgan & RainmakerThinking, 2013) and that they will soon account for over a third of the global population (Gomez et al., 2019) or in a few years they will make up a quarter of the global workforce (Mann & Forbes Coaches Council, 2023; Merriman, 2020). This means that it is now time for the organizations to be prepared for their arrival and for the researchers to focus on leadership studies about Generation Z. Regarding the profound challenges that they will present to leaders (Tulgan & RainmakerThinking, 2013), it is recommended that leaders be ready to lead this new generation (Mann & Forbes Coaches Council, 2023).

While some researchers warn that generalizing about people based on their age can foster inaccurate beliefs and lead to stereotyping (Paggi & Cloves, 2021), others propose that generations represent distinct and separate groups of people with a common set of beliefs, experiences, and values about the way the world works (Koulopoulos & Keldsen, 2014; Roberts et al., 2010). Each day,

new research emerges, shedding light on this upcoming generation (The Center for Generational Kinetics & WP Engine, 2020). Studies indicate that the value perception and approach towards work and success for Generation Z differ significantly from earlier age groups (Fodor & Jaeckel, 2018), and their workplace expectations are driven by values and aligned with their personal morals. They exhibit characteristics such as independence, diversity, engagement, pragmatism, collaboration (Stahl, 2021; Witt & Baird, 2018: 19-20), high self-confidence, an optimistic outlook on their future professional lives, and a propensity for entrepreneurial initiatives. They take growth opportunities precedence over job stability, fulfilling work, a friendly work environment, flexible hours, and a high salary (Adecco, 2021) and they have a genuine desire to make a positive impact and contribute to changing the world (Fromm & Read, 2018).

Sparking Leadership

Leadership embodies the essence of ignition. Minds ablaze with innovative ideas have the power to kindle the potential of others on a grander scale (Brown, 2002). Yet, like a fire that needs a spark, leadership requires intentional effort. Much like arranging logs before expecting a flame, a leader must actively ignite the enthusiasm and capabilities of every individual within their organization (Doyle, 2016). It becomes the leader's responsibility to set alight the collective passions, enabling each person to highlight their unique abilities. The focus should be on sparking internal motivations within employees, whether it is enthusiasm, latent potential, determination, raw talent, or a burgeoning interest (Calvert, 2013). Leaders must recognize that these initial sparks serve as catalysts for personal and organizational transformation (Morgan et al., 2017: 1).

When employees lack enthusiasm, leaders should aim to reignite the spark within them. These sparks, once ignited, function as catalysts for both personal and organizational change. They foster the resilience and mindset needed to guide oneself and others toward desired outcomes (Morgan et al., 2017: 1). Effective leaders harness their passion to fuel the passions of those around them, avoiding actions that may dampen spirits (Lucas, 1999: 66). In today's organizational landscape, leaders play a crucial role in ensuring that these sparks lead to meaningful impact (Morgan et al., 2017: 3).

Termed as "fire starters" or "sparking leaders," these exceptional leaders inspire those around them to exceed their current capabilities. They serve as the catalysts, providing the spark that propels employees to create their fires (Chester, 2015; Davis et al., 2018: 13). These small sparks, igniting inspiration, have the potential to drive changes, open new directions, and spur fresh initiatives. The nurturing of employees to their fullest potential becomes paramount through the engine of inspired action. Sparking leaders motivate employees to achieve new milestones, aligning with Bennis's (2007: 5) assertion that exemplary leaders create a sense of mission, motivate others, establish adaptive social architectures, build trust, develop other leaders, and yield results.

A leader's magical ability to motivate and inspire others is the key to connecting with them (Hoque, 2015; Leibowitz, 2018). While behavioral approaches to leadership categorize several styles derived from social psychology, this study focuses on sparking leaders who ignite the internal sparks within employees and use their passion to inflame the passions of others (Calvert, 2013; Lucas, 1999: 66).

Self-Efficacy

Self-efficacy is defined as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses. (Bandura, 1986: 391). Both theory and research have solidified the significance of self-efficacy beliefs as crucial components in comprehending human actions (Flammer, 2001: 13814). Self-efficacy has the potential to influence key elements of achieving business success such as, selection of activities, exertion of effort, perseverance, job performance, job satisfaction and overall employee well-being (Schunk, 2001; Wegner, 2023). A robust sense of self-efficacy emerges as a powerful predictor of

success, providing individuals with the motivation, persistence, and problem-solving skills required to overcome obstacles and achieve desired outcomes (Chellappa & Forbes Human Resources Council, 2023).

Self-efficacy can evolve, and leaders can actively shape this progression (Chellappa & Forbes Human Resources Council, 2023; Kim & Beehr, 2017; Rehman & Zeb, 2023). Leaders aiming to empower their employees for success are recommended to focus on self-efficacy (Wegner, 2023). Sparking leaders, through their inspirational and motivational approaches, have the potential to significantly impact on the self-efficacy of employees. By fostering an environment of encouragement and support, these leaders ignite a sense of confidence, competence, and belief in the capabilities of their team members. The sparking leader's ability to articulate a compelling vision, provide constructive feedback, and acknowledge individual contributions can contribute to a positive feedback loop, reinforcing employees' belief in their capacity to tackle challenges and achieve goals. As employees experience recognition and empowerment under the guidance of a sparking leader, their self-efficacy is likely to be enhanced, leading to increased motivation and a willingness to take on innovative initiatives with confidence. Past studies indicate that sparking leaders positively influence subordinates' work passion, consequently contributing to higher job satisfaction (Bilginoğlu & Yozgat, 2021). Moreover, employees' evaluation of sparking leadership predicts increased work engagement, reduced burnout, and a lower intention to leave the organization (Bilginoğlu & Yozgat, 2020b). Additionally, research highlights that sparking leadership is associated with employees' perceptions of enhanced business performance (Bebitoğlu, 2022).

Thus, the researchers propose the following hypothesis based on the above literature:

H1: Sparking leadership has a positive effect on Generation Z employees' self-efficacy.

Innovative Work Behavior

Numerous enterprises face challenges in today's turbulent global economy. Embracing a truly innovative approach to business can be beneficial in navigating this unpredictable economic terrain. This encourages creative thinking and inventive solutions to complex problems, providing businesses with a crucial capability necessary for success in these challenging times (Brown, 2010; Rubiera, 2016).

Innovative work behavior is variously defined as "the behavior of staff to introduce new and useful ideas in organizational activities and services" (Xu & Suntrayuth, 2022) or "intentional creation, introduction an application of new ideas within work role, group or organization, in order to benefit role performance, the group, or the organization" (Janssen, 2000: 288). The spectrum of innovations encompasses a broad range, extending from the conception and integration of novel ideas that significantly influence theories, practices, or products throughout the entire organization, to more localized initiatives aimed at enhancing daily work processes and designs (Janssen, 2003: 348.) Researchers suggest that innovative work behavior is a key factor in business performance (Jankelová et al., 2021) and crucial for business sustainability (Thurlings et al., 2015). Given this context, it becomes crucial to explore the factors influencing innovative work behavior among employees within organizations (Eid & Agag, 2020). Accordingly, numerous studies have explored the influence of leadership factors and consistently demonstrated their crucial role as antecedents to innovative work behavior (e.g., Afsar & Umrani, 2020; Hussain et al., 2023; Javed et al., 2019).

Individuals possessing high self-efficacy are inclined to participate in innovative behaviors, as they exhibit the confidence, knowledge, and skills required to generate ideas, apply them in their work, and demonstrate a greater willingness to confront and resolve uncertainties (Richter et al., 2012). Previous empirical studies have further supported self-efficacy as an antecedent influencing

innovative behavior (Christianto & Handoyo, 2020; Fiernaningsih et al., 2021; Gkontelos et al., 2023; Newman et al., 2018; Sarwoko, 2020).

Thus, the researchers propose the following hypothesis based on the above literature:

H2: Generation Z employees' self-efficacy has a positive effect on their innovative work behavior.

However, the relationship between sparking leadership and Generation Z employees' innovative work behavior is not uniform across all individuals. Generation Z employees' self-efficacy, or their belief in their own ability to perform tasks and overcome challenges, is poised to function as a mediating factor in this dynamic. When employees possess high self-efficacy, the impact of sparking leadership on fostering innovative work behavior is likely to be more pronounced. In contrast, employees with lower self-efficacy may experience a less considerable influence. Self-efficacy serves as a lens through which employees interpret and respond to the sparking leadership style, influencing the extent to which they engage in innovative work behaviors. This nuanced relationship underscores the importance of considering individual differences in self-efficacy when exploring the outcomes of sparking leadership on innovation in the workplace.

Thus, the researchers propose the following hypothesis based on the above literature:

H3: Generation Z employees' self-efficacy mediates the relationship between sparking leadership and Generation Z employees' innovative work behavior.

METHOD

Proposed Model

The conceptual model is demonstrated in Figure 1.

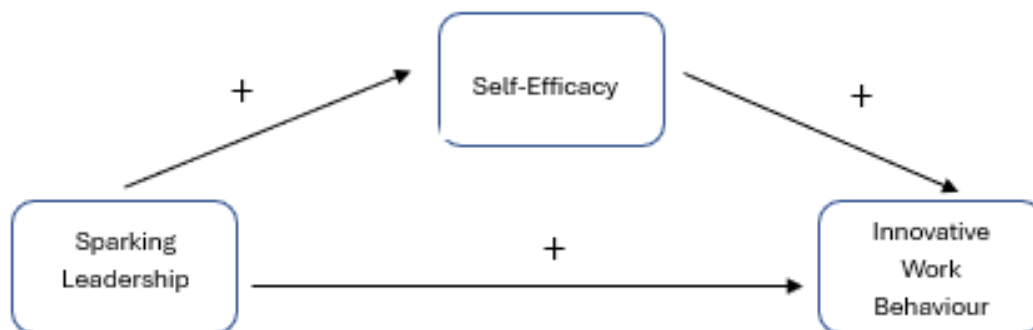


Figure 1. Research model

Participants and Procedure

A quantitative correlational research design was used to collect data using a web-based survey including sparking leadership (Bilginoğlu & Yozgat, 2020a), self-efficacy (Romppel et al., 2013) and employees' innovative work behavior (Janssen, 2000; 2001) measures. In addition, researchers also used demographic surveys to collect information about the Generation Z employees.

The participants for the study were Generation Z employees working at least one year in private or government companies in Marmara region, Türkiye. Researchers invited Generation Z employees to participate in the surveys via e-mail. After elimination of nineteen inconsistent responses. Final sample of interest included 387 employees.

Final data for this study was analyzed by using IBM-SPSS ver. 22. Descriptive statistics, including frequency distributions and measures of central tendency and dispersion were used to summarize the demographic characteristics.

Common method bias was evaluated using Harman's Single Factor Analysis.

Research model (Figure 1) was evaluated by A.F. Hayes' PROCESS macro (v. 3.5) Analyses were conducted within 95% confidence range. The existence of the mediation effect and the effect size of this mediation were determined according to the confidence intervals obtained as a result of the bootstrap technique. The bootstrap technique was performed by selecting five thousand resampling options.

In the research, managers' sparking leadership (SL) was used as the independent variable, Generation Z employees' innovative work behavior (IWB) was used as the dependent variable, and Generation Z employees' self-efficacy (SE) variables was used as the mediation variable.

Hypotheses

Based on a review of the literature, the following hypotheses are proposed:

H1: Sparking leadership has a positive effect on Generation Z employees' self-efficacy.

H2: Generation Z employees' self-efficacy has a positive effect on their innovative work behavior.

H3: Generation Z employees' self-efficacy mediates the relationship between sparking leadership and Generation Z employees' innovative work behavior.

Measures

Sparking leadership is measured by the 8-item scale developed by Bilginoğlu and Yozgat (2020a). One sample question is "My supervisor ignites the employees' passions and let them show what they are capable of."

Self-efficacy is measured by the 6-item form of the scale Schwarzer and Jerusalem (1995), adapted into Turkish by Aypay (2010) and shortened by Romppel et al. (2013). One sample item is "It is easy for me to stick to my aims and accomplish my goals."

Generation Z employees' innovative work behavior is measured using the 9-item scale developed by Janssen (2000, 2001) and adapted into Turkish by Önhon (2016). "I create new ideas for improvements." is one of the questions.

Results

Demographics

Age of Generation Z employees ranged from 19 to over 28 (mean=24.10, std.dev. =2.54), tenure 1 to over 10 (mean=4.10, std.dev. =2.17). Most of the respondents were male (n=278, 71.8%), not at managerial position (n=343, 88.6%) and working in private sector (n=344, 88.9%). Single respondents were more (n=277, 71.6%). Respondents were well educated [bachelor's degree (n=176, 45.5%); master's degree (n=31, 8.0%), and doctorate's degree (n=1, .3%)] (See Table 1).

Table 1. Frequency distributions: managers' demographics (N=387)

	n	%		n	%
Gender			Education		
Male	278	71.8	High school	113	29.2
Female	109	28.2	Vocational school	66	17.1
Marital status			Bachelor's degree	176	45.5
Single	277	71.6	Master's degree	31	8.0
Married	110	28.4	Doctorate's degree	1	.3
Managerial position			Sector		
Manager	44	11.4	Private	344	88.9
Not	343	88.6	Governmental	43	11.1

Hypotheses Testing

To determine the factor structure and the distribution of items by factors exploratory factor analysis (EFA) was used (Fabrigar et al., 1999). Before conducting the exploratory factor analysis, the Kaiser-Meyer-Olkin (KMO) coefficient was calculated for sample sufficiency, and the appropriateness of correlations between the items was examined by the Bartlett test. Our data set shows that Kaiser-Meyer-Olkin value .89 (> .60) is particularly good for performing EFA analysis and that the Bartlett test [$\chi^2 = 4,335.884$; $df = 253$; $p < .000$] shows that it is significant (Tabachnick & Fidell, 2012).

Harman's single factor analysis was used to assess the common method bias. Where the variance explained by one factor is 30.31 % less than 50 % there was no statistical evidence for common method bias (Harman, 1968). The comparison of model fit indexes of three and one factor models also showed no evidence for common method variance (Table 2).

Table 2. Model fit indexes

Model	χ^2/df	RMSEA	SRMR	IFI	CFI	GFI
One factor model	9.95	.20	.15	.48	.48	.54
Three factor model	2.83	.07	.05	.90	.90	.87

To determine the number of factors scree plot analysis was used, the item loads and the cross-loadings between the factors were used when deciding remaining items to stay in the analysis. In other words, while keeping the items in the analysis, it is paid attention that each item load is higher than .60 and if there are items loaded with more than one factor at the same time, the difference between factor loads is more than .30 (Worthington & Whittaker, 2006).

The results showed a three-factor structure, which explains 56.287% of the total variance. According to the EFA structure matrix, the first factor is Generation Z employees' innovative work behavior consisting of nine items, the second factor is sparking leadership consisting of eight items and the third factor is Generation Z employees' self-efficacy consisting of six items. It was determined that all three factors have acceptable internal consistency (Cronbach Alpha coefficients were .908 for Generation Z employees' innovative work behavior, .875 for sparking leadership and .841 for self-efficacy). All items remained.

Composite reliability (CR) and average variance extracted (AVE) values were also examined for reliability; all values were found to be above the recommended .50 and composite reliabilities above .70 (See Table 3).

Table 3. Item means values, standard deviations, factor loadings, eigenvalues, variance, and internal consistency values

Items	Factor 1	Factor 2	Factor 3	CR	AVE
IWB2	.780				
IWB8	.761				
IWB3	.752				
IWB5	.750				
IWB1	.748			.917	.622
IWB9	.734				
IWB7	.726				
IWB6	.724				
IWB1	.713				
SL7		.775			
SL3		.762			
SL4		.762			
SL8		.744			
SL2		.721		.893	.512
SL6		.681			
SL1		.637			
SL5		.626			
SE2			.819		
SE1			.813		
SE4			.739		
SE5			.734	.878	.548
SE3			.663		
SE6			.657		
Eigenvalue	5.203	4.325	3.417		
% of Variance	22.623	18.806	14.858		
Internal consistency	.908	.875	.841		

Factor 1: Generation Z employees' innovative work behavior (IWB); Factor 2: Sparking leadership (SL); Factor 3: Generation Z employees' self-efficacy (SE); (N = 387).

The mean scores for Generation Z employees' innovative work behavior were 3.57 (SD 1.10), with higher scores indicating more innovative work behavior. Sparking leadership had a mean score of 3.73 (SD 1.02), with higher scores indicating higher sparking perception. The mean number of items for self-efficacy was 3.06 (SD 0.99), with higher scores indicating higher self-efficacy (See Table 4).

Table 4. Baseline statistics for scaled variables

	Mean	SD	Skewness	Kurtosis
Independent variable				
Sparking leadership	3.73	1.02	.16	-.01
Dependent variable				
Innovative work behavior	3.57	1.10	.10	-.27
Mediating variable				
Self-efficacy	3.06	.99	.22	.10

Skewness and kurtosis values between -2 and 2 were considered acceptable to prove normal univariate distribution (George & Mallery, 2010; Hair et al. 2010; Bryne, 2010).

In Table 5 correlation analysis results are shown. Depending the correlation coefficients in table 5; statistically significant positive relationship between sparking leadership and self-efficacy (.209***), between sparking leadership and Generation Z employees' innovative work behavior (.378***), and finally, between self-efficacy and Generation Z employees' innovative work behavior (.195***) are found.

Table 5. Inter-correlation matrix—dependent and independent variables

	SL	SE	IWB
Sparking leadership (SL)	-		
Self-efficacy (SE)	.209***	-	
Innovation work behavior (IWB)	.378***	.195***	-

*p≤.05; **p≤.01; ***p≤.001

Table 6 shows the results of the regression analysis between the managers' sparking leadership (independent variable) and self-efficacy (the mediation variable). It is seen that managers' sparking leadership has a significant and positive effect on self-efficacy x ($\beta = .2010$, %95 CI [.1066; .2954], $t = 4.1852$, $p = .000$). In line with the findings, non-standardized beta value is statistically significant (Gürbüz, 2021). According to the results of the analysis, sparking leadership has a positive effect on Generation Z employees' self-efficacy (H1 accepted).

Table 6. The effect of sparking leadership on self-efficacy

Model Summary						
R	R-sq	MSE	F	df1	df2	P
.2086	.0435	.9341	17.5161	1.000	385.000	.0000
Model						
	coeff	se	t	p	LLCI	ULCI
Constant	2.3074	.1858	12.4206	.0000	1.9422	2.6727
Sparking Leadership	.2010	.0480	4.1852	.0000	.1066	.2954
Standardized coefficients						
	coeff					
Sparking leadership	.2086					

Table 7 shows the combined effects of the managers' sparking leadership (independent variable) and self-efficacy (the mediation variable) on the Generation Z employees' innovative work behavior (the dependent variable).

Table 7. The effects of sparking leadership and self-efficacy on Generation Z employees' innovative work behavior

Model Summary						
R	R-sq	MSE	F	df1	df2	P
.3958	.1566	1.0279	35.6602	2.000	384.000	.0000
Model						
	Coeff	se	t	p	LLCI	ULCI
Constant	1.7478	.2307	7.5777	.0000	1.2943	2.2013
Sparking Leadership	.3789	.0515	7.3549	.0000	.2776	.4802
Self-efficacy	.1350	.0535	2.5248	.0000	.0299	.2401
Standardized coefficients						
	Coeff					
Sparking leadership	.3524					
Self-efficacy	.1210					

Depending on the outputs of the analysis Generation Z employees' self-efficacy significantly and positively affects their innovative work behavior ($\beta = .1350$, 95% CI [.0299; .2401], $t = 2.5248$, $p = .000$). It has also emerged that the sparking leadership affects Generation Z employees' innovative work behavior significantly and positively ($\beta = .3789$, 95% CI [.2776; .4802], $t = 7.3569$, $p = .0000$).

In addition, the effect of the sparking leadership on Generation Z employees' innovative work behavior deteriorates as soon as the self-efficacy is included in the model (Table 6). When the sparking leadership and self-efficacy are included in the model together, it explains about 16% ($R^2 = .1566$) of the Generation Z employees' innovative work behavior. In the light of these findings, Generation Z employees' self-efficacy has a positive effect on their innovative work behavior (H_2 accepted).

The confidence ranges of the direct and indirect impact (effect) values of the sparking leadership on the Generation Z employees' innovative work behavior calculated using the bootstrap technique were shown in Table 8.

Table 8. Direct / indirect effects of sparking leadership on Generation Z employees' innovative work behavior

Direct effect						
	Effect	Se	T	p	LLCI	ULCI
Sparking Leadership	.3789	.0515	7.3549	.0000	.2776	.4802
Indirect effect(s)						
	Effect	BootSE	BootLLCI	BootULCI		
Self-efficacy	.0271	.0150	.0036	.0615		
Partially standardized indirect effect(s)						
	Effect	BootSE	BootLLCI	BootULCI		
Self-efficacy	.0246	.0137	.0033	.0562		
Completely standardized indirect effect(s)						
	Effect	BootSE	BootLLCI	BootULCI		
Self-efficacy	.0252	.0140	.0034	.0574		

The findings evidence the indirect effect of the sparking leadership on Generation Z employees' innovative work behavior is significant and the confidence interval values (BLLCI, BULCI) do not include zero. As a result, the self-efficacy mediates the relationship between the sparking leadership and Generation Z employees' innovative work behavior ($\beta = .0271$, 95% BCA CI [.0036; .0615]). Accordingly, that finding, Generation Z employees' self-efficacy mediates the relationship between sparking leadership and Generation Z employees' innovative work behavior (H_3 was accepted). As seen the indirect effect value is .0271 (innovative work behavior of the employees, whose self-efficacy is one unit higher than others is .0271 units higher). According to the findings, the completely and partially standardized impact sizes on the Generation Z employees' innovative work behavior of their self-efficacy's confidence ranges do not cover 0 (zero) and the effect is significant (Table 8).

CONCLUSION

In the face of increasingly complex and dynamic environments, organizations are compelled to enhance their innovative capabilities to identify opportunities for sustained superior performance (Alfy & Naithani, 2021; Shalley et al., 2004). The success of innovation initiatives is intricately tied to the human capital and work behavior of employees, serving as crucial inputs in the process of value creation (Chen & Huang, 2009). Reflecting this, management scholars have shown a growing interest in exploring the factors that influence individuals' innovative behavior in the workplace (Farrukh et

al., 2023; Shah et al., 2022). Innovative work behavior research has extensively explored numerous factors that serve as antecedents to an individual's innovative behavior, with a predominant focus on personal and contextual characteristics (Ma Prieto & Pilar Pérez-Santana, 2014: 184).

In the contemporary workplace, there exists a fascinating amalgamation of multigenerational values, diverse attitudes towards distinct leadership styles, and varied workplace preferences (Burke, 2015; Lewis & Wescott, 2017). Through this study spanning Generation Z and how the sparking leaders spark their self-efficacy as well as their innovative work behavior, the researchers seek to understand how Generation Z can best be motivated, managed, and led for optimal results. The present study suggests that sparking leadership is a leadership style that resonates very well with Generation Z. Accordingly, it is advised that the sparking leaders embrace Generation Z and take advantage of what they have to offer.

The findings of this study offer several meaningful implications for organizational leaders, particularly those managing Generation Z employees. First, the evidence that sparking leadership enhances both self-efficacy and innovative work behavior indicates that organizations should prioritize leadership development initiatives that cultivate leaders capable of igniting passion, confidence, and creativity in younger employees. Leadership training programs can incorporate modules focused on emotional intelligence, motivational communication, and coaching-based leadership approaches to help leaders connect more effectively with Gen Z.

Second, the small but significant mediating role of self-efficacy suggests that simply exhibiting sparking leadership behaviors is not sufficient. Managers must also actively support the development of employees' self-belief by setting attainable goals, recognizing individual contributions, and fostering a psychologically safe environment where risk-taking and innovation are encouraged. Organizations can implement mentorship programs or peer coaching to further reinforce self-efficacy among employees.

Lastly, to translate these insights into practice, Human Resources professionals and organizational decision-makers should consider integrating sparking leadership principles into recruitment, onboarding, and talent development strategies. By aligning leadership styles with the intrinsic values and motivational drivers of Generation Z—such as authenticity, purpose, and empowerment—organizations can better retain talent, reduce disengagement, and promote a culture of continuous innovation.

Despite its contributions, this study has several limitations that should be acknowledged. First, the methodological approach raises concerns regarding generalizability. The cross-sectional design, combined with convenience sampling limited to the Marmara region, restricts the extent to which findings can be applied to broader populations. Future research could replicate the study in different geographical areas or with more diverse samples to enhance external validity. Second, the study relied on self-reported measures, which may be subject to social desirability bias and common method variance, even though statistical tests indicated no severe bias. Using multi-source data or longitudinal designs could strengthen causal inferences. Third, the cross-sectional design of the study prevents establishing definitive cause-effect relationships among sparking leadership, self-efficacy, and innovative work behavior. Longitudinal or experimental studies would allow a more robust assessment of these relationships over time. Finally, the focus on a specific generational cohort, while providing valuable insights, means that the findings may not apply to other generations in the workforce. Comparative studies, including multiple generations could further clarify the unique effects of sparking leadership across age groups.

As leaders seek to evaluate the best practices for leading, they should evaluate the things that are most valued by Generation Z employees and what they expect from work. Beyond the propositions offered above, this research encourages the leaders to review the literature focused on Generation Z, their expectations from a work environment, leadership, and especially sparking leadership to help further light the spark inside the Generation Z employees.

Generation Z is on the verge of surpassing Millennials as the most populous generation globally, with over one-third of the world's population identifying themselves as members of Generation Z (Deloitte, 2023). In 2018, Türkiye had over thirty-two million individuals under the age of twenty-five, with a specific focus on the cohort aged 10 to 24, constituting more than nineteen million people. The youth demographic in Türkiye, particularly those born after 1995, commonly known as Generation Z, exhibits distinct attitudes and behaviors, setting them apart from other generations (Tarı-Kasnakoğlu et al., 2020). Previous research reveals that older leaders cannot get a solid understanding of what younger employees really want. A large body of literature has sought to examine the gaps that exist among the current generations (Freeman & Freeman, 2020) which is defined as *"a difference in values and attitudes between one generation and another"* (Mendez, 2008). Bridging the generation gap requires leaders to realize that what works for their generation is not the same as what works for all generations. Sparking leaders will not define community by their age and widen the generation gap. Instead, they will define it through a deep understanding of Generation Z employees' interests and behaviors and will narrow it.

The real key to building a better organizational environment is to realize that business is fundamentally a human enterprise. Sparking leaders see their employees as their full humanity, not just as economic agents seeking to maximize their self-interests. Seeing business as fully human, they motivate and inspire the employees by lighting their fire and igniting their passions to let them show of what they are capable. The present research reviews relevant literature relating to the characteristics of Generation Z and their expectations of work life and potential leaders. The researchers found that sparking leadership has an impact on self-efficacy and innovative employee behavior in Generation Z employees. In this way, it is suggested that sparking leadership is a good match for them.

Funding Information

This research did not receive any specific grant from funding agencies in the public, commercial, or non-profit sectors.

Declaration of Conflict

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

- Adecco (2021). Yes, It Matters: What Millennials and Gen Z Really Think About Work. Retrieved at <https://www.adeccousa.com/employers/resources/generation-z-vs-millennials-ebook/> [Accessed on October 27, 2023]
- Afsar, B., Umrani, W.A. (2020). Transformational Leadership and Innovative Work Behavior: The role of Motivation to Learn, Task Complexity and Innovation Climate, *European Journal of Innovation Management*, 23(3), 402-428. <https://doi.org/10.1108/EJIM-12-2018-0257>
- Alfy, S.E., Naithani, P. (2021). Antecedents of Innovative Work Behaviour: A Systematic Review of the Literature and Future Research Agenda, *World Review of Entrepreneurship, Management and Sustainable Development*, 17(1), 1–19.
- Aypay, A. (2010). The Adaptation Study of General Self-Efficacy (GSE) Scale to Turkish, *İnönü University Journal of the Faculty of Education*, 11(2), 113-131.
- Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewoods Cliffs, NJ: Prentice Hall.
- Bebitoğlu, M. E. (2022). The Impact of Sparking Leadership on Business Performance Perceived by the Employees with Gender and Seniority Interaction, *Uluslararası Yönetim İktisat ve İşletme Dergisi*, 18(2), 507-524. <https://doi.org/10.17130/ijmeb.964584>

- Bennis, W. (2007). The Challenges of Leadership in the Modern World: Introduction to the Special Issue, *American Psychologist*, 62(1), 2–5.
- Bilginoğlu, E., Yozgat, U. (2020a). Ateşleyici Liderlik Ölçeği (ALÖ) Geliştirme Çalışması, *Akdeniz İİBF Dergisi*, 20(1) 18-34. <https://doi.org/10.25294/auibfd.734195>
- Bilginoğlu, E., Yozgat, U. (2020b). Keeping the Spark Alive: Preventing Burnout at Work While Increasing Work Engagement, *International Journal of Management Practice*, 13(6), 698-712.
- Bilginoğlu, E., Yozgat, U. (2021). The Impact of Sparking Leadership on Creating Work Passion and Job Satisfaction in Organizations – An Empirical Study, *Anadolu Üniversitesi Sosyal Bilimler Dergisi*, 21(1), 43-58. <https://doi.org/10.18037/ausbd.902549>
- Bresman, H., Rao, V.D. (2017, April 04). 35 Percent of Gen Z Expect “Motivating Behaviour” from Their Leaders. Retrieved at <https://knowledge.insead.edu/leadership-organisations/what-generations-x-y-and-z-want-from-leadership-5716> [Accessed on October 27, 2023]
- Brown, B. (2010). Why Innovation Matters, *Research-Technology Management*, 53(6),18-23. <https://doi.org/10.1080/08956308.2010.11657658>
- Brown, T. (2002). *The Anatomy of Fire. Sparking a New Spirit of Enterprise*. USA: Management General.
- Byrne, B. M. (2010). *Structural Equation Modeling with Amos: Basic Concepts, Applications, and Programming* (2nd ed.). New York: Taylor and Francis Group.
- Burke, R.J. (2015). Managing an Aging and Multi-generational Workforce: Challenges and Opportunities. In R.J. Burke, C.L. Cooper & A.G. Antoniou (Eds.) *The Multi-generational and Aging Workforce: Challenges and Opportunities* (3-36). Cheltenham, UK: Edward Elgar Publishing.
- Calvert, D. (2013). There Are Two Ways to Light a Fire. Retrieved at <https://blog.peoplefirstps.com/connect2lead/ways-light-a-fire-2> [Accessed on October 27, 2023]
- Chellappa, S., Forbes Human Resources Council (2023, June 02). Level Up Teams’ Performance with Self-Efficacy. Retrieved at <https://www.forbes.com/sites/forbeshumanresourcescouncil/2023/06/02/level-up-teams-performance-with-self-efficacy/?sh=937971a76869> [Accessed on October 29, 2023]
- Chen, C., Huang, J. (2009). Strategic Human Resource Practices and Innovative Performance: The Mediating Role of Knowledge Management Capacity, *Journal of Business Research*, 62(1), 104-114.
- Chester, E. (2015). *On Fire at Work: How Great Companies Ignite Passion in Their People Without Burning Them Out!* Shippensburg, PA: Sound Wisdom.
- Christianto, Y.P., Handoyo, S. (2020). The Correlation Between Self-Efficacy and Innovative Work Behaviour in The Employees of Tourism Industry in a Tourism City, *Palarch’s Journal of Archaeology of Egypt/Egyptology*, 17(3), 1794-1800.
- Davis, R., Palokoff, K., Eder, P. (2018). *Firestarters: How Innovators, Instigators, and Initiators Can Inspire You to Ignite Your Own Life*. New York: Prometheus Books.
- Deloitte (2023). Welcome to Generation Z. Retrieved at <https://www2.deloitte.com/us/en/pages/consumer-business/articles/understanding-generation-z-in-the-workplace.html> [Accessed on October 19, 2023]
- Dorsey, J.R., Villa, D. (2020). *Zconomy: How Gen Z Will Change the Future of Business - and What to Do About It*. USA: Harper Business.
- Doyle, S. (2016). How To Be a Firestarter – 5 Ways to Motivate Your Employees. Retrieved at <https://goodmenproject.com/featured-content/firestarter-5-ways-motivate-employees-dg/> [Accessed on October 27, 2023]
- Eid, R., Agag, G. (2020). Determinants of Innovative Behaviour in the Hotel Industry: A Cross-Cultural Study, *International Journal of Hospitality Management*, 91, 102642. <https://doi.org/10.1016/j.ijhm.2020.102642>
- Fabrigar, L.R., Wegener, D.T., MacCallum, R.C., Strahan, E.J. (1999). Evaluating the Use of Exploratory Factor Analysis in Psychological Research, *Psychological Methods*, 4(3), 272–299.
- Farrukh, M., Meng, F., Raza, A., Wu, Y. (2023). Innovative Work Behaviour: The What, Where, Who, How and

- When, *Personnel Review*, 52(1), 74-98. <https://doi.org/10.1108/PR-11-2020-0854>
- Fiernaningsih., N., Herijanto, P., Maskur (2021). Antecedents Of Variables that Affect Innovative Behavior in the Era of the Covid-19 Pandemic, *PalArch's Journal of Archaeology of Egypt/Egyptology*, 18, 1492-1498.
- Flammer, A. (2001). Self-efficacy. In N. J. Smelser & P. B. Baltes. (Eds.) *International Encyclopedia of the Social & Behavioral Sciences* (13812-13815). Amsterdam; NewYork: Elsevier.
- Fodor, M., Jaeckel, K. (2018). What does It Take to Have a Successful Career Through the Eyes of Generation Z - Based on the Results of a Primary Qualitative Research, *International Journal on Lifelong Education and Leadership*, 4(1), 1-7.
- Freeman, R.E., Freeman, B. (2020, March 26). Is There a Generation Gap in Business? Retrieved at https://sloanreview.mit.edu/article/is-there-a-generation-gap-in-business/?gclid=Cj0KCQjwnueFBhChARIsAPu3YkQtRhaSF7MsbJPdwnob_fsQFlaT1_37QjYohy-MwnZ0ggEW0NH13r4aArYcEALw_wcB [Accessed on October 27, 2023]
- Fromm, J. (2017, January 04). Gen Z Is on the Rise, Here Is What You Need to Know. Retrieved at <https://www.forbes.com/sites/jefffromm/2017/01/04/gen-z-is-on-the-rise-here-is-what-you-need-to-know/?sh=4291b38f7c39> [Accessed on October 29, 2023]
- Fromm, J., Read, A. (2018). *Marketing to Gen Z: The Rules for Reaching This Vast—and Very Different—Generation of Influencers*. New York: Amacom.
- Fry, R., Parker, K. (2018, November 15). Early Benchmarks Show 'Post-Millennials' on Track to Be Most Diverse, Best-Educated Generation Yet. Retrieved at <https://www.pewresearch.org/social-trends/2018/11/15/early-benchmarks-show-post-millennials-on-track-to-be-most-diverse-best-educated-generation-yet/> [Accessed on November 10, 2023]
- General Assembly (2021). *Technology & the Future of Work: Next-Gen Perspectives*. Retrieved at <https://www.adecogroup.com/-amz930-com.azureedge.net/-/media/project/adecogroup/pdf-files/new-survey-how-to-align-businesses-needs-with-gen-z-and-millennials-career-expectations/talentpathingwhitepaper32221.pdf/?modified=2021040610155> [Accessed on November 07, 2023]
- George, D. and Mallery, P. (2010) *SPSS for Windows Step by Step: A Simple Guide and Reference 17.0 Update*. 10th Edition, Pearson, Boston.
- Gkontelos, A., Vaiopoulou, J., Stamovlasis, D. (2023). Teachers' Innovative Work Behavior as a Function of Self-Efficacy, Burnout, and Irrational Beliefs: A Structural Equation Model, *European Journal of Investigation in Health, Psychology and Education*, 13(2), 403-418. <https://doi.org/10.3390/ejihpe13020030>
- Gomez, K., Mawhinney, T., Betts, K., Sapp, K., Brown, A., Kara Santner, K. (2019). *Welcome To Generation Z*. Retrieved at <https://www2.deloitte.com/us/en/pages/consumer-business/articles/understanding-generation-z-in-the-workplace.html> [Accessed on October 27, 2023]
- Gürbüz, S. (2021). *Sosyal Bilimlerde Aracı ve Düzenleyici Etki Analizleri IBM SPSS Process Makro Uygulamalı, Örnek Veri Setleri*, 2. Baskı, Seçkin Yayıncılık.
- Hair, J.F., Black, W.C., Babin, B.J. and Anderson, R.E. (2010) *Multivariate Data Analysis*. 7th Edition, Pearson, New York.
- Harman, H. H. (1968) *Modern Factor Analysis*. Second Edition, Revised, The University of Chicago Press, Chicago.
- Hoque, F. (2015). Three Habits of Motivational Leaders. Retrieved at <https://www.fastcompany.com/3052188/three-habits-of-motivational-leaders> [Accessed on October 29, 2023]
- Hunt, T., Fedynich, L. (2019). Leadership: Past, Present, and Future: An Evolution of an Idea, *Journal of Arts & Humanities*, 8(2), 20-26.
- Hussain, R., Gohar, M., Iqbal, Y. M. J., Khan, H. A. (2023). Entrepreneurial Leadership and Innovative Work Behaviour: Moderating Role of Islamic Work Ethics, *Journal of Entrepreneurship, and Innovation in Emerging Economies*, 9(2), 181-197. <https://doi.org/10.1177/23939575231186944>

- Jankelová, N., Joniaková, Z., Mišún, J. (2021). Innovative Work Behavior—A Key Factor in Business Performance? The Role of Team Cognitive Diversity and Teamwork Climate in This Relationship, *Journal of Risk and Financial Management*, 14(4), 185. <http://dx.doi.org/10.3390/jrfm14040185>
- Janssen, O. (2000). Job Demands, Perceptions of Effort-Reward Fairness and Innovative Work Behaviour, *Journal of Occupational and Organizational Psychology*, 73(3), 287–302. <https://doi.org/10.1348/096317900167038>
- Janssen, O. (2001). Fairness Perceptions as a Moderator in the Curvilinear Relationships between Job Demands, and Job Performance and Job Satisfaction, *Academy of Management Journal*, 44(5), 1039-1050.
- Janssen, O. (2003). Innovative Behaviour and Job Involvement at the Price of Conflict and Less Satisfactory Relations with Co-workers, *Journal of Occupational and Organizational Psychology*, 76(3), 347-364. <https://doi.org/10.1348/096317903769647210>
- Javed, B., Naqvi, S., Khan, A., Arjoon, S., Tayyeb, H. (2019). Impact of Inclusive Leadership on Innovative Work Behavior: The Role of Psychological Safety, *Journal of Management & Organization*, 25(1), 117-136. <https://doi.org/10.1017/jmo.2017.3>
- Jenkins, (2017, September 26). The Most Effective Way to Lead Generation Z. Retrieved at <https://www.inc.com/ryan-jenkins/most-effective-way-to-lead-generation-z.html> [Accessed on November 07, 2023]
- Jenkins, R. (2022, August 16). This Is What Generation Z Wants Most from Managers. Retrieved at <https://www.inc.com/ryan-jenkins/this-is-what-generation-z-wants-most-from-managers.html> [Accessed on November 10, 2023]
- J. Walter Thompson Intelligence (2023). Into Z Future Understanding Generation Z, the Next Generation of Super Creatives. Retrieved at https://assets.ctfassets.net/inb32lme5009/5DFlqKVGIldmAu7X6btfGQt/44fdca09d7b630ee28f5951d54fed71/Into_Z_Future_Understanding_Gen_Z_The_Next_Generation_of_Super_Creatives_.pdf [Accessed on December 07, 2023]
- Kim, M., Beehr, T.A. (2017). Self-Efficacy and Psychological Ownership Mediate the Effects of Empowering Leadership on Both Good and Bad Employee Behaviors, *Journal of Leadership & Organizational Studies*, 24(4), 466-478. <https://doi.org/10.1177/1548051817702078>
- Kingl, A. (2020). *Next Generation Leadership*. USA: Harper Collins.
- Knowles, S. (2020). *How To Be Insightful: Unlocking the Superpower that Drives Innovation*. USA: Routledge.
- Koulopoulos, T.M., Keldsen, D. (2014). *The Gen Z Effect: The 6 Forces Shaping the Future of Business*. Brookline, MA: Bibliomotion, Inc.
- Leibowitz, G. (2018). 13 Inspiring Traits of Exceptional Leaders. Retrieved at <https://www.inc.com/glenn-leibowitz/this-is-how-exceptional-leaders-inspire-motivate-their-people.html> [Accessed on November 07, 2023]
- Lewis, L., Wescott, H. (2017). Multi-Generational Workforce: Four Generations United in Lean, *Journal of Business Studies Quarterly*, 8(3).
- Lucas, J.R. (1999). *The Passionate Organization: Igniting the Fire of Employee Commitment*. Amacom Books, USA.
- Madden, C. (2019). *Hello Gen Z: Engaging the Generation of Post-Millennials (Revised Edition)*. Sydney Australia: Hello Clarity.
- Mann, K., Forbes Coaches Council (2023, June 05). Guiding The Next Generation: Understanding and Leading Gen-Z. Retrieved at <https://www.forbes.com/sites/forbescoachescouncil/2023/06/05/guiding-the-next-generation-understanding-and-leading-gen-z/?sh=10c75374cd49> [Accessed on December 07, 2023]
- Ma Prieto, I., Pilar Pérez-Santana, M. (2014). Managing Innovative Work Behavior: The Role of Human Resource Practices, *Personnel Review*, 43(2), 184-208. <https://doi.org/10.1108/PR-11-2012-0199>
- Mendez, N. (2008). Generation Gap. In S.J. Loue., M. Sajatovic (Eds.) *Encyclopedia of Aging and Public Health*. Boston: MA: Springer.

- Mendler, A. (2018, October 31). What Business Leaders Should Know About Generation Z. Retrieved at <https://www.forbes.com/sites/theyec/2018/10/31/what-business-leaders-should-know-about-generation-z/?sh=70911d763cc8> [Accessed on November 07, 2023]
- Merriman, M. (2015). What if the Next Big Disruptor Isn't a What but a Who? Ernst & Young. Retrieved at [http://www.ey.com/Publication/vwLUAssets/EY-rise-of-gen-znew-challenge-forretailers/\\$FILE/EY-rise-of-gen-znewchallenge-for-retailers.pdf](http://www.ey.com/Publication/vwLUAssets/EY-rise-of-gen-znew-challenge-forretailers/$FILE/EY-rise-of-gen-znewchallenge-for-retailers.pdf) [Accessed on November 07, 2023]
- Merriman, M. (2020, January 02). Is Your Business Ready for Gen Z? Retrieved at https://www.ey.com/en_gl/digital/generation-z-millennial [Accessed on December 01, 2023]
- Monster (2016). Monster Multi-generational Survey: From Nylons and Neckties, to Nose Rings and Norm Care: Today's Talent Spans Four Generations. Retrieved at https://media.newjobs.com/cms/static-content/info/PRODUCTS/monster_genz_report.pdf [Accessed on December 01, 2023]
- Morgan, A., Lynch, C., Lynch, S. (2017). *Spark: How to Lead Yourself and Others to Greater Success*. Boston: Houghton Mifflin Harcourt.
- Newman, A., Tse, H.H.M., Schwarz, G., Nielsen, I. (2018). The Effects of Employees' Creative Self-Efficacy on Innovative Behavior: The Role of Entrepreneurial Leadership, *Journal of Business Research*, 89, 1–9. <https://doi.org/10.1016/j.jbusres.2018.04.001>.
- Önhon, Ö. (2016). *The Relationship Between Organizational Climate for Innovation and Employees' Innovative Work Behavior; The Moderating Effects of Leadership Behavior; ICT Sector in Turkey*. T.C. Marmara Üniversitesi, Unpublished Doctoral Dissertation.
- Paggi, R., Cloves, (2021). *Managing Generation Z: How to Recruit, Onboard, Develop, and Retain the Newest Generation in the Workplace*. Fresno, California: Quill Driver Books.
- Rehman, F.U., Zeb, A. (2023). Investigating the Nexus Between Authentic Leadership, Employees' Green Creativity, and Psychological Environment: Evidence from Emerging Economy, *Environmental Science and Pollution Research*, 30, 107746–107758. <https://doi.org/10.1007/s11356-023-29928-1>
- Richter, A. W., Hirst, G., van Knippenberg, D., Baer, M. (2012). Creative Self-efficacy and Individual Creativity in Team Contexts: Cross-level Interactions with Team Informational Resources, *Journal of Applied Psychology*, 97(6), 1282–1290. <https://doi.org/10.1037/a0029359>
- Roberts, B.W., Edmonds, G., Grijalva, E. (2010). It Is Developmental Me, not Generation Me: Developmental Changes Are More Important than Generational Changes in Narcissism— Commentary on Trzesniewski & Donnellan, *Perspectives on Psychological Science*, 5(1), 97-102.
- Robert Half (2015). *Get Ready for Generation Z*. Retrieved at https://www.roberthalf.ca/sites/default/files/Media_Root/images/rh-pdfs/rh_0715_wp_genz_nam_eng_sec.pdf [Accessed on December 01, 2023]
- Romppel, M., Herrmann-Lingen, C., Wachter, R., Edelmann, F., Düngen, H.D., Pieske, B., Grande, G. (2013). A Short Form of the General Self-Efficacy Scale (GSE-6): Development, Psychometric Properties and Validity in an Intercultural Non-clinical Sample and a Sample of Patients at Risk for Heart Failure, *GMS Psycho-Social-Medicine*, 10, Doc 01. <https://doi.org/10.3205/psm000091>
- Rubiera, C.L. (2016, March 01). How Innovation Can Help Companies in a Turbulent Global Economy. Retrieved at <https://theconversation.com/how-innovation-can-help-companies-in-a-turbulent-global-economy-54965> [Accessed on December 07, 2023]
- Sarwoko, E. (2020). Entrepreneurial Leadership and Innovative Work Behavior: The Role of Creative Self-efficacy, *Journal of Economics, Business, and Accountancy Ventura*, 23(2), 183-193.
- Schlotter, L., Hubert, P. (2020). *Generation Z – Personalmanagement und Führung: 21 Tools für Entscheider*. Wiesbaden: Springer Gabler.
- Schroth, H. (2019). Are You Ready for Gen Z in the Workplace? *California Management Review*, 61(3) 5–18.
- Schunk, D.H. (2001). Self-efficacy: Educational Aspects. In N.J. Smelser & P.B. Baltes (Eds.), *International Encyclopedia of the Social & Behavioral Sciences*, (13820-13822). <https://doi.org/10.1016/B0-08-043076-7/02402-5>

- Schwarzer, R., Jerusalem, M. (1995). Generalized Self-Efficacy Scale. In J. Weinman, S. Wright & M. Johnston (Eds.) *Measures in Health Psychology: A User's Portfolio. Causal and Control Beliefs* (35-37). Windsor, UK: Nfer-Nelson.
- Seemiller, C., Grace, M. (2019). *Generation Z: A Century in the Making*. New York, NY: Routledge.
- Shah, S.T.H., Shah, S.M.A., El-Gohary, H. (2022). Nurturing Innovative Work Behaviour through Workplace Learning among Knowledge Workers of Small and Medium Businesses, *Journal of the Knowledge Economy*, <https://doi.org/10.1007/s13132-022-01019-5>
- Shalley, C.E., Zhou, J., Oldham, G.R. (2004). The Effects of Personal and Contextual Characteristics on Creativity: Where Should We Go from Here?, *Journal of Management*, 30(6), 933-958.
- Stahl, A. (2019, September 10). How Generation-Z Will Revolutionize the Workplace. Retrieved at <https://www.forbes.com/sites/ashleystahl/2019/09/10/how-generation-z-will-revolutionize-the-workplace/?sh=7e8e2fba4f53> [Accessed on December 01, 2023]
- Stahl, A. (2021, May 04). How Gen-Z Is Bringing a Fresh Perspective to The World of Work. Retrieved at <https://www.forbes.com/sites/ashleystahl/2021/05/04/how-gen-z-is-bringing-a-fresh-perspective-to-the-world-of-work/?sh=123d171610c2> [Accessed December 01, 2023]
- Tarı-Kasnakoğlu, B., Türe, M., Kalender, Y. (2020). Generation Z in Turkey: A Generation with High Hopes and Big Fears. In E. Gentina & E. Parry (Eds.) *The New Generation Z in Asia*. UK: Emerald Publishing.
- The Center for Generational Kinetics, WP Engine (2020). *Generation Influence: Reaching Gen Z in the New Digital Paradigm*. Retrieved at <https://wpengine.com/wp-content/uploads/2020/08/Generation-Influence-U.S.-Report.pdf> [Accessed on December 07, 2023]
- Tabachnick, B., Fidell, L. (2012). *Using Multivariate Statistics*. London: Pearson.
- Thurlings, M., Evers, A. T., Vermeulen, M. (2015). Toward a Model of Explaining Teachers' Innovative Behavior: A Literature Review, *Review of Educational Research*, 85(3), 430-471. <https://doi.org/10.3102/0034654314557949>
- Tulgan, B., RainmakerThinking (2013). Meet Generation Z: The Second Generation Within the Giant "Millennial" Cohort. Retrieved at <https://grupespsichoterapija.it/wp-content/uploads/2017/09/Gen-Z-Whitepaper.pdf> [Accessed on October 18, 2023]
- Wegner, A. (2023). How to Boost Your Employees' Self-Efficacy (and Why It Matters). Retrieved at <https://www.babbelforbusiness.com/us/blog/self-efficacy/#the-importance-and-value-of-selfefficacy-in-the-workplace> [Accessed on December 08, 2023]
- Williams, K. C., Page, R. A., Petrosky, A. R., Hernandez, E. H. (2010). Multi-generational Marketing: Descriptions, Characteristics, Lifestyles, and Attitudes, *The Journal of Applied Business and Economics*, 11(2), 21- 36.
- Witt, G.L., Baird, D.E. (2018). *The Gen Z Frequency: How Brands Tune in and Build Credibility*. London: Kogan Page Limited.
- Workforce Institute, Kronos (2019). How to Be an Employer of Choice for Gen Z: Fulfilling the Next-Generation Workplace Wish List. Retrieved at <https://workforceinstitute.org/wp-content/uploads/2019/11/How-to-Be-an-Employer-of-Choice-for-Gen-Z.pdf> [Accessed on December 06, 2023]
- Worthington, R.L., Whittaker, T.A. (2006). Scale Development Research: A Content Analysis and Recommendations for Best Practices. *The Counseling Psychologist*, 34(6), 806–838.
- Xu, Z., Suntrayuth, S (2022). Innovative Work Behavior in High-tech Enterprises: Chain Intermediary Effect of Psychological Safety and Knowledge Sharing, *Frontiers in Psychology*, 13, 1017121. <https://doi.org/10.3389/fpsyg.2022.1017121>

COMPARISON OF LEADERSHIP STYLES AND ORGANIZATIONAL COMMITMENT PERCEPTIONS OF TEACHERS WORKING IN STATE AND PRIVATE SCHOOLS IN GIRESUN, ORDU AND TRABZON PROVINCES

Selim KOCA

Giresun University, Institute of Social Sciences, kocaselim82@hotmail.com
<https://orcid.org/0000-0001-6501-7485>

Kurtuluş Yılmaz GENÇ

Giresun University, Faculty of Economics and Administrative Sciences, kyilmazgenc@gmail.com
<https://orcid.org/0000-0001-5637-2995>

ABSTRACT

The aim of this study is to comparatively examine the perceived leadership styles and organizational commitment levels of teachers working in public and private primary schools affiliated to the Ministry of National Education in the provinces of Ordu, Giresun and Trabzon in the Central and Eastern Black Sea Region. Since the leadership styles and organizational commitments perceived by the teachers working in the primary, secondary and high schools of these three provinces have not been discussed comparatively before, this research is aimed to shed light on the administrators working in these provinces when determining their leadership styles.

Within the scope of this study, 398 teachers working in Ordu, 376 teachers working in Giresun and 418 teachers working in Trabzon responded to our survey. As a result of the analysis, it was concluded that there is a significant relationship between leadership styles and employees' organizational commitment.

KEYWORDS

Leader, Leadership, Leadership Styles, Organizational Commitment

INTRODUCTION

From the time of humankind's first appearance until today, the ways people meet their individual and social needs have constantly changed. The need to cooperate to meet the needs of human beings has led to the formation of conscious unions over time and thus to the emergence of the phenomenon of organization. When we look at the definitions in the literature on the organization, it is seen that there are very different definitions depending on the perspectives of the authors. However, in its most general sense, the organization; It is possible to define it as a group of people with an identifiable membership who have come together with the intention of performing joint actions to achieve a common goal (Giddens, 2012: 683). In today's world, the success and growth of some organizations, while the failure and end of life of some organizations are generally explained by organizational qualities such as the service quality of organizations, the talents of their employees and their ability to adapt to changing conditions, as measurable reasons such as finance, technology and market are insufficient to explain this situation (Uysal, 2015: 33).

The success of organizations is affected by their employees' participation in organizational goals, their commitment and dedication to the goals of the organization. Authors who realized the importance of employees developing commitment to their organization and conducted research on this subject addressed the issue from their own perspective and focused on a wide variety of organizational commitment models. Among the studies conducted in the field of organizational commitment, the most well-known and used model of organizational commitment is the three components model developed by Allen & Meyer (2001). In this model, the authors emphasized the psychological dimension of organizational commitment and defined the loyalty relationship of

employees with the organization as the behavior that makes them want to be a permanent member of the organization. This model proposes that an individual may be emotionally, normatively, or continuance addicted to his or her organization.

Feeling committed to an organization is not a phenomenon that will happen automatically. In addition to the structural factors of the organization being important in realizing this commitment, the behavioral patterns of the leaders are also important. When the literature is examined, leaders' behavioral styles affect their followers' commitment to the organization. It was previously thought that the personal characteristics of leaders (height, weight, etc.) were sufficient to be a good leader, but then it was concluded that these personal characteristics alone were not sufficient to be a good leader, and some researchers focused on the behavior of leaders and introduced the behavioral approach. Personal and behavioral approaches assumed that a leadership style would provide the best results in every situation, but later researchers thought that this idea could not be true and put forward the contingency approach, which emphasizes that each situation has its own characteristics, a leader's behavioral style cannot be effective in all situations, and that leaders should exhibit a different leadership behavior for each situation. Leaders apply leadership behavioral styles, which are classified in three ways as autocratic leadership, democratic-participatory leadership and Recognizing Full Freedom (Laissez-Faire), according to situations and conditions.

LITERATURE REVIEW

Leader And Leadership Concepts

According to the Turkish Language Association dictionary, leader is defined as: "Leader, chief, person responsible for the highest level management of a party or an organization, or the leading team or competitor in a competition." Leadership is; "It is defined as leadership and the duty of the leader. (TDK, 2022).

It is very difficult to make a clear and precise definition of leadership. When we look at the literature, we see that many different definitions have been made by management scientists regarding the concept of leadership. These definitions differ depending on the way leadership is handled and the perspective on leadership. For example; In the early simple model approach, leadership was assumed to be good management. (Allio, 2013: 4). Semantically, leadership is explained as the process of leading, and in operational definition, leadership is explained as the social exchange between leaders and followers. (Allio, 2013: 4). In its conceptualization as a situational approach, leadership is a phenomenon that prioritizes and facilitates decisions and actions. In the aesthetic concept approach, leadership is an art or craft. In a Sufi proverb, it is mentioned that blind men describe an elephant only according to the characteristics of the parts they touch, but the elephant is not just the parts these men touch, it is a being that includes all the parts these people touch and has many aspects and dimensions. For this reason, the fact that only a few authors explain the concept of leadership from the perspectives of their own fields is insufficient to explain leadership. (Allio, 2013: 4).

Leadership is a universal, human and social phenomenon. The concept of leadership is a versatile and rich concept that can mean different things to different individuals. Some of the definitions made about leader and leadership are as follows;

Leadership can be defined as a person influencing and directing the activities of other people in order to achieve certain group or personal goals under certain conditions. In this respect, leadership is a process related to the things the leader does. A leader is a person who drives other individuals to act in line with a purpose, inspires and influences them, and ensures that his followers follow him willingly. (Koçel, 2015: 668).

Northouse and Rowe (2007) defined leadership as a process and described it as an individual influencing a group of individuals to achieve a common goal. (Amanchukwu et al., 2015: 6).

In another definition, a leader is the person who brings together the members of a certain group and directs the group to achieve group goals, and the ability to persuade group members to direct them to determined goals is defined as leadership. (Korkmaz et al., 2013: 699).

““According to Stogdil, the leader is the person who influences any group by setting goals and achieving these goals. Leadership is the ability of a person to direct the activities of other individuals under certain conditions and motivate them to develop their abilities.”” (Bakan et al., 2015: 202-205).

““Kouzes and Posner (1990) defined a good leader as a person who can create a common vision, plan around common values to achieve this vision, mobilize his followers, challenge all kinds of difficulties and encourage his followers to achieve the goal.”” (Daşçı & Cemaloğlu, 2015: 134).

When the definitions found in the literature on leadership are examined, it is determined that there are some common approaches. First of all, in order to talk about leadership, there must be a group of people and common goals, and there must be someone who will direct the people to achieve these goals. The leader must have the knowledge, ability and skills to enable his followers to voluntarily strive to achieve common goals. (Bakan et al., 2015: 2002-205).

Leader Behavior Styles

In field writing, leader behavior styles are generally; It is classified as Autocratic Leadership, Democratic-Participatory Leadership and Recognizing Full Freedom (Laissez-Faire) Leadership.

a) Autocratic Leadership

In this leadership style, where followers are excluded from management by leaders, followers do not have any say in determining plans, policies and goals. In this leadership style, all management authority belongs to the leader. Subordinates are responsible only for carrying out the orders given to them by their leaders. (Çakınberk & Demirel, 2010: 107). Autocratic leadership is a leadership style suitable for individuals who grow up in societies where bureaucracy is active, receive an education in this style and are familiar with bureaucracy. In this leadership style, leaders do not take into account the feelings and thoughts of their followers, therefore, job dissatisfaction among employees is high and commitment to the organization is low. In the autocratic leadership style, authority is centralized, therefore, the decision-making process is very fast. Autocratic leaders who do not delegate authority and responsibilities do not allow their followers to be involved in the decision-making process and make all decisions themselves. (Çakınberk & Demirel: 2010: 107).

b) Democratic-Participatory Leadership

Democratic, participatory leaders want to share management authority with their followers. He determines his leadership behavior in line with the ideas he receives from his followers by consulting their followers on issues such as preparing plans and policies, determining goals, creating work divisions and work orders. (Çakınberk & Demirel, 2010: 107). Leaders who have adopted this leadership style encourage their subordinates to participate in planning, organizing and decision-making activities and encourage them to be a part of the decision-making process. Employees are informed about situations that affect their work, and they are encouraged by the leaders they follow to share their ideas and opinions about their work and to make suggestions to do the job more efficiently. (Eryeşil & İraz, 2017: 131-132).

c) Recognizing Full Freedom (Laissez-Faire) Leadership

In this approach, leaders direct and guidance of their followers at a minimum level. Joint activity and interaction between leaders and followers remains at a very low level (Çakınberk & Demirel, 2010: 107). Leaders who have adopted a leadership approach that allows full freedom leave their followers to their own devices, generally use very little management authority, and allow their followers to make plans, programs and achieve their goals within the resources allocated to them. As a result, leaders who implement the full freedom approach leave the right to exercise authority to their followers. (Eren, 2015: 461).

Concept of Organizational Commitment

The concept of commitment is in the Turkish Dictionary of the Turkish Language Association; The state of being connected is defined as affiliation, feeling and showing closeness towards someone with love, respect, and loyalty. In the light of this definition, the concept of organizational commitment can be expressed as the situation where the employee is loyal to the organization with love and respect. (TDK, 2022).

The employee factor is an extremely important element in order to gain superiority over competitors, increase organizational efficiency and employee satisfaction, produce quality products and provide service. In today's world, the human factor, which is not seen as an ordinary production factor, is seen as an important intellectual capital that can develop creative and new ideas in business life and provide competition. Therefore, it is very important for organizations to ensure that human resources, which are so valuable to organizations, are committed to the organization in order to ensure their participation in organizational activities at the highest level and to increase their productivity.

One of the most fundamental issues regarding the organization is to increase the job performance of the human element, that is, the most important of the production functions, that is, the employees, and to include them in the organizational processes at the maximum level. Ensuring the highest level of participation of employees in organizational processes is extremely important for organizations to prevent workforce losses such as employees slacking off from work, being late for work, or not coming to work. Strengthening the ties between the organization and its employees, thus gathering employees around common values and culture and improving individuals' sense of belonging, enables the organization to achieve the determined goals in the most effective way.

In a widely accepted paradigm in organizational theory, organizations and their members are viewed as being in an exchange relationship. Each party makes certain demands on the other and provides something in response to those demands. Describing such an exchange in terms of organizational incentives and individual contributions, March and Simon (1958) pointed out that employees' contributions to the organization come in two general forms: production and participation. (Angle & Perry, 1981: 26).

Although there are many definitions of organizational commitment, the literature generally focuses on employees feeling attitudinally or behaviorally committed to their organization.

The attitudinal commitment approach argues that people act in accordance with their own values and want to stay where they are in order not to lose business or personal gains. This approach is that the employee wants to maintain organizational membership in order to achieve his own values and goals while realizing the values and goals of the organization.

Behavioral commitment is the commitment that an employee develops towards his own behavior rather than the organization he works for. This approach argues that when individuals exhibit a behavior, they tend to repeat that behavior, and that the individual who makes them repeat their behavior becomes attached to this behavior after a while and develops appropriate attitudes towards it, and as a result, the attitudes they develop increase the likelihood of repeating the behavior. (Muş & Özdemir, 2021: 153).

Allen and Meyer's Organizational Commitment Model

The concept of organizational commitment is tried to be modeled in different ways by many researchers. The most well-known and used in these studies is the three components model of organizational commitment developed by Allen and Meyer (2001). This model suggests that an individual may be emotionally, normatively, or continuance-dependently committed to his or her organization. (Keskes et al., 2018: 271).

a) Affective Commitment

The concept of organizational commitment is tried to be modeled in different ways by many researchers. The most well-known and used in these studies is the three components model of organizational commitment developed by Allen and Meyer (2001). This model suggests that an individual may be emotionally, normatively, or continuance-dependently committed to his or her organization. (Keskes et al., 2018: 271).

b) Normative Commitment

The second dimension in the category of employee commitment in an organization is normative commitment. The main reason why the employee feels obliged to be with the organization is that he internalizes the values and goals of the organization. Potential antecedents of normative commitment include organizational sector-specific affective commitment behaviors, organizational trustworthiness, and participative management, as well as coworker commitment, which incorporates emotional and normative dimensions. Coworker commitment is expected to provide normative signals that affect the development of idealistic commitment. (Dinç Elmalı & Öcal Özakar, (2021).

c) Continuance Commitment

Another dimension of employee loyalty is continuance commitment. (Allen ve Meyer, 2001). This dimension is based on Becker's (1960) side bet theory. According to this theory, the longer an individual stays in an organization, the more he invests in that organization. Therefore, since leaving the institution means losing the investments, the longer the individual remains loyal to the institution, the more he accumulates an investment that becomes costly for him to lose. Time, jobs, effort, organization-specific skills that cannot be transferred or transferred, etc. Investments such as these, as well as the scarcity of alternative employment, workplace friendships and political agreements, constitute the costs that prevent leaving the organization.

Relationship between Leadership Styles and Organizational Commitment

The study titled "Leadership style, organizational commitment and organizational citizenship behavior in a credit union in Indonesia", prepared by Wulani, Supriharyanti and Agustian, examines the perceptions of Credit Union employees on the relationship between transactional and transformational leadership styles, organizational commitment and organizational citizenship behavior. It was concluded that transformational leadership has a positive effect on organizational commitment, organizational commitment has an effect on the targeted colleague, but transactional leadership does not have a significant effect on organizational commitment. (Wulani, 2019: 80).

A study by Mash and Cohen concluded that the more followers perceive a leader as having a transformational leadership style, the more emotionally committed they will be to the organization and the more focused they will be on promotion and success. Conversely, the more followers perceive a leader as a transactional leader, the higher their continuance commitment will be and the more focused they will be on preventing failure. (Mash ve Cohen, 2018: 137).

In the study titled "The effect of leadership styles on employees' organizational commitment" prepared by Clinebell, the relationship between transformational, transactional and passive/avoidant leadership styles and three dimensions of organizational commitment, namely affective commitment, continuance commitment and normative commitment, was examined in two subsidiaries of a multinational organization. It was concluded that transactional leadership has a significant positive effect on continuance commitment and also affects emotional commitment, transformational leadership also has a significant positive effect on normative commitment, and passive/avoidant leadership has a significant negative effect on emotional commitment. (Clinebell, 2013: 139).

DATA AND METHODOLOGY

Research data was collected through a prepared survey. Surveys prepared on Google Drive were administered online to teachers working in Giresun, Ordu, and Trabzon. A total of 1,192 teachers were surveyed. The survey form consists of two sections and a total of 55 questions. The first section includes 10 questions on demographic variables. The second section includes a 45-question scale on leadership styles (3 dimensions, 27 items) and an organizational commitment scale (3 dimensions, 18 items). The scale is a 5-point Likert-type scale with responses ranging from "1 = Completely Disagree," "2 = Disagree," "3 = No Opinion," "4 = Agree," and "5 = Completely Agree."

The research covers teachers working in Trabzon, Giresun and Ordu, so the research is limited to teachers working in these provinces.

Independent Group t Tests

Independent group t-test, which is a parametric test, is used to reveal whether there is a statistically significant difference between two independent groups by looking at the average, and it always compares two different variables. Since the features of the t test are necessary and appropriate to explain the relationships between some of our variables in our study, analyzes were made using this test for some of our variables. The results of the t test are shown in tables below and the necessary sections are explained.

Table 1. Independent Group t Test Results Regarding the Differentiation of Leadership Styles and Sub-Dimensions Scores According to the School Type Variable

Score	Groups	N	\bar{x}	SS	Sh $_{\bar{x}}$	t Test		
						t	Sd	p
Leadership Styles	State	1090	108,55	19,27	,583	-1,915	1190	,056
	Special	102	112,38	19,38	1,919			
Employee Oriented	State	1090	36,43	7,06	,214	-1,466	1190	,143
	Special	102	37,50	7,31	,724			
Production Oriented	State	1090	36,58	6,27	,190	-1,715	1190	,087
	Special	102	37,70	6,46	,639			
Change Oriented	State	1090	35,53	6,74	,204	-2,348	1190	,019*
	Special	102	37,16	6,25	,619			

*p<.05

In table 1 above, an independent groups t test was applied to see the differentiation of leadership styles, which are among the variables of the research, and its sub-dimensions, employee-oriented, production-oriented and change-oriented scores, according to the school type variable. The homogeneity of group variances was examined with the Levene test and it was determined that the variances were distributed homogeneously ($p \geq 0.05$). According to the results of the independent groups t test, no significant difference was found between the groups for three variables. However, a significant difference was found between the groups for the change-oriented variable. This difference was obtained in favor of teachers working in private schools.

	HYPOTHESIS	RESULTS
H0	There is no significant difference in teachers' perceptions of leadership styles between teachers working in public and private schools.	Irrefutable
H0 ₁	There is no significant difference in teachers' perceptions of employee-oriented leadership styles between teachers working in public and private schools.	Irrefutable
H0 ₂	There is no significant difference in teachers' perceptions of production-oriented leadership styles between teachers working in public and private schools.	Irrefutable
H0 ₃	There is no significant difference in teachers' perceptions of change-oriented leadership styles between teachers working in public and private schools.	Refutable

Table 2. Independent Group t Test Results Regarding the Differentiation of Organizational Commitment and Its Sub-Dimensions Scores According to the School Type Variable

Score	Groups	N	\bar{x}	SS	Sh $_{\bar{x}}$	<i>t</i> Test		
						<i>t</i>	<i>Sd</i>	<i>p</i>
Organizational Commitment	State	1090	61,18	10,17	,308	-2,345	1190	,019*
	Special	102	63,65	10,05	,996			
Normative Commitment	State	1090	18,90	5,01	,151	3,677	1190	,000*
	Special	102	16,99	5,15	,510			
Continuance Commitment	State	1090	19,47	4,52	,137	-6,404	1190	,000*
	Special	102	22,46	4,21	,417			
Affective Commitment	State	1090	22,81	4,44	,134	-3,023	1190	,003*
	Special	102	24,20	4,62	,457			

*p<.05

In table 2 above, an independent groups t test was applied to see the differentiation of organizational commitment, one of the variables of the research, and its sub-dimensions, normative commitment, continuance commitment and affective commitment scores, according to the school type variable. The homogeneity of group variances was examined with the Levene test and it was determined that the variances were distributed homogeneously ($p \geq 0.05$). According to the results of the independent groups t test, a significant difference was obtained between the groups for all variables. When we look at which groups the difference is between; The scores of teachers working in private schools were found to be higher in organizational commitment, continuance commitment and affective commitment. However, in normative commitment, teachers working in public schools had higher scores than those working in private schools.

	HYPOTHESIS	RESULTS
H0	There is no significant difference in teachers' perceptions of organizational commitment between teachers working in public and private schools.	Refutable
H0 ₁	There is no significant difference in teachers' perceptions of normative commitment between teachers working in public and private schools.	Refutable
H0 ₂	There is no significant difference in teachers' perceptions of continuance commitment between teachers working in public and private schools.	Refutable
H0 ₃	There is no significant difference in teachers' perceptions of emotional commitment between teachers working in public and private schools.	Refutable

Table 3. One-Way Analysis of Variance (ANOVA) Results Showing the Differentiation of Leadership Styles and Sub-Dimensions Scores According to the Working City Variable

<i>f</i> , \bar{x} and <i>SS</i> Values					ANOVA Results					
Score	Group	<i>N</i>	\bar{x}	<i>SS</i>	Varian. C.	<i>KT</i>	<i>Sd</i>	<i>KO</i>	<i>F</i>	Differ
City of Work Leadership Styles	Trabzon	418	106,04	20,174	intergrou	6765,05	2	3382,52	9,20	3>1
	Ordu	398	109,04	19,541	p					3>2
	Giresun	376	111,88	17,569	in-group	437087,43	1189	367,60		2>1
	Total	1192	108,88	19,304	Total	443852,48	1191			
City of Work Employee Oriented	Trabzon	418	35,69	7,407	intergrou	723,80	2	361,90	7,27	3>1
	Ordu	398	36,39	7,225	p					3>2
	Giresun	376	37,59	6,444	in-group	59187,39	1189	49,77		
	Total	1192	36,52	7,092	Total	59911,19	1191			
City of Work Production Oriented	Trabzon	418	35,82	6,724	intergrou	614,87	2	307,43	7,85	3>1
	Ordu	398	36,74	6,255	p					2>1
	Giresun	376	37,57	5,697	in-group	46566,51	1189	39,16		
	Total	1192	36,68	6,294	Total	47181,39	1191			
City of Work Change Oriented	Trabzon	418	34,53	6,943	intergrou	971,50	2	485,75	10,9	3>1
	Ordu	398	35,89	6,741	p					2>1
	Giresun	376	36,71	6,252	in-group	52805,85	1189	44,41		
	Total	1192	35,67	6,719	Total	53777,35	1191			

*p<.05

Another point of interest in the research in table 3 above is to determine whether the scores of the leadership styles, employee-oriented, production-oriented and change-oriented variables used in the study differ according to the variables of the city studied. In this context, according to the results of one-way analysis of variance (ANOVA) conducted for the research variables; There is a significant difference between all groups and the city variable. Post-Hoc LSD test was performed to determine which city group the difference between groups was in. According to the results obtained, it was concluded that a significant difference occurred among employees in Trabzon, Ordu and Giresun for the variable of leadership styles, and that the scores of employees in Giresun were higher than those of employees in Ordu and Trabzon, and that the scores of employees in Ordu were higher than those of employees in Trabzon. For the employee-oriented variable, which is the other significant difference, there is a significant difference between employees in Giresun and those in Ordu and Trabzon. The scores of employees working in Giresun are higher than those working in Ordu and Trabzon. There is no significant difference between employees working in Ordu and Trabzon. For the other significant difference, the production-oriented variable, there is a significant difference between those working in Trabzon and those working in Ordu and Giresun. The scores of those working in Trabzon are lower than those working in Ordu and Giresun. There is no significant difference between employees working in Ordu and Giresun. For the change-oriented variable, which is the other significant difference, there is a significant difference between those working in Trabzon and those working in Ordu and Giresun. The scores of those working in Trabzon are lower than those working in Ordu and Giresun. There is no significant difference between employees working in Ordu and Giresun.

	HYPOTHESIS	RESULTS
H0	There is no significant difference between teachers' perceptions of leadership styles and the city variable studied.	Refutable
H0 ₁	There is no significant difference between teachers' perceptions of employee-oriented leadership styles and the city variables studied.	Refutable
H0 ₂	There is no significant difference between teachers' perceptions of production-oriented leadership styles and the city variables studied.	Refutable
H0 ₃	There is no significant difference between teachers' perceptions of change-oriented leadership styles and the city variables studied.	Refutable

Table 4. One-Way Analysis of Variance (ANOVA) Results Showing the Differentiation of Organizational Commitment and Its Sub-Dimensions Scores According to the Working City Variable

<i>f</i> , \bar{X} and <i>SS</i> Values					ANOVA Results					
Score	Group	<i>N</i>	\bar{X}	<i>SS</i>	Varian. C.	<i>KT</i>	<i>Sd</i>	<i>KO</i>	<i>F</i>	Differ.
City of Work Organizational Commitment	Trabzon	418	60,11	10,580	intergroup	2028,49	2	1014,24		
	Ordu	398	61,01	9,966	p					
	Giresun	376	63,24	9,706	in-group	121443,62	1189	102,13	9,93	3>1 3>2
	Total	1192	61,40	10,181	Total	123472,12	1191			
City of Work Normative Commitment	Trabzon	418	18,39	5,229	intergroup	131,44	2	65,72		
	Ordu	398	18,67	4,974	p					
	Giresun	376	19,19	4,901	in-group	30238,41	1189	25,43	2,58	3>1
	Total	1192	18,73	5,049	Total	30369,85	1191			
City of Work Continued Commitment	Trabzon	418	19,21	4,823	intergroup	276,32	2	138,16		
	Ordu	398	19,66	4,379	p					
	Giresun	376	20,38	4,426	in-group	24663,76	1189	20,74	6,66	3>1 3>2
	Total	1192	19,73	4,576	Total	24940,09	1191			
City of Work Affective Commitment	Trabzon	418	22,51	4,566	intergroup	298,38	2	149,19		
	Ordu	398	22,67	4,543	p					
	Giresun	376	23,65	4,214	in-group	23551,70	1189	19,80	7,53	3>1 3>2
	Total	1192	22,92	4,474	Total	23850,08	1191			

*p<.05

Another point of interest in the research in table 4 above is to determine whether the organizational commitment, normative commitment, continuance commitment and affective commitment scores used in the study differ according to the city variables studied. In this context, according to the results of one-way analysis of variance (ANOVA) conducted for the research variables; There is a significant difference between all groups and the city variable. Post-Hoc LSD test was performed to determine which city group the difference between groups was in. According to the results obtained, it was concluded that a significant difference occurred between employees in Giresun and Ordu and

Trabzon for the organizational commitment variable, and that the scores of employees in Giresun were higher than those working in Ordu and Trabzon, and that there was no significant difference between employees in Ordu and Trabzon. For the normative commitment variable, which is another significant difference, there is a significant difference between those working in Giresun and those working in Trabzon. The scores of employees working in Giresun are higher than those working in Trabzon. There is no significant difference between employees working in Giresun and Ordu and Ordu and Trabzon. For the continuance commitment variable, which is the other significant difference, it was concluded that the difference occurred between employees in Giresun and Ordu and Trabzon, and the scores of employees in Giresun were higher than those working in Ordu and Trabzon, and there was no significant difference between employees in Ordu and Trabzon. For the affective commitment variable, which is another significant difference, it was concluded that the difference occurred between employees in Giresun and Ordu and Trabzon, and the scores of employees in Giresun were higher than those working in Ordu and Trabzon, and there was no significant difference between employees in Ordu and Trabzon.

	HYPOTHESIS	RESULTS
H0	There is no significant difference between teachers' perceptions of organizational commitment and the city variables studied.	Refutable
H0 ₁	There is no significant difference between teachers' perceptions of normative commitment and the city variables studied.	Refutable
H0 ₂	There is no significant difference between teachers' perceptions of continuance commitment and the city variables studied.	Refutable
H0 ₃	There is no significant difference between teachers' perceptions of emotional commitment and the city variables studied.	Refutable

FINDINGS AND DISCUSSIONS

Within the scope of this study, the relationships between the perception of leadership styles of teachers working in the provinces of Trabzon, Giresun and Ordu, selected as samples, and their commitment to their organizations were examined. In order to measure the sample selected in this research, it was measured whether the scales, which were previously used in other academic research and whose validity and reliability were proven, were still valid and reliable today by conducting a survey on employees in small and medium-sized enterprises in Giresun and Trabzon provinces. As a result of this survey study, it was concluded that the selected scales are still valid and reliable for the subject and sample of our thesis.

In order for a society to develop, each member should be well educated. Teachers fulfill their duty of educating individuals who will form the future of society. Connecting teachers to their organizations will help them devote themselves to their work and work more efficiently and effectively. The effective and efficient work of teachers will directly affect the students who are the subject of the study. Having a positive impact on their students will guide them to become healthy and useful individuals for society, while having a negative impact on them may lead to unhealthy individuals being raised for the society. In the literature on the subject, there are many studies examining the relationship between organizational culture and organizational commitment. However, the absence of a comprehensive study on teachers covering Giresun, Ordu and Trabzon provinces that could help understand the cultural texture of this region made it necessary to conduct this research. Based on the view that in order to reach clear results in the research, the relevant variables should be examined under the dimensions of the variables in a way that does not allow any deficiencies, the concepts in question were discussed through their sub-dimensions. In this context, in order to better understand the concepts that are the subject of our research; perceived leadership styles, employee-oriented, production-oriented and change-oriented, organizational commitment; It has been discussed comprehensively with its dimensions of emotional commitment, normative commitment and continuance commitment. As a result of the analysis, no problems were found in the reliability and structural suitability of the dimensions in question and the research was started.

In the one-way analysis of variance (ANOVA) results;

Leadership styles, production-oriented and change-oriented, were found to have a more positive and constructive impact on the perceptions of teachers working in Giresun and Ordu than in Trabzon. Furthermore, teachers working in Giresun had the highest scores on these leadership styles. This result suggests that teachers working in Trabzon exhibit greater resistance to change than teachers working in Giresun and Ordu. Additionally, it was concluded that teachers working in Giresun province scored higher on the perception of an employee-focused leadership style than teachers working in Trabzon and Ordu provinces. This leadership style encompasses supporting, coaching, counseling, appreciating, and rewarding employees. This result suggests that managers working in Giresun province showed greater concern for their employees than managers working in Trabzon and Ordu. As a result of this employee-focused approach, teachers working in Giresun had higher organizational commitment, continuance commitment focused on the costs of employee departure, and emotional commitment manifested as a strong belief in the acceptance of organizational values and goals, a desire to act for the benefit of the organization, and an intense desire for continued organizational membership, compared to teachers working in Ordu and Trabzon. This result is consistent with the prevailing view in the literature that positive leadership style perceptions positively affect employees' organizational commitment. In their research, Ergün and Çelik (2015) concluded that employee-focused leadership has an impact on job satisfaction, organizational commitment, and job stress (Ergün & Çelik, 2015: 203).

It was concluded that teachers working in Giresun had higher normative commitment, a dimension of organizational commitment based on feelings of loyalty or gratitude toward the organization, its values, or its policies, than teachers working in Trabzon. This result is also parallel to the relationship between leadership styles and organizational commitment found in the literature. Doğanay & Şen (2016) concluded in their research that production-oriented leadership styles had a high level of normative commitment and continuance commitment, a moderate level of affective commitment, and employee performance. Employee-oriented leadership styles had a high level of affective commitment and employee performance, and a moderate level of normative commitment (Doğanay & Şen, 2016: 324).

In order to better understand the effects of other variables within our study, the results of an independent group t-test analysis were as follows:

According to the results of an independent group t-test conducted to determine the difference in scores for leadership styles and their sub-dimensions (employee-oriented, production-oriented, and change-oriented) based on school type, no significant differences were found between teachers working in public and private schools for the variables of leadership styles, employee-oriented, and production-oriented leadership styles. However, a significant difference was found between the groups for the change-oriented variable. It was concluded that teachers in private schools have a higher perception of change-oriented leadership styles, which positively shift followers' perspectives in line with contemporary needs and enhance staff capacity, than teachers in public schools. This suggests that private school administrators adapt their institutions and teachers more quickly to change. Administrators in public schools implement decisions made at the central level. Private school administrators, on the other hand, have more freedom in determining management policies, allowing them to adapt more quickly to environmental change. The results support these characteristics of both public and private schools.

The results of an independent sample t-test conducted on the differences in organizational commitment and its sub-dimensions based on the school type variable revealed that teachers working in private schools scored higher for both continuance commitment and affective commitment. However, teachers working in public schools scored higher for normative commitment than those working in private schools. Affective commitment arises because individuals want to, continuance commitment arises because of the necessity of commitment for personal gain, and

normative commitment arises from moral grounds. Teachers working in public schools are selected through an exam, and their ability to leave their jobs and rejoin public schools is subject to specific rules. These rules are more onerous than those in private schools. Teachers working in private schools, on the other hand, are often able to find work at another private school upon leaving their current school. The results indicate that teachers working in private schools either embrace the values and beliefs of their organization and identify with it, or have a commitment to the organization based on their needs and focus on the costs of leaving the organization. Teachers working in public schools adopt a commitment style where the values they hold bind them to the organization through a sense of obligation for several key reasons, and this sense of obligation stems not from the individual's personal gain but from their belief that their actions are right and moral.

CONCLUSION AND IMPLICATIONS

The results of the research conducted on teachers working in primary, secondary and high schools affiliated with the Ministry of National Education in Trabzon, Giresun and Ordu provinces, in order to understand their leadership styles and organizational commitments, are presented in detail above. It is thought that the findings obtained through scientific methods as a result of comparative analysis of these three provinces may shed light on managers when determining their leadership styles.

Because the responsibility of creating a positive work environment within an organization rests primarily with managers, they carry significant responsibilities. The concept of leadership has long been a crucial topic, as organizations must develop an understanding of effective leadership to remain competitive in an increasingly competitive environment. Leadership is viewed as a crucial management function that helps maximize productivity and achieve organizational goals. The word leadership is defined as a position, personality, responsibility, and means to an end (Limsila & Ogunlana, 2007: 172). A leader's most important duty is undoubtedly to successfully lead the organization under their leadership to achieve its predetermined goals. Achieving organizational goals depends on employees embracing the organization's goals and working diligently to achieve them. Effective and productive work requires employees to feel committed to the organization. The behavioral elements of organizational commitment are generally defined as employees' strong belief in and acceptance of the organization's goals and values, their willingness to exert considerable effort on behalf of the organization, and their strong desire to maintain membership in the organization (Shaw et al., 1998: 518). Organizational commitment is a force that binds an employee to a plan of action related to specific goals. As a result, committed employees become more diligent and active; therefore, organizations with dedicated employees are more effective (Aranki et al. 2019: 137). For managers, having employees with high organizational commitment is considered extremely important. Therefore, managers need to understand the factors that increase organizational commitment among employees and implement strategies accordingly.

REFERENCES

- Allen, N. J., & Meyer, J. P. (1990). The measurement and antecedents of affective, continuance and normative commitment to the organization. *Journal of Occupational Psychology*, 63(1), 1–18. <https://doi.org/10.1111/j.2044-8325.1990.tb00506.x>
- Allio, R. J. (2013). Leaders and leadership – many theories, but what advice is reliable? *Strategy & Leadership*, 41(1), 4–14.
- Amanchukwu, R. N., Stanley, G. J., & Ololube, N. P. (2015). A review of leadership theories, principles and styles and their relevance to educational management. *Management*, 5(1), 6–14.
- Angle, H. L., & Perry, J. L. (1981). An empirical assessment of organizational commitment and organizational effectiveness. *Administrative Science Quarterly*, 26(1), 1–14. <https://doi.org/10.2307/2392596>
- Bakan, İ., Erşahan, B., Büyükebeşe, T., Doğan, İ. F., & Kefe, İ. (2015). Dönüşümcü ve etkileşimci liderlik ile öğretmenlerin tükenmişlik düzeyleri arasındaki ilişki. *Uluslararası İktisadi ve İdari İncelemeler Dergisi*, 14, 202–205.

- Çakınberk, A., & Demirel, E. T. (2010). Örgütsel bağlılığın belirleyicisi olarak liderlik: Sağlık çalışanları örneği. *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 24, 105–118.
- Clinebell, S. (2013). Impact of leadership styles on employee organizational commitment. *Journal of Service Science*, 6(1), 139.
- Daşcı, E., & Cemaloğlu, N. (2015). İlköğretim kurumu yöneticilerinin liderlik tarzları ile öğretmenlerin yaşadıkları yıldırma (mobbing) arasındaki ilişki. *Adıyaman Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 19, 133–156.
- Dinç Elmalı, E., & Öcal Özakar, Ö. (2021). Algılanan örgütsel destek ve psikolojik güçlendirmenin örgütsel bağlılık üzerindeki etkisi: Banka çalışanları üzerine bir araştırma. *İstanbul Ticaret Üniversitesi Sosyal Bilimler Dergisi*, 20(40), 24–43. <https://doi.org/10.46928/iticusbe.735601>
- Eren, E. (2015). *Örgütsel davranış ve yönetim psikolojisi* (15. baskı). Beta Yayınları.
- Eryeşil, K., & İraz, R. (2017). Liderlik tarzları ile örgütsel bağlılık arasındaki ilişkinin incelenmesine yönelik bir alan araştırması. *Selçuk Üniversitesi Sosyal Bilimler Meslek Yüksekokulu Dergisi*, 2, 131–150.
- Giddens, A. (2012). *Sosyoloji* (1. baskı). Kırmızı Yayınları.
- Goyal, P., & Baroda, S. (2022). Leadership styles: Imperative to salubrious organizational commitment. *International Journal of Advance Research in Computer Science and Management Studies*, 10(4), 1–8.
- Keskes, I., Sallan, J. M., Simo, P., & Fernandez, V. (2018). Transformational leadership and organizational commitment: Mediating role of leader–member exchange. *Journal of Management Development*, 37(3), 271–284.
- Koçel, T. (2015). *İşletme yöneticiliği* (16. baskı). Beta Yayınları.
- Korkmaz, M., Aras, G., Yücel, A. S., & Kıygın, S. (2013). Sivil havacılık sektöründe kabin personelinin algıladıkları liderlik stilleri ve iş tatmini üzerindeki ilişkileri: Türk Hava Yolları örneği. *International Journal of Social Science*, 7, 695–710.
- Mash, R., & Cohen, L. (2018). Followers' perception of leadership style, organizational commitment and regulatory focus. Moderated by organizational types. *Asian Journal of Social Sciences and Management Studies*, 3, 137.
- Meyer, J. P., & Allen, N. J. (2001). Organizational commitment. In *Personnel psychology and human resource management: A reader for students and practitioners* (pp. 289–342).
- Muş, Y., & Özdemir, M. (2021). Sağlık hizmetlerinde çalışan kadınlarda hissedilen cam tavan algısının örgütsel bağlılığa etkisi. *Ekonomi İşletme Siyaset ve Uluslararası İlişkiler Dergisi*, 7(1), 145–170.
- TDK. (2022). *Türk Dil Kurumu sözlükleri*. <https://sozluk.gov.tr>
- Uysal, Ş. (2015). Performans yönetimi sisteminin tanımı, tarihçesi, amaç ve temel unsurlarına genel bir bakış. *Electronic Journal of Vocational Colleges*, 5(2), 33–42. <https://doi.org/10.17339/ejovoc.51537>
- Wulani, F., Supriharyanti, E., & Agustian, B. (2019). Leadership style, organizational commitment and organizational citizenship behavior on credit union in Indonesia. *European Journal of Business and Management*, 14, 80.

COLLABORATION BETWEEN ENGINEERS AND MANAGERS: A STUDY IN THE PALESTINIAN MANUFACTURING SECTOR

Aysar Al Njoun

Golden Wheat Mills, Ramallah, Palestine, aysar.njoun@hotmail.com

Pelin Vardarlier

*Balıkesir University, Balıkesir, Türkiye, pelin.vardarlier@balikesir.edu.tr
<https://orcid.org/0000-0002-5101-6841>*

ABSTRACT

This study examines the influence of collaboration between engineers and management on role effectiveness and manufacturing productivity within the Palestinian manufacturing sector, a region constrained by socio-political and economic challenges. Using a qualitative approach, the research analyzes semi-structured interviews with eleven stakeholders—general managers, CEOs, and engineering managers from industries including food, metalwork, pharmaceuticals, and hygienic production. Conducted in Arabic and translated to English, the interviews were processed via thematic analysis, yielding five key themes: engineering roles and contributions, training and development, constraints and challenges, collaboration and management expectations, and impact and added value. The study concludes that enhancing collaboration through consistent training, structured incentives, and adaptive solutions to external pressures could elevate engineers' effectiveness and sector output. While engineers' adaptability offers resilience, the lack of quantitative metrics suggests a need for further research to measure impacts precisely. These insights underscore the necessity of aligning engineers' professional aspirations with managerial support to foster sustainable productivity gains in Palestine's manufacturing sector, providing a foundation for future policy and practice improvements amidst its unique challenges.

KEYWORDS

Engineers, Management, Palestinian Manufacturing Sector, Manufacturing Productivity, Role Effectiveness

INTRODUCTION

Engineering plays a critical role in the manufacturing sector by driving innovation, enhancing productivity, and enabling economic growth. Engineers are at the forefront of designing, developing, and optimizing manufacturing systems, with responsibilities that span efficiency, safety, quality control, and sustainability (Haapala et al., 2013; Riis et al., 2007; May et al., 2017). Their involvement is vital in adapting to technological advancements and responding to market demands.

In Palestine, however, the potential of engineering to transform manufacturing is significantly constrained by political instability, limited access to resources, restricted movement, and economic challenges. These conditions often hinder the full utilization of engineering capabilities and impede sectoral development. Despite these constraints, engineering remains an indispensable force in the Palestinian manufacturing context, with growing recognition of its value and the urgent need to overcome the barriers engineers face (FarajAllah et al., 2018).

The engineering profession in Palestine is affected not only by resource limitations but also by organizational structures that often prioritize financial and commercial considerations over technical expertise. One study highlights how engineers are often subordinate to accountants and financial

managers, limiting their influence on strategic decision-making and process innovation (FarajAllah et al., 2018). This imbalance reduces the potential effectiveness of engineering roles and undermines their contributions to industrial advancement.

Nonetheless, the demand for process engineering in Palestinian industrial companies remains high, revealing both a gap and an opportunity. A second study emphasizes the significant need for re-engineering and process improvement initiatives, underlining the importance of technical interventions to boost performance in manufacturing (FarajAllah et al., 2018). Additionally, research in sustainable manufacturing practices stresses the importance of engineering in addressing legislative, environmental, and economic pressures (Früchtel et al., 2020; Haapala et al., 2013).

Engineers in the Palestinian manufacturing sector operate across various disciplines. Mechanical engineers focus on machinery design and maintenance, ensuring operational efficiency and reducing energy use. Electrical engineers design and maintain safe and reliable power systems. Civil engineers support infrastructure development, such as factory construction and transportation networks. Industrial engineers optimize production workflows, identify inefficiencies, and implement cost-effective solutions (Haapala et al., 2013).

While their roles are essential, engineers face significant challenges in Palestine. These include the lack of modern technology, weak infrastructure, restricted access to global markets, and the ongoing political conflict that affects investment and industrial stability (FarajAllah et al., 2018). Sustainability goals, such as reducing energy consumption and minimizing waste, also pose added complexity to engineering tasks (Früchtel et al., 2020).

Despite these barriers, opportunities exist for engineers to drive transformation. These include technological innovation, international collaboration, and leveraging local resources for sustainable development. Further, targeted investment in research and development can catalyze progress by encouraging homegrown solutions and enhancing self-reliance.

Recent literature stresses the need for multi-stakeholder collaboration to strengthen engineering roles in manufacturing. Partnerships between industry, academia, and government can bridge skills gaps, promote innovation, and enhance training programs (May et al., 2017). A shift in educational focus is also essential. Morelock (2017) argues for a redefinition of engineering identity and competencies to reflect both technical expertise and soft skills, such as leadership, communication, and business acumen. This evolution is critical for engineers to remain relevant and effectively contribute to modern manufacturing demands.

Existing Gaps in Engineering Roles

A thorough assessment of engineering roles in the Palestinian manufacturing sector reveals significant gaps in skills and application. Many engineers lack access to updated training programs aligned with current industry needs. Educational curricula and practical experience must be reformed to equip engineers with competencies in process optimization, automation, sustainability, and interdisciplinary collaboration.

Statement of the Problem

Manufacturing globally faces rapid technological shifts, globalization, and growing environmental concerns. These pressures demand that engineers go beyond traditional technical roles to include strategic planning, financial impact analysis, and regulatory compliance. In Palestine, engineers often lack the tools and training to meet these expanded roles effectively. Therefore, engineering education and professional development must evolve to equip engineers with both hard technical skills and soft managerial capabilities. This transformation is not only crucial for the engineers' professional relevance but also for the sustainable growth of the manufacturing industry.

METHODOLOGY

Research Design

To understand the experiences, challenges, and contributions of engineers in the Palestinian manufacturing sector, this study adopts a qualitative research design. This approach enables a deep exploration of individual perspectives, allowing for nuanced insight into how engineers function within their work environments (Creswell, 2018). Qualitative research is particularly well-suited for exploring complex social phenomena, such as career transitions and workplace dynamics (Ghauri, Gronhaug, & Strange, 2020; Patton, 2015; Stevens & Wrenn, 2013; Savickas, 2019).

The primary data collection method used was semi-structured interviews, which provided a flexible yet guided format for participants to share their thoughts and experiences. Participants included engineers and managers with relevant industry experience in the Palestinian manufacturing sector. Interviews were conducted in Arabic and later translated for analysis. This method was chosen for its ability to capture subjective insights and personal narratives, particularly useful for understanding engineers' transitions into managerial roles and their day-to-day collaboration with business leadership.

The data was analyzed using thematic analysis, which allows for identifying patterns and themes from participant responses. This method is recognized for its clarity and adaptability, particularly in exploratory research (Braun & Clarke, 2006, 2019; Nowell et al., 2017). Ethical considerations guided the research process throughout to ensure transparency, informed consent, and the respectful treatment of participants.

Participants

The study utilized purposive sampling to select participants from seven different companies across various sizes and business models. This method allowed the inclusion of participants with relevant characteristics and experiences aligned with the research objectives (Patton, 2015; Maxwell, 2013). Companies were categorized into three types:

1. Family-run businesses, often with traditional management styles.
2. Mid-sized to large firms, typically transitioning from family ownership to broader market operations.
3. International affiliates, companies operating within Palestine but with international ties and exposure to global practices.

This diverse selection ensured a comprehensive understanding of engineering roles across different organizational contexts.

Participant diversity was further enhanced by considering:

- Business background (e.g., size and scope of operations),
- Professional roles and experience (e.g., junior engineers to senior managers),
- Educational backgrounds (from vocational training to university-level education).

Involving both engineers and managers allowed the study to capture multiple perspectives. Engineers shared insights into their tasks, technical contributions, and work challenges, while managers discussed their expectations, the collaborative process, and the strategic use of engineering expertise within the company.

Table 1. Overview of the interviewees

Interviewee	Education	Current position	Field/ Industry
Interviewee 1	Master's Degree	General Manager	Food Manufacturing
Interviewee 2	Bachelor's Degree	General Manager	Food Manufacturing
Interviewee 3	Bachelor's Degree	Engineering Department Manager	Metal Work Manufacturing
Interviewee 4	Master's Degree	Chairman of Board	Pharmaceutical Manufacturing
Interviewee 5	Master's Degree	CEO	Hygienic Production
Interviewee 6	Bachelor's Degree	Engineering Department Executive	Metal Work Manufacturing
Interviewee 7	Bachelor's Degree	Production Manager	Food Manufacturing
Interviewee 8	Bachelor's Degree	Production Manager	Pharmaceutical Manufacturing
Interviewee 9	Bachelor's Degree	Group General Manger, Vice Chairman	Food Manufacturing / Metal Work Manufacturing
Interviewee 10	Master's Degree	General Manager	Food Manufacturing
Interviewee 11	Bachelor's Degree	Technical Manager	Food Manufacturing

The study also explored how companies view engineering roles, including:

- Expected outcomes from hiring engineers (e.g., innovation, problem-solving, efficiency),
- Integration of engineers into the company (e.g., technical-only roles or broader contributions),
- Engineer-manager collaboration (e.g., communication, planning, leadership).

Moreover, it investigated training and development efforts, including:

- Orientation programs for new hires,
- On-the-job training (OJT) for skills development,
- Professional development opportunities (e.g., certifications, workshops).

These dimensions helped assess how effectively engineers are utilized and supported in their roles.

Data Analysis

To analyze interview data, this research used thematic analysis, an established technique for identifying, interpreting, and reporting patterns within qualitative data (Braun & Clarke, 2006, 2019). It was selected for its ability to accommodate both inductive (data-driven) and deductive (theory-driven) approaches, making it ideal for uncovering how collaboration affects engineering role effectiveness and productivity.

The process followed Braun and Clarke's (2006) six-phase model:

1. Familiarization with the data,
2. Generation of initial codes,
3. Grouping codes into themes,
4. Reviewing themes for accuracy and depth,
5. Defining and naming final themes,
6. Producing a detailed report aligned with the research question.

Codes included terms such as "technical skills," "communication," "leadership," "role ambiguity," and "mentorship." Themes like "skill gaps," "career aspirations," and "orientation and training" emerged, helping structure the final analysis.

To ensure rigor, the analysis was conducted manually and supported using MAXQDA, a qualitative data analysis tool. The process was iterative, with data repeatedly reviewed to ensure completeness and accuracy. Quotations and case examples were incorporated to ground themes in real-world experiences.

Despite its strengths, thematic analysis has limitations. It can be subjective, with potential bias in interpreting themes (Nowell et al., 2017), and the process is time-consuming. These risks were mitigated by following a systematic approach and involving multiple researchers to validate findings.

Ethical Considerations

Ethical integrity was maintained throughout the study in accordance with TÜBİTAK guidelines (2023). Participants were recruited through professional networks, social media, and industry forums based on predefined inclusion criteria. Informed consent was obtained, with participants fully briefed on the study's purpose, procedures, and their rights.

Data confidentiality was ensured by:

- Assigning identification codes to participants,
- Storing data in password-protected systems,
- Limiting access to the research team.

Participants were informed that their involvement was voluntary and that they could withdraw at any time without consequences. To address potential emotional discomfort, psychological support resources were made available. Participants also benefited by gaining insights into their career development and contributing to a broader understanding of engineering's role in Palestinian industry.

RESULTS

To analyze the qualitative data collected for this study, MAXQDA software was employed to facilitate coding and visualization of key themes. A word cloud was generated to visually represent the frequency and significance of terms within the dataset, with larger words indicating higher prominence. The word cloud was created by extracting frequently occurring terms from the coded segments, providing an initial overview of the data's content.

Table 2. Thematic Map

Theme	Code
Engineering Roles and Contributions	Personal Impact on Engineering & Management
	Core Responsibilities
	Specializations & WorkForce
	Key Skills for Engineers & Leaders
Training & Development	Orientation Programs
	OJT Training and Impact
Challenges and Constrains	Workplace Constrains
	Barriers to Engineering Growth in Palestine
	Political Impact on Engineering & Manufacturing
	Broader Industry Challenges
Collaboration & Management	Engineers' Work Values & Identity
	Engineers' Expectations from Management
	Management's Expectations from Engineers
Impact and Value	Engineers' Role in Productivity & Innovation
	Strategies for Engineer-Manager Collaboration

The first section, Engineering Roles and Contributions, outlines the core responsibilities of engineers, engineers' personal characteristics and what does the engineering identity is portrayed based also on their backgrounds as 11 out of 13 interviewees were graduates of an Engineering Department 5 of which were general managers or higher, their areas of specialization, and the essential skills required for effective performance. Understanding these aspects helps define the significance of engineers in the manufacturing process and their impact on business success.

The second section, Training and Development, examines the orientation and training programs available to engineers. It explores how companies invest in skill-building through structured programs and on-the-job training (OJT), assessing the impact of these initiatives on engineers' performance and adaptability.

The third section, Constraints and Challenges, identifies the key obstacles engineers face in the Palestinian manufacturing sector. It addresses internal company constraints, broader industry limitations, and external factors such as political instability as the market withstands within an occupied territory and how that affect productivity and the expansion of engineering roles.

The forth section, Collaboration and Management Expectations, investigates the dynamic between engineers and management. It highlights what engineers value in their work, their expectations from leadership, and, conversely, what managers expect from engineers. This section provides insight into how collaboration can be improved for better alignment between technical and business objectives.

Finally, the Impact and Added Value section explores how engineers contribute to innovation, efficiency, and productivity in their firms. Although most interviewees have pointed such collaborations in previous answers within the interview questions, it was meant to specifically shed light directly to the point. It also identifies best practices and strategies that foster effective collaboration between engineers and management, leading to improved organizational performance.

The MAXQDA code relations diagram illustrates the interconnections between coded segments, with proximity and connections reflecting co-occurrence in the qualitative data. The analysis aligns with five themes: Engineering Roles and Contributions, Training & Development, Challenges and Constraints, Collaboration & Management, and Impact and Value.

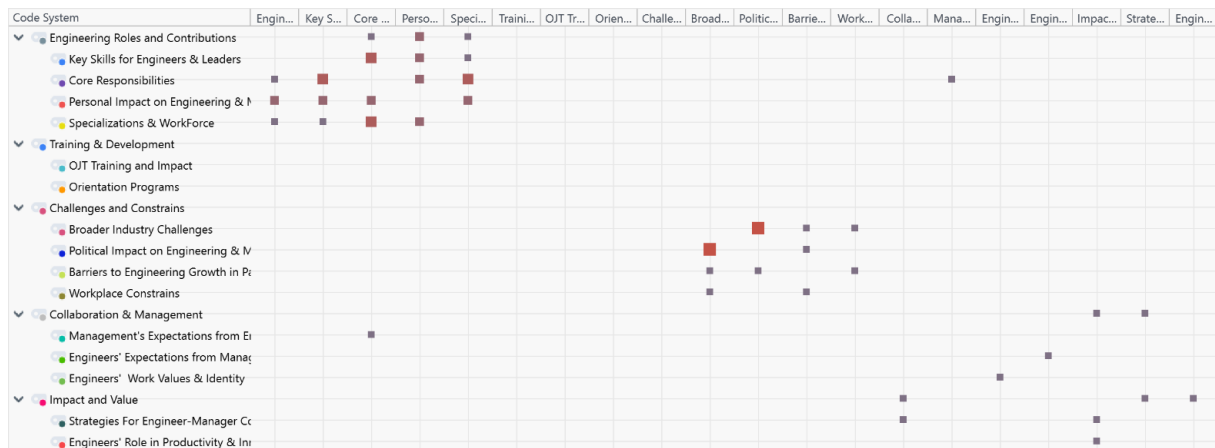


Figure 1. Code Relations

The analysis reveals that engineers’ roles, skills, and training are closely tied to their challenges and collaboration with management, all of which shape their impact on productivity and innovation. Political and industry constraints in Palestine further complicate these dynamics, underscoring the need for supportive training and collaboration strategies.

The findings of this study are structured around five key themes identified in the final thematic map: engineering roles and contributions, training and development, constraints and challenges, collaboration and management expectations, and impact and added value.

To enhance engineers’ impact and collaboration in Palestinian manufacturing, several targeted recommendations are proposed. The study highlights issues such as unclear role definitions, limited career growth, and weak collaboration between engineers and management—problems that undermine productivity and retention.

The study reveals that engineers in the Palestinian manufacturing sector hold pivotal technical and strategic roles, but their potential is often restricted by limited training, unclear role definitions, and external political and economic constraints. Despite these challenges, engineers significantly contribute to innovation, productivity, and organizational problem-solving. Thematic analysis of interviews with engineers and managers from diverse industries shows that collaboration between technical and managerial teams enhances performance, especially when supported by structured training and mutual respect. However, gaps remain in role clarity, career advancement, and alignment of expectations, which hinder the full integration of engineering expertise into strategic decision-making.

CONCLUSION

This study sought to investigate how collaboration between engineers and management influence’s role effectiveness and manufacturing productivity within the Palestinian manufacturing sector, focusing on how their collaboration influence’s role effectiveness and manufacturing productivity. Conducted through thematic analysis of interviews with eleven key stakeholders—ranging from general managers and CEOs to engineering and production managers across industries like food, metalwork, pharmaceuticals, and hygienic production, the research offers a rich, multi-perspective understanding of the dynamics at play. The findings, organized into five overarching engineering roles and contributions, training and development, constraints and challenges, collaboration and management expectations, and impact and added reveal both the strengths and vulnerabilities of this sector, shaped by its unique socio-political and economic context. This conclusion synthesizes these insights, reflects on their broader implications, and considers pathways forward for enhancing collaboration and productivity in an environment marked by adversity.

The pivotal role of engineers in the Palestinian manufacturing sector emerges as a foundational finding. Participants unanimously described engineers as having technical importance of production, responsible for overseeing machinery, ensuring quality control, and maintaining operational continuity. Their core responsibilities extend beyond technical execution to include simplifying complex systems for broader organizational understanding and advising on production workflows—a role succinctly captured by one interviewee’s remark: *"Analyze and simplify the complicated technical information to make it easier for workers and managers to understand and advise a work plan."* This dual function underscores engineers’ significance not only as implementers but also as communicators and strategists, bridging the gap between shop floor realities and managerial decision-making. Notably, the study reveals a high prevalence of engineering backgrounds among managerial interviewees (9 out of 11 were engineering graduates, with 5 in high-level management), suggesting that engineers’ structured problem-solving and analytical skills equip them for leadership roles, enhancing their influence across organizational hierarchies.

In conclusion, this research affirms that collaboration between engineers and management profoundly shapes role effectiveness and manufacturing productivity in the Palestinian manufacturing sector. Engineers’ technical prowess and adaptability position them as key agents of change, yet their potential is curtailed by inconsistent training, market limitations, and political instability.

Strengthening this collaboration through structured development programs, formalized strategies like innovation incentives, and advocacy to ease external constraints offers a viable path forward. For instance, sector-wide training initiatives could standardize skill-building, while partnerships with international firms might circumvent import barriers. Additionally, fostering a culture of mutual respect and shared decision-making could align engineers’ values with managerial goals, enhancing both morale and output. While the Palestinian context poses formidable challenges, it also highlights engineers’ resilience and ingenuity—qualities that, with targeted support, could transform adversity into opportunity.

To strengthen collaboration and boost productivity, the study recommends formal training programs, clearer career pathways for engineers, and joint strategic planning mechanisms between engineers and managers. Fostering a culture of mutual understanding, providing innovation incentives, and building partnerships—especially international ones—could help overcome systemic barriers and enhance resilience. In conclusion, while Palestine’s unique socio-political landscape imposes distinct limitations, engineers remain key agents of progress. With targeted support and institutional alignment, their collaborative potential with management could serve as a cornerstone for sustainable industrial growth. Future research should explore measurable impacts of such collaborations and inform broader policy reforms.

Future research might explore longitudinal impacts of collaboration strategies or quantify productivity gains, providing a roadmap for policymakers, industry leaders, and firms to bolster this critical sector. Ultimately, the synergy between engineers and management is not just a driver of productivity but a cornerstone for the sector’s sustainability and growth in Palestine.

REFERENCES

- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.
- Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, 11(4), 589–597.
- Braun, V., & Clarke, V. (2021). *Thematic analysis: A practical guide*. SAGE Publications.
- Creswell, John W. 2018 *Qualitative, Quantitative, and Mixed Methods Approaches* / John W. Creswell, PhD, Department of Family Medicine, University of Michigan, and J. David Creswell, PhD, Department of Psychology, Carnegie Mellon University

- FarajAllah, A M A., Talla, S A E., Abu-Naser, S S., & Shobak, M J A. (2018, September 28). Availability of Re-Engineering Requirements for Palestinian Industrial Companies. <http://ijeais.org/wp-content/uploads/2018/09/IJAMSR180902.pdf>
- Früchtl, M., Leis, M., & Wertheim, R. (2020). A comprehensive and interdisciplinary perspective on sustainable manufacturing towards sustainable life cycles. <https://doi.org/10.1016/j.promfg.2020.02.197>
- Ghauri, P., Gronhaug, K., & Strange, R. (2020). *Research methods in business studies*. Cambridge University Press.
- Haapala, K R., Zhao, F., Camelio, J A., Sutherland, J W., Skerlos, S J., Dornfeld, D., Jawahir, I., Clarens, A F., & Rickli, J L. (2013). A Review of Engineering Research in Sustainable Manufacturing - eScholarship. <https://escholarship.org/content/qt8260n3t5/qt8260n3t5.pdf>
- John R. Morelock (2017): A systematic literature review of engineering identity: definitions, factors, and interventions affecting development, and means of measurement, *European Journal of Engineering Education*, DOI: 10.1080/03043797.2017.1287664
- Maxwell, J. A. (2013). *Qualitative research design: An interactive approach*. SAGE.
- May, G., Stahl, B., Taisch, M., & Kiritsis, D. (2017, November 1). Energy management in manufacturing: From literature review to a conceptual framework. *Elsevier BV*, 167, 1464-1489. <https://doi.org/10.1016/j.jclepro.2016.10.191>
- Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International journal of qualitative methods*, 16(1), 1609406917733847.
- Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods*, 16(1), 1–13.
- Patton, M. Q. (2015). *Qualitative research & evaluation methods (4th ed.)*. SAGE.
- Riis, J O., Johansen, J., Wæhrens, B V., & Englyst, L. (2007, October 30). Strategic roles of manufacturing. *Emerald Publishing Limited*, 18(8), 933-948. <https://doi.org/10.1108/17410380710828262>
- Savickas, M. L. (2019). Career construction theory and practice. In *Career theories and models at work* (pp. 147–154). CERIC.
- Stevens, R. E., & Wrenn, B. (2013). *The marketing research guide*. Routledge.
- TÜBİTAK. (2023). *Scientific Research Ethics Guidelines*. The Scientific and Technological Research Council of Turkey.

FINANCE IN THE DIGITAL ERA

GENDER DIVERSITY AS A RISK BUFFER: CORPORATE GOVERNANCE AND FINANCIAL STABILITY IN SPANISH SMES

Antonio Minguez-Vera

University of Murcia, Murcia, Spain, minver@um.es
<https://orcid.org/0000-0002-6879-2089>

Joanna Hernik

West Pomeranian University of Technology, Szczecin, Poland, Joanna.Hernik@zut.edu.pl
<https://orcid.org/0000-0001-8895-6039>

Luis A. Palma-Martos

University of Seville, Seville, Spain, lpalma@us.es
<https://orcid.org/0000-0001-5834-3629>

Maria Safitri

Dian Nuswantoro University, Semarang, Indonesia, mariasafitri@dsn.dinus.ac.id
<https://orcid.org/0000-0003-2149-8939>

ABSTRACT

This study examines the effect of corporate governance variables on financial risk, measured through the logarithmic transformation of the Altman Z-score, with a particular emphasis on gender diversity mediation within the board of directors. Utilizing a panel dataset comprising 9,714 observations from Spanish SMEs covering the period 2014–2019, we intentionally exclude pandemic years to prevent potential bias. Employing System GMM estimation and sequential mediation testing within a GMM framework, we analyze how different governance structures influence financial stability. Our findings indicate that increased gender diversity significantly reduces financial risk, while board size positively correlates with greater risk, and CEO duality exhibits no significant impact. Ownership concentration, assessed through the largest shareholder's stake, the Herfindahl index, and the Cubbin-Leech index, is found to elevate financial risk. Director ownership demonstrates both linear and nonlinear (negative and positive) relationships with risk, whereas CEO ownership negatively impacts financial risk. Firms with family ownership exhibit reduced risk, in contrast to those with corporate or institutional ownership, which experience increased risk. Mediation analysis reveals that board size and directors' ownership positively influence gender diversity, while family ownership negatively affects it, and institutional ownership shows a positive association. Furthermore, gender diversity fully mediates the relationship between board size, director ownership, and financial risk, maintaining its risk-reducing role, with the other variables losing significance. Partial mediation by gender diversity is also observed concerning family and institutional ownership, underscoring its pivotal role in corporate governance mechanisms influencing SME financial risk.

KEYWORDS

Financial Risk, Corporate Governance, Gender Diversity, SMEs, System GMM.

INTRODUCTION

This research explores how corporate governance structures influence financial risk in Spanish SMEs during the pre-pandemic period (2014–2019), using the logarithmic transformation of the Altman Z-score as a measure of financial stability. The study pays special attention to the mediating role of gender diversity on boards, examining how governance elements (such as ownership concentration, identity of the major shareholder, board size, CEO duality, and shareholdings of directors and the

CEO) affect both gender diversity and financial risk. Gender diversity is measured using the Shannon index, Shannon (1948). The goal is to capture both the direct and mediated effects of governance on risk and provide relevant insights for policy and management.

Financial risk poses a significant challenge for SMEs, which typically face greater vulnerability due to limited access to finance, less diversification, and narrower resource bases (Altman et al., 2010; Cowling et al., 2015; OECD, 2022). These vulnerabilities make risk mitigation strategies, especially those tied to governance structures, essential for their sustainability and growth. Strong governance can serve as a buffer against financial instability and reduce the probability of firm failure.

Corporate governance plays a vital role in mitigating risk by aligning managerial and shareholder interests and enhancing monitoring and control systems (Shleifer & Vishny, 1997, Martín-Ugedo & Minguez Vera, 2023). In SMEs, however, governance structures differ from those of large corporations; they often feature concentrated ownership, family control, and informal management practices (Miller et al., 2007). These unique features may amplify or reduce financial risk depending on how control is exercised (Zahra, 2005).

A growing body of research emphasizes the importance of gender diversity in governance (Fayyaz et al., 2023). Diverse boards are associated with a broader range of perspectives, improved oversight, and more effective decision-making (Post & Byron, 2015; Bernile et al., 2018; Lucas-Pérez et al., 2022; Sánchez-Marín et al., 2022). Female directors, often more risk-averse and stakeholder-oriented, are linked to more conservative and sustainable financial policies (Adams & Ferreira, 2009; Sila et al., 2016; García-Izquierdo et al., 2021). These attributes may be particularly valuable in the context of SMEs, where the margin for error is typically smaller.

Board size is another governance element whose relationship with risk remains debated. Larger boards may contribute positively by providing varied expertise and stronger control (Anderson et al., 2004), but they may also create coordination problems and inefficiencies in decision-making (Yermack, 1996). Empirical results reflect this duality: while Pathan (2009) finds a positive relationship between board size and risk, Nguyen et al. (2015) and Ararat et al., 2020 find no significant effects, suggesting the relationship may be context-dependent.

CEO duality (when the CEO also serves as board chair) can improve decision-making efficiency and speed (Donaldson & Davis, 1991; Hernández-Nicilás et al., 2022). However, it may also weaken the board's independence and oversight, potentially increasing risk (Jensen, 1993). Some evidence points to a positive association with risk (Tang, 2017), while other studies report no clear effect (Krause et al., 2014), implying that the effect of duality may depend on firm size, sector, or country context.

Director and CEO ownership introduces a complex dynamic. According to agency theory, managerial ownership aligns interests with shareholders and can reduce agency costs and risk (Morck et al., 1988). Conversely, high levels of insider ownership can promote entrenchment and opportunism, increasing risk exposure (Fahlenbrach & Stulz, 2009). Chen et al. (2008) emphasize the potential for nonlinear effects, where moderate levels of ownership reduce risk but higher levels reverse this effect.

Ownership concentration similarly presents a trade-off. High concentration can enhance control and reduce managerial slack (La Porta et al., 1999), but it may also enable dominant shareholders to pursue private benefits, raising firm-level risk (Young et al., 2008). This trade-off is particularly relevant for SMEs, where concentrated ownership is common and minority protections may be weaker (Chrisman et al., 2004).

The identity of the main shareholder further nuances the governance-risk relationship. Family-controlled firms tend to adopt conservative, long-term strategies due to reputational and legacy concerns (Anderson & Reeb, 2003). In contrast, institutional investors may encourage riskier, short-

term focused decisions (Bushee, 2001), while non-financial corporations may engage in strategic behaviors that increase the firm's operational risk depending on their external objectives (Thomsen & Pedersen, 2000).

Together, these theoretical and empirical insights establish a comprehensive framework for examining how various corporate governance characteristics (along with the mediating role of gender diversity) shape financial risk in SMEs. By focusing on a large and representative panel of Spanish SMEs, this study contributes to filling a significant gap in the literature and offers relevant implications for both academic inquiry and corporate practice.

METHODOLOGY

This study employs a panel data approach to examine the relationship between corporate governance mechanisms and financial risk in Spanish SMEs. The empirical analysis uses a dataset of 9,714 firm-year observations from 2014 to 2019, deliberately excluding the COVID-19 period to eliminate pandemic-related distortions.

The dependent variable is financial risk, captured by the natural logarithm of the Altman Z-score, which is computed from several accounting ratios that reflect firm profitability, leverage, solvency, liquidity, and efficiency. This composite measure is widely used to estimate the likelihood of financial distress (Altman et al., 2010).

A key explanatory variable is gender diversity on the board of directors, measured using the Shannon index. This index is calculated as $H_{it} = -\sum p_{it} \ln p_{it}$, where p_{it} is the proportion of board members of each gender for firm i and year t , Shannon (1948). The Shannon index captures both presence and distribution of gender groups and increases as the board composition becomes more balanced. This measure provides a continuous and informative alternative to simpler binary indicators, making it more suitable for analyzing its impact on governance outcomes such as risk.

Board characteristics also include the natural logarithm of the number of directors (board size), a dummy for CEO duality (equal to 1 when the CEO is also the board chair), the percentage of shares held collectively by board members (excluding the CEO), and the percentage held by the CEO. To explore possible nonlinearities, we also include the squared terms of board and CEO ownership.

Ownership structure is assessed through three dimensions. First, we use the percentage of equity held by the largest shareholder to capture direct control. Second, we calculate the Herfindahl index, Herfindahl, (1950), ($H_{it} = \sum s_{it}^2$), where s_{it} represents each shareholder's equity share, to reflect ownership concentration for firm i , year t . Third, the Cubbin-Leech index (ALPHA), Cubbin & Leech (1983), is included to estimate effective control through coalition-building capacity. This is computed as:

$$ALPHA_{it} = \frac{P_{it}}{\sqrt{H_{it} - P_{it}^2}}$$

where P_{it} is the voting rights of the main shareholder for the firm i in the year t . H_{it} is the Herfindahl index. ALPHA ranges from 0 (dispersed ownership) to 1 (highly concentrated control), capturing potential dominance through shareholder alliances.

Additionally, we identify the nature of the primary shareholder: (1) a family (dummy = 1 if the main owner is a family); (2) a financial institution; and (3) a non-financial corporation. These classifications allow us to explore how differing shareholder types relate to financial risk through their strategic orientations.

Control variables include leverage (total liabilities to total assets), firm size (log of total assets), firm age (log of years since founding), and return on assets (net income to total assets), consistent with prior research linking financial structure and performance to corporate risk (Berger & Bonaccorsi di Patti, 2006).

We estimate a panel model using the System Generalized Method of Moments (System GMM), suitable for datasets with a short time dimension and many cross-sectional units (Arellano & Bover, 1995; Blundell & Bond, 1998). This estimator addresses endogeneity, simultaneity, and unobserved firm-specific effects through the use of internal instruments based on lagged variables. The Hansen J-test and the Arellano-Bond test for AR(2) are used to validate instrument relevance and the absence of autocorrelation.

The main model is expressed as:

$$Financial_Risk_{it} = \beta Governance_{it} + \gamma Controls_{it} + \mu_i + \epsilon_{it}$$

To explore mediation, we follow the steps outlined by Baron and Kenny (1986), adapted for panel data using GMM. First, we regress gender diversity on governance variables and controls:

$$Gender_Diversity_{it} = \phi Governance_{it} + \gamma Controls_{it} + \mu_i + \epsilon_{it}$$

Second, we introduce gender diversity into the financial risk equation:

$$Financial_Risk_{it} = \beta Governance_{it} + \lambda Gender_Diversity_{it} + \gamma Controls_{it} + \mu_i + \epsilon_{it}$$

A mediating effect is present when the inclusion of gender diversity reduces the size or significance of the direct effects of governance variables. If the effect disappears, mediation is full; if it is attenuated but still significant, it is partial.

This two-stage empirical strategy enables us to test both direct effects of governance variables and the indirect role of board gender diversity in shaping SME financial resilience.

RESULTS

The empirical analysis broadly supports our expectations and reveals strong interactions between governance characteristics and board diversity in shaping financial outcomes. The Shannon index, used to capture gender diversity on the board, shows a significant and negative relationship with financial risk. This reinforces previous literature suggesting that diversity enhances the board's ability to monitor, question decisions, and avoid excessive risk-taking (Adams & Ferreira, 2009; Post & Byron, 2015; Sila et al., 2016).

Board size, as expected, is positively related to financial risk, likely due to coordination inefficiencies and reduced speed in strategic decision-making in larger groups (Yermack, 1996; Pathan, 2009). Notably, when gender diversity is included in the model, the direct effect of board size becomes non-significant, suggesting that the board's demographic composition (not its absolute size) plays a more crucial role in risk moderation.

CEO duality does not significantly influence financial risk, contradicting agency theory predictions. This neutrality may be explained by the SME context, where CEO-chair duality is common and often necessary for efficient leadership (Donaldson & Davis, 1991; Krause et al., 2014).

The ownership structure also demonstrates complex patterns. Director ownership follows a U-shaped curve: moderate levels lower risk due to aligned interests (Morck et al., 1988), while higher levels increase risk, possibly due to entrenchment and reduced oversight (Fahlenbrach & Stulz, 2009). Importantly, this relationship is fully mediated by gender diversity, indicating that board ownership fosters diversity, which in turn leads to lower risk.

In contrast, CEO ownership maintains a stable, negative association with financial risk and is not mediated through diversity. This points to a strong alignment of interests and suggests that CEOs with equity stakes are more financially prudent (Sila et al., 2016).

Ownership concentration (through the largest shareholder, Herfindahl index, and Cubbin-Leech index) consistently correlates with higher financial risk. These results confirm the notion that dominant shareholders may pursue personal agendas at the expense of firm-wide stability (La Porta et al., 1999; Young et al., 2008). This concentration of power can be particularly damaging in SMEs with fewer counterbalances.

Ownership identity also plays a crucial role. Family ownership shows a protective effect, associated with lower financial risk, possibly due to long-term horizons, succession concerns, and reputational incentives (Anderson & Reeb, 2003; Chrisman et al., 2004). Conversely, firms owned by institutional investors or corporations are significantly riskier, reflecting pressures to deliver short-term returns or align the firm's strategy with group interests (Bushee, 2001; Thomsen & Pedersen, 2000).

The mediation analysis confirms the structural role of gender diversity. It fully mediates the influence of board size and director ownership on risk and partially mediates the impact of family and institutional ownership. These results suggest that gender diversity is not only a beneficial attribute in its own right but also a key channel through which broader governance features impact risk exposure (Bernile et al., 2018; Joecks et al., 2021).

Together, these findings underscore the multifaceted nature of corporate governance in SMEs and highlight the central role of gender-diverse boards in fostering financial resilience.

CONCLUSION

This study offers a comprehensive assessment of how corporate governance mechanisms influence financial risk in Spanish SMEs, emphasizing the mediating role of gender diversity on the board. The findings provide relevant theoretical and practical implications, highlighting both the complexity and the critical importance of governance design in ensuring financial resilience in this specific segment of the economy.

From a theoretical standpoint, our research contributes to the governance literature by integrating board gender diversity not simply as a variable of interest but as a mediating mechanism. Prior research has primarily emphasized the direct benefits of gender diversity in terms of risk aversion, monitoring, or decision quality (Adams & Ferreira, 2009; Post & Byron, 2015; Căpraru et al., 2025). Our results go a step further by demonstrating how gender diversity can modify or transmit the effects of other governance structures, thereby acting as a strategic channel through which board configuration and ownership concentration exert their influence.

In particular, the full mediation observed in the relationships between board size and director ownership with financial risk underlines the transformative role of diversity. These findings suggest that it is not merely the number of directors or their ownership stakes that matter, but how these characteristics influence the board's demographic composition and deliberative quality. Diversity,

especially gender diversity, brings varied perspectives, fosters debate, and counters homogeneity, which are essential for risk-sensitive governance (Bear et al., 2010).

Additionally, our focus on SMEs enhances the originality of the study. Much of the literature on corporate governance and risk has focused on large listed companies. SMEs, however, operate under different constraints, such as concentrated ownership, informal control structures, and limited external scrutiny (Miller et al., 2007). Our findings demonstrate that traditional governance levers (such as CEO duality or board size) do not operate identically in SMEs. For instance, CEO duality was found to be irrelevant to risk levels, which supports the idea that SMEs may benefit from unified leadership due to resource constraints and agility needs.

Furthermore, the classification of ownership identity adds nuance to the debate. That family firms exhibit lower financial risk supports arguments regarding their long-term orientation, reputational concern, and relational capital (Anderson & Reeb, 2003). In contrast, the higher risk associated with institutional and corporate shareholders may reflect short-term performance pressures or conflicting strategic interests (Bushee, 2001). However, our mediation analysis shows that gender diversity can attenuate these effects, especially in institutionally owned SMEs, suggesting that diversity may serve as a counterbalance to otherwise risk-inducing structures.

From a policy perspective, these findings advocate for stronger institutional support for board diversity in SMEs. While much attention has been paid to listed firms, SMEs represent the backbone of most economies and face increasing complexity and uncertainty. National and regional bodies should consider extending diversity guidelines, offering incentives, or providing governance training tailored to SMEs. In line with EU-level recommendations (European Commission, 2020; European Institute for Gender Equality, 2023), promoting gender-inclusive governance in SMEs is a means to enhance financial sustainability and competitiveness.

For practitioners, the study delivers actionable insights. SME founders, investors, and advisors should consider not just formal governance variables but also how these elements influence or inhibit diversity. Investing in a balanced, inclusive board can yield benefits beyond social equity, it can materially reduce financial risk and enhance decision-making resilience.

Methodologically, the study demonstrates the value of using advanced panel techniques such as System GMM, combined with sequential mediation testing. This approach improves causal inference and highlights the layered nature of governance effects, moving beyond linear or single-equation models. Future research should consider replicating this methodology in other national contexts or extending the mediation framework to other forms of diversity, such as educational background or professional experience.

Limitations must also be acknowledged. The study is confined to Spanish SMEs in the pre-COVID period, limiting the external validity of the findings. Moreover, while the Shannon index is a robust measure of diversity, it does not capture informal dynamics such as inclusion culture or power asymmetries on the board. These elements warrant further qualitative or mixed-method inquiry.

In conclusion, this study identifies gender diversity not only as a determinant of financial resilience but also as a mechanism through which governance structures interact. It enriches theoretical debates, offers practical guidance, and calls for a reframing of SME governance policies. By moving beyond surface-level variables to examine how governance features interact, and by emphasizing diversity's structural role, the research provides a strong foundation for future exploration and institutional reform.

REFERENCES

Adams, R. B., & Ferreira, D. (2009). Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics*, 94(2), 291–309.

- Altman, E., Sabato, G., & Wilson, N. (2010). The value of non-financial information in SME risk management. *Journal of Credit Risk*, 6(2), 95–127.
- Anderson, R. C., Mansi, S. A., & Reeb, D. M. (2004). Board characteristics, accounting report integrity, and the cost of debt. *Journal of Accounting and Economics*, 37(3), 315–342.
- Anderson, R. C., & Reeb, D. M. (2003). Founding-family ownership and firm performance: Evidence from the S&P 500. *Journal of Finance*, 58(3), 1301–1328.
- Ararat, M., Aksu, M., & Cetin, A. T. (2020). How board diversity affects firm performance in emerging markets: Evidence on channels in controlled firms. *Corporate Governance: An International Review*, 28(2), 106–128.
- Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29–51.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173–1182.
- Bear, S., Rahman, N., & Post, C. (2010). The impact of board diversity and gender composition on corporate social responsibility and firm reputation. *Journal of Business Ethics*, 97(2), 207–221.
- Berger, A. N., & Udell, P. (2006). Capital structure and firm performance: A new approach to testing agency theory and an application to the banking industry. *Journal of Banking & Finance*, 30(4), 1065–1102.
- Bernile, G., Bhagwat, V., & Rau, P. R. (2018). Board diversity, firm risk, and corporate policies. *Journal of Financial Economics*, 127(3), 588–612.
- Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115–143.
- Bushee, B. J. (2001). Do institutional investors prefer near-term earnings over long-run value? *Contemporary Accounting Research*, 18(2), 207–246.
- Căpraru, B.; Minguez-Vera, A. & Sprincean, N. (2025). Does Gender Diversity on the Boards of Independent Fiscal Institutions Matter for Achieving Better Fiscal Outcomes? *Social Science Research Network (SSRN)*
- Chen, C. R., Lin, C., & Yi, B. (2008). CEO duality and firm performance: An endogenous explanation. *Corporate Governance: An International Review*, 16(1), 58–74.
- Chrisman, J. J., Chua, J. H., & Litz, R. A. (2004). Comparing the agency costs of family and non-family firms: Conceptual issues and exploratory evidence. *Entrepreneurship Theory and Practice*, 28(4), 335–354.
- Cowling, M., Liu, W., Ledger, A., & Zhang, N. (2015). What really happens to small and medium-sized enterprises in a global economic recession? UK evidence on sales and job dynamics. *International Small Business Journal*, 33(5), 488–513.
- Cubbin, J., & Leech, D. (1983). The effect of shareholding dispersion on the degree of control in British companies: Theory and measurement. *The Economic Journal*, 93(370), 351–369.
- Donaldson, L., & Davis, J. H. (1991). Stewardship theory or agency theory: CEO governance and shareholder returns. *Australian Journal of Management*, 16(1), 49–64.
- European Commission. (2020). 2020 Report on gender equality in the EU. <https://ec.europa.eu/info/policies/justice-and-fundamental-rights/gender-equality>
- European Institute for Gender Equality (EIGE). (2023). Gender Equality Index 2023: The governance dimension. Publications Office of the European Union.
- Fahlenbrach, R., & Stulz, R. M. (2009). Managerial ownership dynamics and firm value. *Journal of Financial Economics*, 92(3), 342–361.
- Fayyaz, U.E.R.; Jalal, R.N.U.D., Venditti, M. & Minguez-Vera, A. (2023). Diverse boards and firm performance: The

- role of environmental, social and governance disclosure. *Corporate Social Responsibility and Environmental Management*, 30, 1457–1472.
- García-Izquierdo, A. L., Fernández-Muñiz, B., & Llorente, R. M. (2021). Does board gender diversity reduce firm risk? *Corporate Governance: An International Review*, 29(1), 46–60.
- Herfindahl, O. C. (1950). *Concentration in the U.S. Steel Industry* (Doctoral dissertation). Columbia University.
- Jensen, M. C. (1993). The modern industrial revolution, exit, and the failure of internal control systems. *Journal of Finance*, 48(3), 831–880.
- Joecks, J., Pull, K., & Vetter, K. (2021). More than meets the eye: How board gender diversity affects firm risk. *Journal of Business Research*, 130, 622–630.
- Krause, R., Semadeni, M., & Cannella, A. A. (2014). CEO duality: A review and research agenda. *Journal of Management*, 40(1), 256–286.
- La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (1999). Corporate ownership around the world. *Journal of Finance*, 54(2), 471–517.
- Lucas-Pérez, M. E.; Mínguez-Vera, A. & Ortín-Tomás, M. P. (2022). Diversidad de género en el consejo de administración y endeudamiento. *Revista de Trabajo y Seguridad Social. CEF*, 468
- Martín-Ugedo, J. F. y Mínguez-Vera, A. (2023). Board of directors and firm debt in Spanish SMEs: A power perspective. *European Research on Management and Business Economics*, 29 (3), 100231.
- Miller, D., Le Breton-Miller, I., & Lester, R. H. (2007). Family firm governance, strategic conformity, and performance: Institutional vs strategic perspectives. *Organization Science*, 18(5), 713–728.
- Morck, R., Shleifer, A., & Vishny, R. W. (1988). Management ownership and market valuation: An empirical analysis. *Journal of Financial Economics*, 20, 293–315.
- Nguyen, T., Locke, S., & Reddy, K. (2015). Does boardroom gender diversity matter? Evidence from a transitional economy. *International Review of Economics & Finance*, 37, 184–202.
- OECD SME and Entrepreneurship Outlook 2022. OECD Publishing.
- Pathan, S. (2009). Strong boards, CEO power and bank risk-taking. *Journal of Banking & Finance*, 33(7), 1340–1350.
- Post, C., & Byron, K. (2015). Women on boards and firm financial performance: A meta-analysis. *Academy of Management Journal*, 58(5), 1546–1571.
- Sánchez-Marín, G.; Lucas-Pérez, M. E.; Baixauli-Soler, S.; Main, B. G. & Mínguez-Vera, A. (2022). Excess executive compensation and corporate governance in the United Kingdom and Spain: A comparative analysis. *Managerial and Decision Economics*, 43 (7), 2817-2837.
- Shannon, C. E. (1948). A mathematical theory of communication. *The Bell System Technical Journal*, 27(3), 379–423.
- Shleifer, A., & Vishny, R. W. (1997). A survey of corporate governance. *Journal of Finance*, 52(2), 737–783.
- Sila, V., Gonzalez, A., & Hagendorff, J. (2016). Women on board: Does boardroom gender diversity affect firm risk? *International Review of Financial Analysis*, 47, 86–98.
- Tang, Y. (2017). CEO duality and firm performance: The moderating roles of other executives and blockholding outside directors. *Management Decision*, 55(6), 1217–1235.
- Thomsen, S., & Pedersen, T. (2000). Ownership structure and economic performance in the largest European companies. *Strategic Management Journal*, 21(6), 689–705.
- Yermack, D. (1996). Higher market valuation of companies with a small board of directors. *Journal of Financial Economics*, 40(2), 185–211.
- Young, M. N., Peng, M. W., Ahlstrom, D., Bruton, G. D., & Jiang, Y. (2008). Corporate governance in emerging

economies: A review of the principal–principal perspective. *Journal of Management Studies*, 45(1), 196–220.

Zahra, S. A. (2005). Entrepreneurial risk taking in family firms. *Family Business Review*, 18(1), 23–40.

ACKNOWLEDGEMENTS

This work was supported by Fundación Séneca (Spain), under grant 21947/PI/22 and Fundación Cajamurcia.

COMPARISON OF COUNTRIES WITH SOCIO-ECONOMIC INDICATORS ACCORDING TO THEIR DEVELOPMENT LEVELS

Aslı Örgerim

Burdur Mehmet Akif Ersoy University, Burdur, Türkiye, agode@mehmetakif.edu.tr
<https://orcid.org/0000-0001-7785-6200>

Mehmet Tepeli

Burdur Mehmet Akif Ersoy University, Burdur, Türkiye, mtepli@mehmetakif.edu.tr
<https://orcid.org/0000-0001-6054-9562>

Adnan Kalkan

Burdur Mehmet Akif Ersoy University, Burdur, Türkiye, adnankalkan@mehmetakif.edu.tr
<https://orcid.org/0000-0002-2270-4100>

ABSTRACT

Countries are divided into three classes: developed, developing and undeveloped. This study aims to compare countries with different levels of development in terms of basic socio-economic indicators such as education, health, income, corruption, fertility rate, military expenditures and information infrastructure. The data used were evaluated with correlation and regression analyses, and the results were supported with graphs and tables. The analyses show that in developed countries, per capita income, education level and health expenditures are higher, while fertility rates and corruption levels are lower. These findings reveal that the development levels of countries are strongly related to socio-economic indicators.

KEY WORDS

Developed countries, developing countries, undeveloped countries, socio-economic indicators

INTRODUCTION

In today's world, there are significant differences in socio-economic development levels among countries. These differences should be analyzed not only through economic indicators, but also through various social and structural indicators such as education, health, fighting against corruption, population structure, information infrastructure and military power (Todaro & Smith, 2020). The level of development can be defined not only by the economic size of a country, but also by multidimensional elements such as the level of social welfare, access to health services, educational opportunities, quality of governance and life satisfaction of the people (Sen, 1999; UNDP, 2023).

In the literature, countries are generally classified under the categories of “developed”, “developing” and “undeveloped”. These classifications are made on the basis of criteria such as the production capacity of the countries, the level of national income per capita, the adequacy of infrastructure and access to social services (World Bank, 2023). Developed countries generally have high industrial and technological capacity, high income levels, advanced social service systems and effective public administration (OECD, 2022). Developing countries, on the other hand, are countries that continue the industrialization process, aim for economic growth and social development but still experience infrastructure and service deficiencies in some basic areas (UNCTAD, 2021). Undeveloped or underdeveloped countries are countries that have serious problems in accessing basic public

services, have low per capita income and inadequate education and health indicators (Todaro & Smith, 2020).

In this study, comparisons were made between the development levels of countries based on their socio-economic indicators. Indicators such as education level (*primary school, secondary school, undergraduate and above*), health expenditures (*per capita and as a percentage of GDP*), income per capita, fertility rate, unemployment rate, personnel ratio in the armed forces, and service import and export in the information sector were examined in detail (World Bank, 2023; WHO, 2023). In addition, governance indicators such as corruption control were considered as a critical element affecting development levels (Kaufmann, Kraay & Mastruzzi, 2011).

Socio-economic indicators are fundamental tools for understanding where countries stand in the development process and in which areas they have made progress (UNDP, 2023). For example, a high level of education increases not only individual well-being but also social productivity and democratic participation (Barro & Lee, 2013). Similarly, an increase in health expenditures increases the quality of life and life expectancy (Bloom & Canning, 2000). The relationships between these indicators are very important in terms of evaluating the effects of countries' social policies and creating future development strategies.

In this context, the aim of this study is to reveal the common characteristics of countries with different levels of development in terms of the above-mentioned socio-economic indicators and in which areas they differ. The analyses not only evaluate whether the structural differences between countries are statistically significant, but also express the level of relationship between development indicators and socio-economic performance with numerical data.

METHODOLOGY

The development levels of countries can be analyzed through many indicators such as education, health, economy, fight against corruption, fertility rates, digitalization, unemployment and military structure. Studies on these indicators in the literature reveal that development differences between countries are closely related not only to economic size but also to social and structural factors.

Barro and Lee (2013) analyzed the relationship between the education level of countries and per capita income and showed that the increase in higher education rates contributes to economic development in the long term. Hanushek and Woessmann (2012) emphasized that the quality of education is as important as the duration of education in determining economic growth.

Bloom and Canning (2000) argued that healthy individuals are more productive and that health investments directly support economic growth. According to World Health Organization data, health expenditure per capita is higher in developed countries, both in absolute value and as a percentage of GDP.

Mauro (1995) stated that corruption slows down economic growth and foreign investors avoid countries with high corruption rates. According to the Transparency International (2023) report, there is a strong positive relationship between corruption control and the level of development.

Becker (1992), evaluating the effect of economic development on the fertility rate, stated that as the level of welfare increases, families prefer to have fewer children and focus more on individual investments. This is one of the main reasons for low fertility rates in developed countries.

OECD (2020) data shows that IT and digital service exports are more developed in high-income countries. Developing countries, on the other hand, mostly exhibit an import-heavy profile despite their digital infrastructure investments.

According to ILO (*International Labor Organization*) reports, unemployment rates are generally lower in developed countries and labor markets are more flexible and orderly. However, some studies also state that the relationship between unemployment rates and income levels is not always statistically significant.

According to data published by the Stockholm International Peace Research Institute (*SIPRI*), although total military spending is high in developed countries, the ratio of armed force personnel to GDP is lower than in undeveloped countries. This shows that military structures are modernizing and dependence on manpower is decreasing. The literature we reviewed largely coincides with the statistical analyses obtained in our study. It is consistent with the findings in the literature that indicators such as education, health, income, corruption control and fertility are directly related to the level of development.

In this study, the differences in socio-economic indicators according to the development levels of countries has been examined. The development level was considered under three main categories: developed, developing and undeveloped countries according to the World Bank classification. The developed countries group includes Canada, France, Germany, Italy, Japan, Netherlands, England, America and Switzerland. The developing countries are China, Argentina, Czech Republic, Egypt, India, Russia, Türkiye and Brazil. The undeveloped countries category includes Afghanistan, Bangladesh, Colombia, Guinea, Nepal, Niger, Uganda and Venezuela.

Data were obtained from open source databases of international institutions such as the World Bank, IMF, WHO and Transparency International. Time series data was not used in the study. Data from years prior to 2021 were not available in sufficient quantities. The data used includes the average of data from 2021 to 2024. Correlation analyses and simple linear regression analyses were used in the study. The analyses were conducted using the Python programming language. Education level (*primary school to doctorate*), per capita income, total population, health expenditures (*per capita and GDP percentage*), fertility rate, corruption control (*estimated value and percentile ranking*), unemployment rate, armed force personnel ratio and information services (*export/import ratio*) are the main analyzed variables.

RESULTS

Analyses and Results Regarding Relationships Between Income and Education Variables

Figure 1 shows the correlation matrix results between income and education variables.

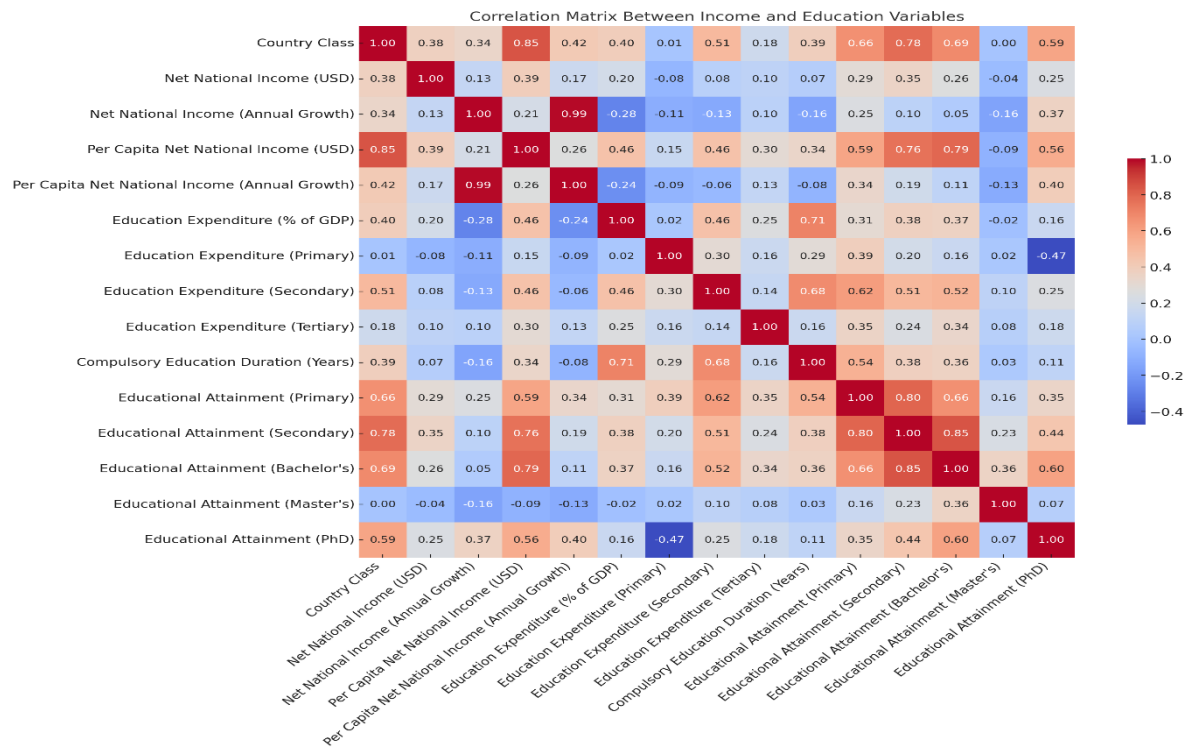


Figure 1. Correlation Matrix Between Income and Education Variables

Strong positive correlations were observed between country class and education levels; there was a positive relationship of 66% at primary school level, 78% at secondary school level and 69% at undergraduate level. These findings show that as the level of development increases, participation rates in education also increase.

Similarly, a high level of correlation was found between net national income per capita and secondary (76%) and undergraduate (79%) education levels; this reveals that as the income level increases, the probability of individuals to reach higher levels of education increases.

It was determined that education expenditures were also significantly related to the secondary education level, 51%; this situation shows that the allocation of public resources to the field of education directly affects the level of education.

On the other hand, significant but relatively lower correlations were obtained between doctorate level and country class and income. The results of the regression analysis are given in Table 1.

Table 1. Regression Results

Dependent variable (Education level)	R ²	P-value (Income)	Coefficient (Income)	Sig. (p<.05)
Bachelor's degree	.631	.000002	4.84*10 ⁻⁶	Yes
Master's degree	.009	.660	-1.65*10 ⁻⁵	No
Doctorate	.312	.0037	2.74*10 ⁻⁷	Yes

According to the regression analysis examining the relationships between net national income per capita and education levels, income level has a significant and strong effect at the undergraduate level. The R² value of this model is 0.631, and income per capita explains 63% of the change in the rate of individuals with a bachelor's degree. The regression coefficient is positive ($\beta = 4.84 \times 10^{-6}$) and

this effect is statistically significant ($p = 0.000002 < 0.05$). This finding shows that as the income level increases, the rate of individuals with a bachelor's degree also increases.

No significant relationship was found between income per capita and graduation rate at the graduate level. The R^2 value of the model is only 0.009, which is not statistically significant ($p = 0.660$). This suggests that the rate of individuals with a master's degree may be independent of income level.

In the analysis at the doctorate level, a positive and significant relationship emerged between income level and education level. The R^2 value of the model is 0.312, and income level explains 31% of the change in the rate of individuals with a doctorate. The regression coefficient is positive, albeit at a low level ($\beta = 2.74 \times 10^{-7}$), and this effect is statistically significant ($p = 0.0037 < 0.05$). This result shows that an increase in income level also increases the rate of individuals with a doctorate degree, but it can be said that this relationship is more limited compared to the one at the undergraduate level. Based on these analyses, it can be said that as income level increases, the rates of undergraduate and doctorate education also increase.

Analyses and Results of Relationships Between Income and Population Variables

There is a strong correlation of 85% between net national income per capita and country class; income per capita is generally higher in more developed countries. A correlation of 48% is observed between total population and net national income, which shows that total national income tends to increase as the population increases.

There is a negative correlation of 57% between fertility rate and country class; while fertility rate is lower in developed countries, there is also a negative correlation of 50% between fertility rate and income per capita, meaning that as income level increases, fertility rate decreases. Figure 2 shows the correlation matrix between income and population variables.

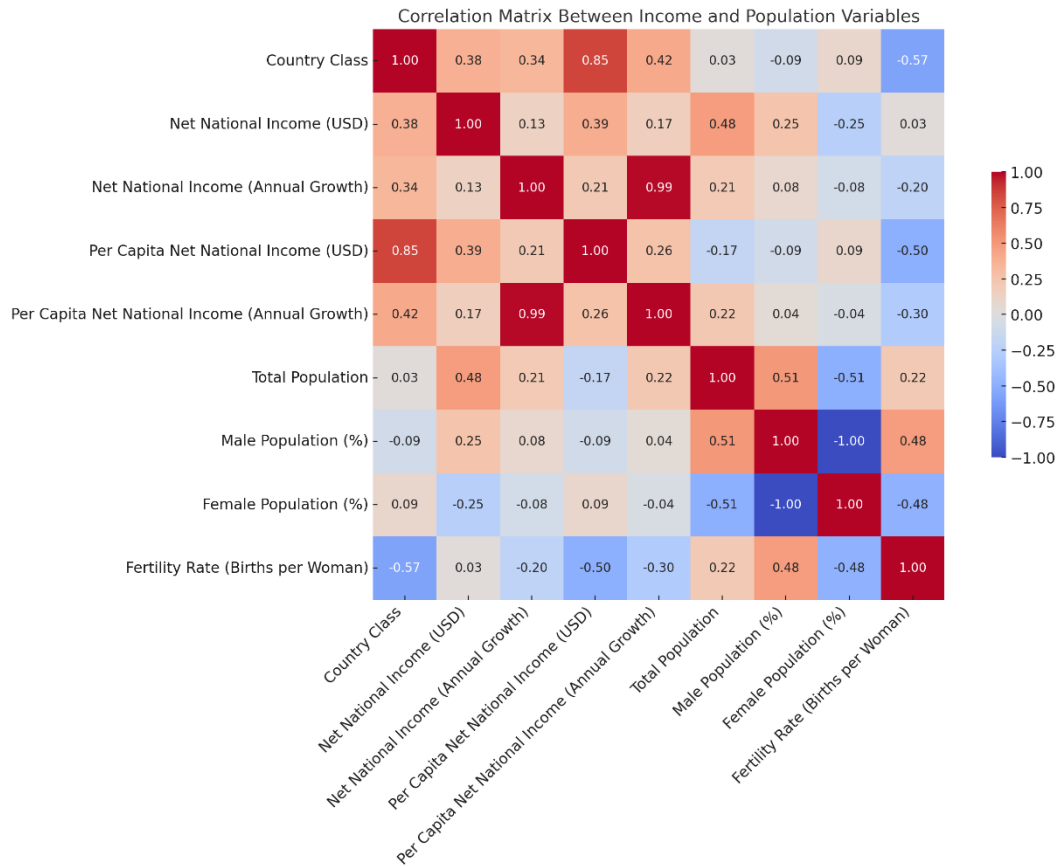


Figure 2. Correlation Matrix Between Income and Population Variables

The results of the regression analysis on the variables with the highest correlations, income and fertility rate and income and total population, are shown in Table 2.

Table 2. Regression Results

Dependent variable	R ²	P-value (Income)	Coefficient (Income)	Sig. (p<.05)
Fertility rate	.255	.0101	-3.6*10 ⁻⁵	Yes
Total population	.030	.4046	-3142.81	No

Simple linear regression analysis between net national income per capita and fertility rate shows that income level has a significant effect on fertility. The R² value of the model is 0.255, which shows that income level explains approximately 26% of the change in fertility rate. The regression coefficient is negative ($\beta = -0.000036$) and this relationship is statistically significant ($p = 0.0101 < 0.05$). This result reveals that there is a significant decrease in the number of births per woman as the income levels of countries increase. Therefore, there is an inverse and significant relationship between the level of economic welfare and fertility.

On the other hand, no significant relationship was found in the regression analysis between income per capita and total population. The R² value of the model is 0.030, the regression coefficient is also negative in this model ($\beta = -3,142.81$), but it is not statistically significant ($p = 0.4046 > 0.05$). This finding reveals that the income level is not a sufficient and significant indicator in explaining the total population size of countries.

According to these results, there is no significant relationship between income and total population. However, a significant relationship was observed between income and fertility rate. It was determined that the fertility rate decreases as income increases.

Analyses and Results of Relationships Between Income and Health Expenditure Variables

There is a strong positive correlation of 87% between net national income per capita and health expenditure per capita; this shows that as income level increases, health expenditure per capita also increases.

A positive correlation of 65% is observed between health expenditure and country class; more developed countries allocate a larger portion of their gross domestic product (GDP) to health expenditure.

In addition, there is a moderate correlation of 52% between net national income and health expenditure, and it is seen that total health expenditure increases as economic size increases. The correlation matrix result between income and health expenditure variables is given in Figure 3.

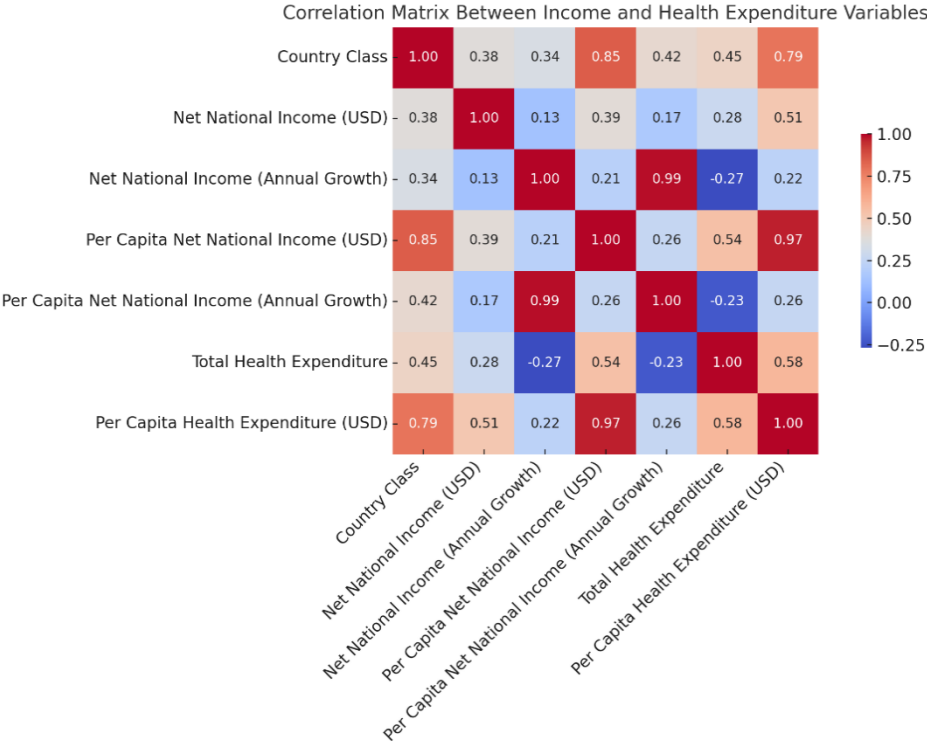


Figure 3. Correlation Matrix Between Income and Health Expenditure Variables

The results of the regression analysis on the income and health expenditure per capita variables with the highest correlations, the income and health expenditure (% GDP) ratio, are shown in Table 3.

Table 3. Regression Results

Dependent variable	R ²	P-value (Income)	Coefficient (Income)	Sig. (p<.05)
Health expenditure (% GDP)	.294	.0051	.1*10 ⁻⁵	Yes
Health expenditure per capita	.934	<.00001	.163134	Yes

When Table 3 is examined, the explanatory power of the model in terms of the ratio of countries' health expenditures to GDP is R² = 0.294, and the income per capita variable explains 29.4% of the variance on this ratio. The regression coefficient is positive with β = 0.000001, and this relationship is statistically significant (p = 0.0051 < 0.05). This result shows that as the economic level increases, countries tend to increase their health expenditures relative to their GDP.

On the other hand, the model exhibits a very high explanatory power in terms of the level of health expenditure per capita (R² = 0.934). The regression coefficient shows a strong positive relationship with β = 0.163134, and this relationship is highly significant (p<0.00001). This finding reveals that the increase in the income level also increases the health expenditure per capita, and this relationship finds strong statistical support.

These results show that in countries with higher incomes, per capita health expenditure and the share of health expenditure in GDP increase significantly as economic size increases.

Analyses and Results of Relationships Between Income and Labor Force Variables

There is a moderate negative correlation of -62% between net national income per capita and unemployment rate; this shows that unemployment rate decreases as income level increases. Similarly, there is a negative correlation of -58% between country class and unemployment rate; unemployment rates are lower in more developed countries. In addition, a negative correlation of -45% is observed between the rate of armed forces personnel and country class, and it is seen that the rate of personnel serving in the armed forces is lower in developed countries. The correlation matrix result between income and labor force variables is given in Figure 4.

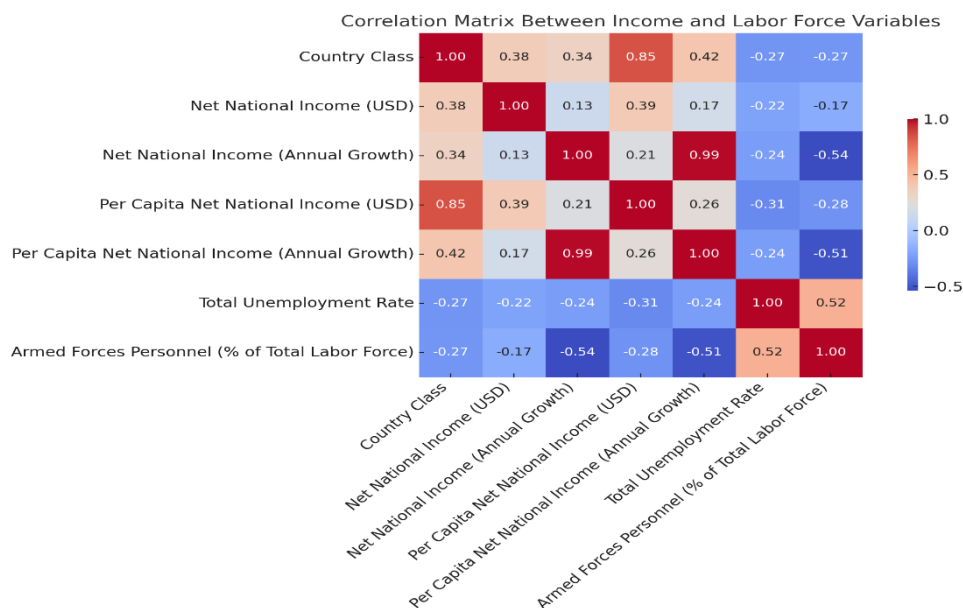


Figure 4. Correlation Matrix Between Income and Labor Force Variables

The results of the regression analysis on the variables with the highest correlations, income and total unemployment rate and income and armed forces personnel (% labor force), are shown in Table 4.

Table 4. Regression Results

Dependent variable	R²	P-value (Income)	Coefficient (Income)	Sig. (p<.05)
Tot. unemployment rate	.098	.1276	-4.55*10 ⁻⁷	No
Armed forces personnel (% labor force)	.079	.1727	-1.1*10 ⁻⁷	No

According to the regression analysis between net national income per capita and total unemployment rate, income level does not have a significant effect on unemployment. The R² value of the model is 0.098, and this model explains only 9.8% of the change in unemployment rate. The regression coefficient is negative ($\beta = -4.55 \times 10^{-7}$), which shows that the unemployment rate tends to decrease as income increases, but this effect is not statistically significant ($p = 0.1276 > 0.05$).

Similarly, no significant relationship was found between income per capita and the armed forces personnel rate. The R² value of this model is 0.079, and the explanatory level is quite low. The regression coefficient is again negative ($\beta = -1.10 \times 10^{-7}$), but this effect is not statistically significant ($p = 0.1727 > 0.05$). This result shows that the military personnel ratio of countries is shaped independently of the level of economic welfare.

According to these results, there is no statistically significant relationship between income and both the unemployment rate and the armed forces personnel ratio. Although a decreasing trend is observed as income increases in both cases, these effects are weak and insignificant. Therefore, the unemployment rate and the armed forces personnel ratio could not be directly and strongly associated with the income level.

Analyses and Results of Relationships Between Income and Corruption Variables

There is a strong positive correlation of 82% between net national income per capita and corruption control; as the income level increases, corruption control reaches a better level. Similarly, a strong positive correlation of 79% is observed between country class and corruption control; corruption is controlled more effectively in more developed countries. In addition, there is a strong positive correlation of 85% between the percentile ranking of corruption control and income per capita; countries with higher income levels are in higher positions in the corruption control ranking. The correlation matrix between income and corruption variables is given in Figure 5.

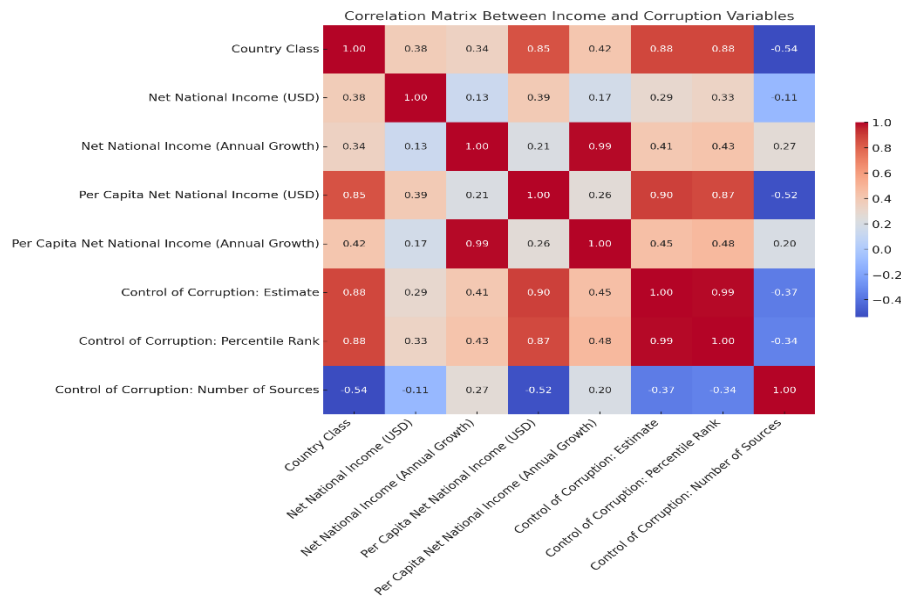


Figure 5. Correlation Matrix Between Income and Corruption Variables

The results of the regression analysis on the variables with the highest correlations, income and corruption control (estimated value) and income and corruption control (percentile rank), are shown in Table 5.

Table 5. Regression Results

Dependent variable	R ²	P-value (Income)	Coefficient (Income)	Sig. (p<.05)
Corruption control (estimated value)	.802	.145*10 ⁻⁸	.000048	Yes
Corruption control (percentile rank)	.763	1.22*10 ⁻⁸	.000013	Yes

According to the regression analysis between net national income per capita and corruption control indicators, income level has a strong and significant effect on perceived control of corruption.

In the first model based on the estimated value, R² value was obtained as 0.802. This result shows that income per capita explains approximately 80.2% of the variance in corruption control. The regression coefficient is positive ($\beta = 0.000048$) and this effect is statistically significant ($p < 0.000001$). This finding reveals that as the level of economic welfare increases, the ability of countries to control corruption also improves.

Similarly, a highly significant relationship was found in the analysis based on the percentile ranking data of corruption control. The R² value of this model is 0.763, indicating that the relationship between the variables is quite strong. The regression coefficient is again positive ($\beta = 0.000013$) and the effect is statistically significant ($p < 0.000001$). This result shows that countries with higher income levels tend to rank higher in the fight against corruption.

These results show that countries with higher incomes have better corruption control in terms of both level and rank.

Analyses and Results Regarding Relationships Between Income and IT Variables

Figure 6 shows the correlation matrix results between income and IT variables.

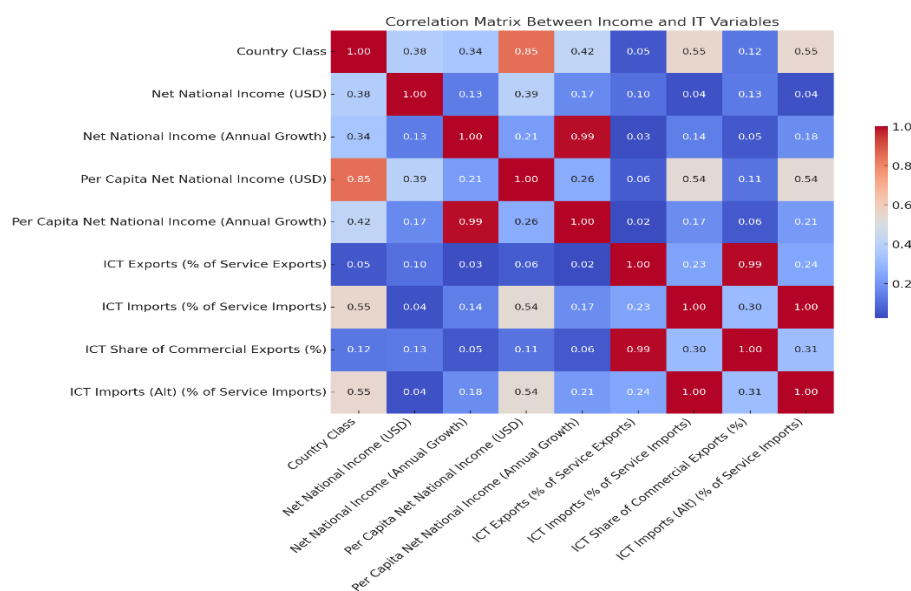


Figure 6. Correlation Matrix Between Income and IT Variables

There is a strong positive correlation of approximately 75% between net national income per capita and the IT services ratio in commercial service exports; this shows that as the income level increases, the IT service exports of countries also increase. A moderate positive correlation of approximately 60% is observed between country class and communication and computer service exports, and this ratio is higher in developed countries. In addition, there is a moderate positive correlation of 52% between net national income and IT-related variables; that is, countries with larger economies tend to import more IT services. The regression analysis results are given in Table 6.

Table 6. Regression Results

Dependent variable	R ²	P-value (Income)	Coefficient (Income)	Sig. (p<.05)
IT services (% service export)	.004	.7683	.592*10 ⁻⁶	No
IT services (% service import)	.290	.0055	4.51*10 ⁻⁶	Yes
IT and other commercial services (% commercial service export)	.013	.5929	1.10*10 ⁻⁶	No

According to the regression analysis between net national income per capita and IT services exports, the effect of income level on this variable is not statistically significant ($p = 0.7683 > 0.05$). The R² value is only 0.004, and the explanatory power of income level on this variable is quite low. On the other hand, a significant relationship was found between income per capita and IT services imports. The R² value of the model is 0.290, which provides a moderate level of explanatory power between the variables. The regression coefficient is positive ($\beta = 4.51 \times 10^{-6}$) and this relationship is statistically significant ($p = 0.0055 < 0.05$). This finding shows that as the income level increases, the rate of IT and communication services imported by countries also increases.

Finally, no significant relationship was found in the analysis between the share of IT and other commercial services in exports and per capita income ($p = 0.5929 > 0.05$). The R^2 value is only 0.013, and the explanatory power of the income level on this variable is quite low. This result shows that the structural share of digitalization in exports can be shaped independently of the income level.

CONCLUSION

This study reveals that the development levels of countries are strongly related to socio-economic indicators. While indicators such as education level, health expenditures and corruption control are highly related to income level, indicators such as unemployment and armed forces personnel ratio exhibited lower or insignificant relationships.

The analysis results show that countries should focus not only on macroeconomic figures but also on health, education and governance indicators when forming their economic and social development policies.

It is of critical importance in this process that developing and undeveloped countries prioritize investments in education infrastructure and health, and develop transparency mechanisms in the fight against corruption.

Another important contribution of the study was the findings on information services. In this field, it was observed that developed countries have an advantage in terms of digital service exports, while developing countries tend to import digital services. This situation suggests that digital development should also be included among the socio-economic development indicators.

As a result, the areas of education, health, income and governance stand out as the main determinants in explaining the development levels of countries; The relationships between these indicators allow us to better understand the development process.

REFERENCES

- Barro, R. J. & Lee, J. W. (2013). A new data set of educational attainment in the world, 1950–2010. *J. of Development Economics*, 104, p. 184–198. <https://doi.org/10.1016/j.jdeveco.2012.10.001>
- Becker, G. S. (1992). Fertility and the economy. *Journal of Population Economics*, 5 (3), p. 185–201.
- Bloom, D. E. & Canning, D. (2000). The health and wealth of nations. *Science*, 287 (5456), p. 1207–1209. <https://doi.org/10.1126/science.287.5456.1207>
- Hanushek, E. A. & Woessmann, L. (2012). The economic benefit of educational reform in the European Union. *CESifo Economic Studies*, 58 (1), p. 73–109.
- Kaufmann, D., Kraay, A. & Mastruzzi, M. (2011). The Worldwide Governance Indicators: Methodology and Analytical Issues. *Hague J. on the Rule of Law*, 3 (2), p. 220–246. <https://doi.org/10.1017/S1876404511200046>
- Mauro, P. (1995). Corruption and growth. *The Quarterly J. of Economics*, 110 (3), p. 681–712.
- OECD. (2022). *OECD Economic Outlook 2022*. OECD Publishing. <https://doi.org/10.1787/16097408>
- Sen, A. (1999). *Development as Freedom*. New York: Alfred A. Knopf.
- Todaro, M. P. & Smith, S. C. (2020). *Economic Development (13th ed.)*. Pearson Education.
- Transparency International. (2023). *Corruption Perceptions Index 2023*. <https://www.transparency.org/en/cpi/2023>
- UNCTAD. (2021). *World Investment Report 2021*. United Nations Conference on Trade and Development. <https://unctad.org>

UNDP. (2023). Human Development Report 2023. United Nations Development Programme.
<https://hdr.undp.org>

WHO. (2023). Global Health Expenditure Database. World Health Organization.
<https://apps.who.int/nha/database>

World Bank. (2023). World Development Indicators. <https://data.worldbank.org>

Statements & Declarations

The authors declare that no funds, grants, or other support were received during the preparation of this manuscript. The authors have no relevant financial or non-financial interests to disclose.

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by [Aslı Örgirim], [Mehmet Tepeli] and [Adnan Kalkan]. The first draft of the manuscript was written by [Aslı Örgirim] and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

THE IMPORTANCE OF FINTECH APPLICATIONS AND GREEN FINANCE: EVALUATION FROM A SUSTAINABILITY PERSPECTIVE

Yusuf Bahadır KAVAS

Amasya University, Amasya, Turkey, yusuf.kavas@amasya.edu.tr
<https://orcid.org/0000-0002-4838-7318>

Batuhan MEDETOĞLU

Burdur Mehmet Akif Ersoy University, Burdur, Turkey, bmedetoglu@mehmetakif.edu.tr
<https://orcid.org/0000-0002-8400-1232>

Arif SALDANLI

Istanbul University, Istanbul, Turkey, saldanli@istanbul.edu.tr
<https://orcid.org/0000-0001-9990-9510>

ABSTRACT

This study was conducted to examine and evaluate the concept of financial sustainability and the factors that affect it in quantitative and qualitative aspects. Countries that achieve financial sustainability make significant progress in implementing developmental policies. In this context, ESG scores are defined, and the functioning of these scores is analyzed. The concept of green finance, which has gained importance in recent years, and products and services in this field were evaluated. In addition, financial sustainability within the framework of the Twelfth Development Plan, Sustainable Development Goals, and related policies is analyzed. The concepts of renewable energy use and the FDI, which are important indicators of development and growth, are evaluated using quantitative data. Financial literacy, which refers to the knowledge, attitudes, and behaviors that will enable the implementation of these concepts, is explained, and its importance is emphasized. The concept of FinTech, which refers to the use of digital and innovative technologies in the financial sector, is defined, and its relationship with financial sustainability is revealed. A mixed-method approach was adopted in this study. The qualitative analysis focused on examining the relationship between policy documents and the Sustainable Development Goals. For the quantitative analysis, indicators obtained from the World Bank, International Monetary Fund, and other international sources were evaluated using descriptive statistical methods. Additionally, FinTech applications were analyzed and assessed within the framework of the mixed-method design. This study examines financial sustainability in a multidimensional way, evaluates the functioning of the concept, and explains the link between FinTech and sustainability through both national and international policies and digital applications.

KEYWORDS

Finance, Fintech, Financial Sustainability

INTRODUCTION

Financial sustainability refers to a business approach that is not only profit-oriented but also considers environmental impacts through the long-term and efficient use of economic resources and infrastructure (Friede, Busch & Bassen, 2015). Sustainable structures are created through practices and regulations to meet unlimited needs with limited resources. Today, these structures are used by countries, companies, and individuals and continue to be developed with supporting of artificial intelligence-based applications (Vinuesa et al., 2020). With the impact of globalization, these structures find more space in the policy-making processes of countries, and their usage rates are increasing rapidly (Stiglitz, 2017). Digitalization and institutionalization policies are important for

both businesses and governments. Simultaneously, these practices contribute to reducing the carbon footprint and increasing accessibility for individuals.

Financial sustainability is becoming increasingly important with the spread of digital technologies, especially in terms of environmental impact. The proliferation of artificial intelligence-based applications provides significant advantages in terms of time and space requirements. Many activities that caused carbon emissions in the past can be reduced by digital solutions, and thus, environmental damage can be prevented (Vinuesa et al., 2020). Therefore, following technological developments, their effective use by businesses and the development of policies in this direction by countries make significant contributions to financial sustainability (Arner, Barberis & Buckley, 2015).

This study is important for examining the elements of financial sustainability and evaluating within the scope of sustainability. The unique aspect of this study is that the relationship between financial sustainability and FinTech is addressed by evaluating it using different indicators. One of the contributions of this study to the literature is to consider financialization together with the policies implemented by countries on sustainability within the scope of globalization.

METHODOLOGY

This study was conducted to examine the basic elements of financial sustainability both qualitatively and quantitatively and to make evaluations. In this context, indicators reflecting the economic, environmental, and technological dimensions of sustainability were evaluated, and inferences were made for sustainability. The research was planned according to a mixed method approach, and a two-stage analysis was conducted. This study was explanatory and did not establish a causal relationship.

Using a qualitative approach, ESG scores, Turkey's Twelfth Development Plan, the United Nations Sustainable Development Goals, and current financial technology applications are evaluated, and financial sustainability is analyzed within the framework of national and international policies (International Monetary Fund, 2025; Global Footprint Network, 2025; Presidency of the Republic of Turkey, Strategy and Budget Directorate, 2025; Thomson Reuters, 2025; United Nations, 2025; World Bank, 2025).

A descriptive statistical method was used with a quantitative approach. The analysis was carried out using quantitative data obtained from the World Bank, OECD, International Energy Agency, and Thomson Reuters on ESG scores, Efficiency of Financial Institutions, sustainable energy investments, and renewable energy use. The data were evaluated mainly for the OECD countries. Inferences are based on the trend and fit between indicators, rather than direct statistical modeling.

RESULTS

The concept of money, which is an important element in the functioning of finance, has been affected by digital developments, and the use of virtual currencies has become possible. In addition, opportunities such as debit or credit cards enable the use of digital money. With the digitalization of banking activities, the use of mobile and Internet branches has become widespread, providing great convenience for both individuals and businesses. It becomes possible to carry out financial activities without going to the branch, without time or space limitations. The increase in the number of digital channel users also offers significant convenience for businesses. Today, supporting digitalization activities with artificial intelligence applications enables the development of new technologies for process management (Bughin et al., 2018).

The FinTech concept is defined as the use of digital and innovative technologies in financial services (Arner et al., 2015). The concept, which provides accessibility and convenience, is a set of activities for the use of financial products and services. FinTech, which increases speed, efficiency, and

effectiveness, has significant benefits for users and businesses (Gomber et al., 2018). The establishment of financially sustainable structures is also possible with FinTech. Unlike traditional methods, many areas, such as processing and analyzing big data and personalized financial advice, are also included in FinTech. The concept is used in many areas, such as banking, insurance, investment, and payment systems. In particular, banking FinTech, which has common application examples, continues to develop with artificial intelligence automation. Examples such as mobile and Internet branches, digital wallets, virtual currencies, insurance technologies, and digital payments are listed as outputs of the related technology. The use of the relevant concept by large masses is important for both institutions and national policies. FinTech embodies significant benefits as a set of systems with great long-term advantages in terms of financial sustainability with the development of new technologies (Vinuesa et al., 2020).

CONCLUSION

Countries continue their production activities to exist in a competitive environment and global conditions. Production activities are important for exports and development (Apergis & Payne, 2010). However, in the long run, production activities consume resources and cause environmental harm. It is important to use renewable energy resources in production activities for development. Renewable energy is one of the most important concepts within the scope of the Twelfth Development Plan, established in line with the policies of our country and the Sustainable Development Goals implemented by the United Nations. Policies must be realized to carry the resources available today to the future, which will increase the development speed of countries and create a sustainable structure as well as profitability.

As ESG scores quantitatively measure sustainability, control and monitoring are also possible (Eccles, Ioannou & Serafeim, 2014). For businesses, the relevant score is seen as an indicator of success, and the principle of social responsibility, which is the purpose of businesses, is fulfilled. The relevant score holistically addresses and evaluates many indicators, such as carbon emissions, waste management, energy efficiency, labor rights, community relations, and business transparency.

Green products and investments refer to activities that finance environmentally friendly projects (Banga, 2019). These activities can be carried out to protect natural resources and combat climate disruption and change. Considering the many rapidly changing factors, relevant products and services should be implemented to leave a livable world for future generations. Activities carried out to prevent environmental risks also increase the efficiency. The increasing demand for renewable energy from countries is also a factor that affects profitability in the long term. Green bonds, an important product in the concept of green finance, are among the most well-known green finance practices used to finance projects that provide environmental benefits (Hachenberg & Schiereck, 2018).

Increases in the Financial Development Index items are important for financial sustainability (Tamazian & Rao, 2010). The index, which is evaluated as a result of the activities carried out, is also important in terms of digital technologies. The gains that individuals have within the scope of financial literacy are important not only for individuals but also for national economies. With the use and widespread use of digital technologies, sustainability is ensured, and important steps are taken for development. The FinTech concept incorporates all digital applications and is indispensable for sustainability today (Gao, Tan, & Duan, 2024; X. Huang, Li & Sun 2025).

REFERENCES

- Apergis, N., & Payne, J. E. (2010). Renewable energy consumption and economic growth: evidence from a panel of OECD countries. *Energy policy*, 38(1), 656-660.
- Arner, D. W., Barberis, J., & Buckley, R. P. (2015). The evolution of Fintech: A new post-crisis paradigm. *Geo. J.*

Int'l L., 47, 1271.

- Banga, J. (2019). The green bond market: a potential source of climate finance for developing countries. *Journal of Sustainable Finance & Investment*, 9(1), 17-32.
- Bughin, J., Seong, J., Manyika, J., Chui, M., & Joshi, R. (2018). Notes from the AI frontier: Modeling the impact of AI on the world economy. McKinsey Global Institute, 4(1), 2-61.
- Eccles, R. G., Ioannou, I., & Serafeim, G. (2014). The impact of corporate sustainability on organizational processes and performance. *Management science*, 60(11), 2835-2857.
- Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: aggregated evidence from more than 2000 empirical studies. *Journal of sustainable finance & investment*, 5(4), 210-233.
- Gao, D., Tan, L., & Duan, K. (2024). Forging a path to sustainability: The impact of Fintech on corporate ESG performance. *The European Journal of Finance*, 1-19.
- International Monetary Fund (2025). Financial Development Index Database. <https://legacydata.imf.org/?sk=f8032e80-b36c-43b1-ac26-493c5b1cd33b&sid=1481126573525>
- Global Footprint Network (2025). Ecological Footprint vs Biocapacity. <https://data.footprintnetwork.org/#/countryTrends?type=BCpc,EFCpc&cn=165>
- Gomber, P., Kauffman, R. J., Parker, C., & Weber, B. W. (2018). On the fintech revolution: Interpreting the forces of innovation, disruption, and transformation in financial services. *Journal of management information systems*, 35(1), 220-265.
- Hachenberg, B., & Schiereck, D. (2018). Are green bonds priced differently from conventional bonds?. *Journal of Asset Management*, 19, 371-383.
- Huang, X., Li, D., & Sun, M. (2025). Fintech and Corporate ESG Performance: An Empirical Analysis Based on the NEV Industry. *Sustainability*, 17(2), 434.
- Presidency of the Republic of Turkey, Strategy and Budget Directorate (2025). Twelfth Development Plan. https://www.sbb.gov.tr/wp-content/uploads/2023/12/On-ikinci-Kalkinma-Plani_2024-2028_11122023.pdf
- Stiglitz, J. E. (2017). *Globalization and its discontents revisited: Anti-globalization in the era of Trump*. W.W. Norton & Company.
- Tamazian, A., & Rao, B. B. (2010). Do economic, financial and institutional developments matter for environmental degradation? Evidence from transitional economies. *Energy economics*, 32(1), 137-145.
- Thomson Reuters (2025). ESG Reporting. <https://www.thomsonreuters.com/en/c/esg>
- United Nations (2025). The 17 Goals. <https://sdgs.un.org/goals>
- Vinuesa, R.; Azizpour, H.; Leite, I.; Balaam, M.; Dignum, V.; Domisch, S.; Langhans, S.D. The role of artificial intelligence in achieving the Sustainable Development Goals. *Nat. Commun.* 2020, 11, 233
- World Bank (2025). World Development Indicators. <https://databank.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG/1ff4a498/Popular-Indicators>

UNCOVERING DIGITAL MATURITY AND FINANCIAL PERFORMANCE RELATIONSHIP IN THE SERVICE SECTORS

Mustafa K. Yilmaz

Ibn Haldun University, Istanbul, Türkiye, mustafa.yilmaz@ihu.edu.tr

Mine Aksoy

Yalova University, Yalova, Türkiye, maksoy@yalova.edu.tr
<https://orcid.org/0000-0002-4773-1770>

Esra Cengiz Tirpan

Bilecik Seyh Edebali University, Bilecik, Türkiye, esra.cengiz@bilecik.edu.tr
<https://orcid.org/0000-0001-7675-5635>

Mehtap Ozsahin

Gebze Technical University, Kocaeli, Türkiye, m.ozsahin@gtu.edu.tr
<https://orcid.org/0000-0003-2527-4166>

Erman Coskun

İzmir Bakircay University, Izmir, Türkiye, erman.coskun@bakircay.edu.tr

Ozgun Uysal

Central Security Depository and Trade Depository of Türkiye, Istanbul, Türkiye, ozgur.uysal@mkk.com.tr
<https://orcid.org/0000-0003-1119-4704>

ABSTRACT

This study aims to explore how the digital maturity level (DML) affects the financial performance (FP) in the service sector firms listed on Borsa Istanbul in Türkiye. Using panel data of 59 companies for the years 2016–2022, this study employs a text mining approach to calculate DML of the firms from their annual reports. It also uses panel regression analysis to examine the interplay between DML and FP. The results indicate that there is a U-shaped relationship between DML and FP of service sector firms. Companies that have a higher orientation towards digitalization face a decreasing FP in the short term but get increasing financial benefits in the long run. However, this relationship varies across the sectors of information, communication and publishing activities, construction and public works and transportation and storage. The findings provide valuable insights for companies to structure the right digitalization strategies to ensure sustainable financial gains.

KEYWORDS

Digitalization, Financial performance, Service sector, Text mining, Türkiye.

INTRODUCTION

The impact of digitalization on firm performance comes from enabling improvements in efficiency, revenue growth, product/service quality, customer satisfaction, employee engagement, and a greater focus on innovation (Deloitte, 2023). For instance, digitalization can help firms grow revenue by improving customer experience and the development of new products and services. Thus, ambitious firms should boost innovation to tap high potential of digitalization. Despite the advantages that digital transformation (DT) offers for business community, there are limited discussion of its impact on service sectors, where advanced DT tools such as artificial intelligence (AI),

generative AI, Internet of Things (IoT), virtual reality (VR), and big data analytics are frequently employed (Vial, 2019).

Digitalization plays a more transformative role in the service sectors compared to manufacturing sector in many countries (Ribeiro-Navarrete et al., 2021; Ndubuisi et al., 2023). By 2019, services accounted for 55 percent of the GDP and 45 percent of employment in emerging markets (Nayyar et al. 2021). Digitalization in the service sectors offers several advantages, i.e. automating processes, cutting costs, minimizing human error, and encouraging innovation (Parida et al., 2019). DT allows firms to better understand customer preferences and deliver more customized services. Digitalization also enables service firms to create new business models such as subscription-based, or platform-based services, altering the value chain (Lee & Lim, 2018). The Covid-19 pandemic has remarkably sped up DT in the service sectors, particularly influencing healthcare, education, and entertainment. DT helps firms to better serve customers during this turbulence by developing their capabilities through agility, flexibility, and resilience (Chin et al., 2023).

Most of the prior studies investigating the impact of digitalization on firm performance have been conducted in developed markets. There are relatively few studies (Cherkasova & Slepushenko, 2021; Masoud & Basahel, 2023; Yonghong et al., 2023) that explore the effect of digital maturity (DM) on financial performance (FP) in emerging markets, where digitalization plays a key role in increasing productivity, reducing costs, and facilitating access to global markets (Dahlman et al., 2016). This study seeks to explore the impact of the DM on the FP by conducting a text mining analysis of the annual reports of the service sector firms listed on Borsa Istanbul in Türkiye, a well-suited setting that shows high level of digitalization among emerging markets. We only focus on service sectors where digitalization more intensively shapes operational processes and customer experiences. In conducting the study, we developed digitalization maturity index (DMI) scores from 2016 to 2022 as Turkish firms have given pace to develop digitalization strategies in recent years. We also examined whether the relationship between DM and FP differs among the sub-sectors.

This study contributes to literature in three folds. First, by mapping the digital maturity level (DML) of the firms based on counts of the digitalization related keywords in the annual reports, the study employs text mining analysis to calculate DML scores of the entities. Second, the research explores the interplay between the DML and FP for the service sectors, focusing on how the degree of DML affects FP. In this sense, it guides service sector firms in emerging markets and provides valuable insights for them in refining their digitalization strategies to enhance competitive advantages. Finally, this paper provides new evidence in an emerging market setting where corporate digitalization has been rapidly developing. Thus, it offers clear intuitions for the significance of digitalization, motivating emerging market firms to assess changes in business environment and adopt proper digital tools to boost FP.

METHODOLOGY

In this study, we focused only on the service sectors and selected 59 non-financial companies listed on Borsa Istanbul (BIST) for the period of 2016-2022. Services represent 54 percent of the GDP in Türkiye by 2023, and their share does not display a remarkable change since 2015 (Worldbank, 2024). We excluded firms with less than 4 years of observation data from the sample. We conducted the panel data analysis with a total of 59 firms and 388 observations to test the hypothesis. Our dependent variable is financial performance. Following prior studies (e.g. Kuang et al., 2023; Yonghong et al., 2023; Zeng et al., 2022), we used return on assets (ROA) as a financial performance indicator. We measured it by dividing net income to total assets.

We used calculated digital maturity levels (DML) as the independent variable. Following the related literature (Fu & Li, 2023; Guo & Xu, 2021; Wu et al., 2021; Zeng et al., 2022), we applied text mining analysis to the annual reports of the firms to measure the DML. We employed MAXQDA, which is a

software designed for qualitative and mixed-method data analysis, to analyze the frequencies of the DM related keywords in the annual reports (Marjaei et al., 2019).

We used firm size (SIZE), financial leverage (LEV) and firm age (AGE) as control variables. SIZE was calculated by taking the natural logarithm of the firm's total assets. LEV was measured by dividing total liabilities to total assets. AGE shows the period since the company was founded and is included in the model by taking its natural logarithm.

We employed panel regression analysis using Stata to evaluate the impact of DML on the FP. First, we regress the FP on the DML and control variables in Equation (1).

$$ROA_{i,t} = \alpha + \beta_1 DML_{i,t-1} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 AGE_{i,t} + \sum_{k=1}^7 \lambda_k Year + e_{i,t} \quad (1)$$

To demonstrate a U-shaped relationship, we regress FP on DML and its squared term, DML^2 , as shown in Equation 2. A significant negative coefficient for DML^2 suggests an inverted U-shaped relationship, while a significant positive coefficient for DML^2 indicates a U-shaped relationship (Haans, Pieters, & He, 2016).

$$ROA_{i,t} = \alpha + \beta_1 DML_{i,t-1} + \beta_2 DML_{i,t-1}^2 + \beta_3 SIZE_{i,t} + \beta_4 LEV_{i,t} + \beta_5 AGE_{i,t} + \sum_{k=1}^7 \lambda_k Year + e_{i,t} \quad (2)$$

RESULTS

Table 1 presents the summary of the descriptive statistics, while Table 2 displays the correlation matrix. The VIF values for the explanatory variables are below 10. This indicates that multicollinearity is not a problem. The average DM score is only 1.323, suggesting that the level of digitalization among service sector firms in BIST remains relatively low. For LEV, we noted a significant negative correlation with ROA, whereas no substantial correlation is discernible with the AGE. Finally, SIZE has a positive and insignificant correlation with ROA.

Table 1. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	388	.04	.122	-.587	.683
DML	388	1.323	1.567	0	10.905
SIZE	388	13.857	2.143	9.254	20.176
LEV	388	.566	.278	-.119	1.175
AGE	388	3.267	.663	0	4.489

Table 2. Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)
(1) ROA	1.000				
(2) DML	0.119*	1.000			
(3) SIZE	0.064	0.517*	1.000		
(4) LEV	-	0.202*	0.381*	1.000	
(5) AGE	0.034	0.041	0.329*	0.038	1.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

In Table 3, Model 1 shows the estimation results for equation (1) and Model 2 shows the estimation results for equation (2). Since our hypothesis posits a U-shaped relationship between the DML and FP, we incorporate the quadratic term of DML into Model 2 to empirically test this expected relationship.

Table 3. Regression results

Variables	Model 1 ROA	Model 2 ROA
DML_{t-1}	0.003 (0.008)	-0.048** (0.019)
DML_{t-1}^2		0.004*** (0.002)
$SIZE_t$	0.007 (0.007)	0.038 (0.046)
LEV_t	-0.180*** (0.034)	-0.262*** (0.073)
AGE_t	0.000 (0.015)	0.139 (0.089)
Constant	0.021 (0.068)	-0.734 (0.680)
Observations	328	328
Number of firms	59	59
R-squared		0.381

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Figure 1 displays the scatter plot with fitted lines depicting the relationship between DML and FP. The red line represents the quadratic fit for the relationship of DML and FP. Quadratic fitting approximates discrete data using an analytical equation, offering a more intuitive and accurate representation of the relationship between DML and FP compared to other fitting methods. Hausman's test indicates that the random-effects model is appropriate for Model 1, while the fixed-effects model is recommended for Model 2.

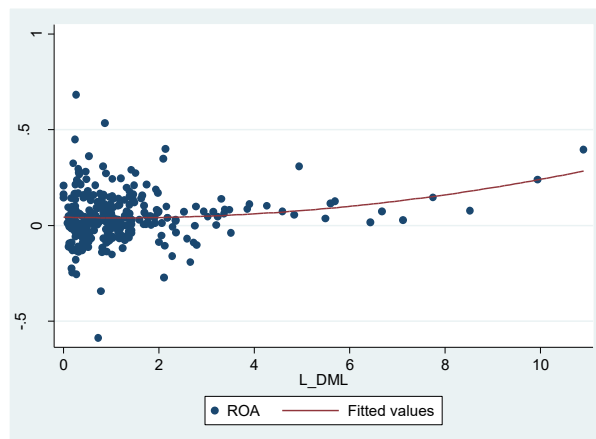


Figure 1. Fitting diagram of the digital maturity level and financial performance

The result for the ROA in Model 2 satisfies the fundamental criteria for a U-shaped relationship. The nonlinear relationship between the DML and FP is shown in Figure 2. The linear term is negatively ($\beta = -0.048$, $p < 0.05$) and the squared term of DML is positively ($\beta = 0.004$, $p < 0.01$) associated with ROA.

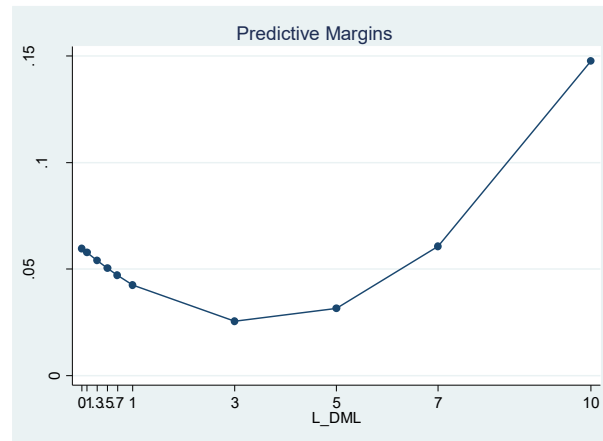


Figure 2. The non-linear relationship between DML and FP

The findings, along with Figure 2, provide additional confirmation of the U-shaped relationship between DML and FP, supporting our hypothesis. Firms in the mature stage of digitalization exhibit higher FP compared to those in the initial stage, demonstrating that a greater digital orientation has an increasingly positive effect on FP. Hence, the relatively negative effect of digitalization decreases after the firm gets into the maturity stage. This outcome validates the findings of the prior studies (Guo & Xu, 2021; Kohtamäki et al., 2020; Yonghong et al., 2023).

CONCLUSIONS

Given the accelerated evolution of information technologies, digital transformation has become a vital strategic focus for firms aiming to improve their performance in the dynamic business environment. The implementation of digital technologies provides a competitive advantage by reducing costs and increasing quality, leading to a different positioning in the market. To achieve this goal and display better financial results with digital resources, firms must have talented employees with adequate training. This study explores whether digital maturity level of firms affects financial performance by running text mining analysis to the annual reports of service sector firms listed on Borsa Istanbul for the years 2016-2022. The paper employs MAXQDA software to analyze the frequencies of digitalization related keywords in the annual reports.

The findings indicate a distinct U-shaped relationship between the digital maturity level and financial performance. The initial excitement surrounding digital transformation can wane as firms struggle with the cultural shift required for successful digitalization. Firms initially experienced a decline in FP as they struggle with the costs of digital transformation. This decline can be attributed to the inability of firms to fully leverage digital tools due to inadequate cultural adaptation and internal resistance. As firms develop a more mature digital culture, the preliminary negative effect gradually diminishes with a certain time lag and becomes positive with the deepening of digitalization process. This may be due to better acceptance and utilization of digital tools by employees and executive managers. This finding indicates that some of the investments in digital transformation, e.g. data analytics, AI, might be so high that the time-to-payoff would be extensive, influencing financial performance over time as argued by Wamba et al. (2017). Thus, as firms embrace digital transformation and reach a certain digital maturity level, they reap the rewards of digital investment such as better relationships with customers, suppliers and other stakeholders, leading to significant improvements in financial performance. Finally, the findings indicate that the relationship between digital maturity and

financial performance varies across information, communication and publishing activities, construction and public works, and transportation and storage sectors due to diverse characteristics of firms in these sub-sectors.

This study offers important theoretical implications and enriches the literature on the relationship between digital maturity and firm performance. Within the theoretical framework of the resource-based view, this study pinpoints the strategic features of digitalization as a competitive resource to show how accelerated digitalization may increase financial performance. However, as argued by Lichtenthaler (2019), having digital technologies as strategic resources is not enough. Firms should dynamically combine their human and digital architecture to sustain competitive advantages. This approach also aligns with the intelligence-based view that highlights the importance of integrating digital technologies to enhance firm performance. Thus, our findings have significant implications for the resource-based view, enriching its relevance and application in digital era.

This study yields several implications for companies and policy makers. First, companies must place significant emphasis on the crucial role of digitalization in boosting financial performance. Second, entities must cultivate skillful human resources with different experiences to increase the financial benefits of digitalization. Ultimately, firms should gradually formulate digitalization strategies and maneuver digital sphere in a reasonable manner to get expected financial gains.

REFERENCES

- Cherkasova V.A., & Slepshenko G.A. (2021). The impact of digitalization on the financial performance of Russian companies. *Finance: Theory and Practice*, 25(2), 128-142.
- Chin, H-S., Marasini, D.P., & Lee, D-H. (2023). Digital transformation trends in service industries. *Service Business* 17, 11-36.
- Dahlman C., Mealy, S., & Wermelinger, M. (2016). Harnessing the digital economy for developing countries. OECD Development Centre Working Paper, 334. DOI: 10.1787/4adffb24-en.
- Deloitte. (2023). Uncovering the connection between digital maturity and financial performance. https://www2.deloitte.com/content/dam/insights/us/articles/6561_digital-transformation/DI_Digital-transformation.pdf
- Fu, T., & Li, J. (2023). An empirical analysis of the impact of ESG on financial performance: the moderating role of digital transformation. *Frontiers in Environmental Science*, 11, 1256052.
- Guo, L., & Xu, L. (2021). The effects of digital transformation on firm performance: Evidence from China's manufacturing sector. *Sustainability*, 13(22), 12844.
- Haans, R.F., Pieters, C., & He, Z.L. (2016). Thinking about U: Theorizing and testing U-and inverted U-shaped relationships in strategy research. *Strategic Management Journal*, 37(7), 1177-1195.
- Kohtamäki, M., Parida, V., Patel, P.C., & Gebauer, H. (2020). The relationship between digitalization and servitization: the role of servitization in capturing the financial potential of digitalization. *Technological Forecasting and Social Change*, 151(6), 119804.
- Kuang, Y., Fan, M., Fan, Y., Jiang, Y., & Bin, J. (2023). Digitalization, financing constraints and firm performance. *Frontiers in Environmental Science*, 11, 1090537.
- Lee, S., & Lim, S (2018). *Living innovation: from value creation to the greater good*. Emerald Publishing Limited, Bingley.
- Lichtenthaler, U. (2019). An intelligence-based view of firm performance: Profiting from artificial intelligence. *Journal of Innovation Management*, 7(1), 7–20.
- Marjaei, S., Yazdi, F. A., & Chandrashekara, M. (2019). MAXQDA and its application to LIS research. *Library Philosophy and Practice*, 1-9. Retrieved from <https://www.proquest.com/scholarly-journals/maxqda-application-lis-research/docview/2236131089/se-2>
- Masoud, R., & Basahel, S. (2023). The effects of digital transformation on firm performance: The role of customer experience and IT innovation. *Digital*, 3, 109-126.

- Nayyar, G., Hallward-Driemeier, M., & Davies, E. (2021). 'At Your Service: the Promise of Services-Led Development'. Washington, DC: World Bank Publications. <https://doi.org/10.1596/978-1-4648-1671-0>.
- Ndubuisi, G., Owusu, S., Asiama, R., & Avenyo, E.K. (2023). Drivers of services sector growth acceleration in developing countries. World Institute for Development Economics Research (WIDER) Working Paper 2023/87.
- Parida, V., Sjödin, D., & Reim, W. (2019). Reviewing literature on digitalization, business model innovation, and sustainable industry: Past achievements and future promises. *Sustainability*, 11(2), 1102391.
- Ribeiro-Navarrete, S., Botella-Carrubi, D., Palacios-Marqués, D., & Orero-Blat, M. (2021). The effect of digitalization on business performance: An applied study of KIBS. *Journal of Business Research*, 126, 319-326.
- Vial, G. (2019). Understanding digital transformation: a review and a research agenda. *The Journal of Strategic Information Systems* 28(2),118–144.
- Wamba, S.F., Gunasekaran, A., Akter, S., Ren, S.J., Dubey, R., & Childe, S.J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. *Journal of Business Research*, 70, 356–365.
- Worldbank. (2024). World Development Indicators: Structure of value. <https://wdi.worldbank.org/table/4.2>.
- Wu, F., Hu, H.Z., Lin, H.Y., & Ren, X.Y. (2021). Digital transformation of enterprises and capital market performance: Empirical evidence from stock liquidity. *Journal of Management World* 37(07), 130–144.
- Yonghong, L., Jie, S., Ge, Z., & Ru, Z. (2023). The impact of enterprise digital transformation on financial performance-Evidence from Mainland China manufacturing firms. *Managerial and Decision Economics*, 44(4), 2110–2124.
- Zeng, H., Ran, H., Zhou, Q., Jin, Y., & Cheng, X. (2022). The financial effect of firm digitalization: Evidence from China. *Technological Forecasting & Social Change* 183, 121951.

FROM DIGITALIZATION TO DELIVERY

INTEGRATING DIGITAL TECHNOLOGIES FOR ENHANCED SUSTAINABILITY AND PERFORMANCE IN SUPPLY CHAINS

Yamen Nissi

Australian University - Kuwait, Mishref, Kuwait, y.nissi@au.edu.kw
<https://orcid.org/0000-0001-9080-8289>

Faidon Theofanidis

Australian University-Kuwait, Mishref, Kuwait, f.theofanidis@au.edu.kw
<https://orcid.org/0000-0001-7060-5409>

Farid Abdallah

Australian University-Kuwait, Mishref, Kuwait, F.abdallah@au.edu.kw
<https://orcid.org/0000-0001-7619-0291>

ABSTRACT

In the past decade, there has been a fast integration of digital technologies in supply chain management, and this has become a critical pathway to achieving sustainability while maintaining or enhancing performance. This study aims to explore digital tools such as blockchain, the internet of things, Artificial intelligence (AI), and big data analytics, and how these tools could be used to optimize supply chain operations across environmental, economic, and social dimensions. Key performance indicators (KPIs) will focus on enhancing resource efficiency, enabling real-time traceability, reducing carbon footprint, and improving stakeholder collaboration. The research identifies the role of digital transformation in aligning sustainability with operational excellence. Through an extensive literature review, this study highlights best practices in the adoption of these technologies across various industries. This research contributes to both academic and practical discussions by providing an integrative conceptual framework that links digital innovation with sustainable supply chain performance, offering actionable insights for managers and policymakers striving to meet evolving environmental standards and market expectations.

KEYWORDS

Digital technologies, Sustainable supply chain, Supply chain performance, Artificial intelligence (AI), Big data analytics

INTRODUCTION

Globally, there has been growing pressure on the supply chain to address environmental, social, and economic sustainability. Over the past two decades, Supply Chain Management (SCM) has been directed towards focusing on cost reduction, efficiency, and responsiveness. However, sustainability goals have created a paradigm shift. In this new norm, digital technologies are shining out as powerful enablers of sustainable digital transformation (Theofanidis et al. 2024; Erturk et al. 2024) while holding on to performance with no compromise. The adoption of such technologies into SCM offers promising benefits to enhance visibility, improve efficiency, reduce waste, and promote ethical practices throughout the supply chain.

This study aims to investigate how digital technologies integration could effectively enhance sustainability in the supply chain without compromising performance, but rather improving it. The specific research objectives are:

- To find key digital technology drivers for sustainability in SCM.
- To analyze the effect of these technologies on supply chain management performance metrics.

- To propose a conceptual framework linking digital transformation, sustainability, and performance outcomes within the supply chain.

Theoretical Background: Three theoretical frameworks underpin this research: the Resource-Based View (RBV), the Triple Bottom Line (TBL) approach, and the dynamic capabilities theory (DCT).

The Resource-Based View (RBV) theory, primarily developed by Jay Barney (1991), stresses the importance of firm resources in achieving sustained competitive advantage. The Resource-Based View stresses that firms achieve competitive advantage by leveraging valuable, rare, and inimitable resources. In the digital transformation context, technologies such as big data, IoT, blockchain infrastructure, and most recently AI are seen as strategic assets enhancing firms' operational capabilities and sustainability performance. Following the RBV model, corporations that adopt these technologies can build dynamic capabilities that lead to superior long-term outcomes (Taher, 2011).

The Triple Bottom Line (TBL) theory, introduced by John Elkington (1997), suggests that businesses should focus on three performance areas: social, environmental, and financial, to achieve sustainable success. The Triple Bottom Line framework emphasizes the equilibrium between economic, environmental, and social goals. It focuses on the holistic view of sustainability, ensuring that profitability must be achieved alongside environmental stewardship and social responsibility. This study adopts the TBL perspective for evaluating the performance implications of digital technology on supply chains, while making sure that sustainability is not treated as an isolated objective but as a core component of the overall organizational performance.

The Dynamic Capabilities Theory (DCT) introduced by Teece et al. (1997) emphasizes a firm's ability to sense, seize, and reconfigure resources and capabilities to address rapidly changing environments. The theory focuses on the strengths that a company possesses, which are dynamic and capable of shifting in response to technological changes, market conditions, and competition pressures, which helps the company to sustain a competitive advantage over time. Unlike traditional resource-based views that focus on static assets, dynamic capabilities highlight the importance of continuous innovation and strategic flexibility in achieving long-term success (Teece, 2007).

The body of literature linking digital technologies to sustainable supply chains has grown greatly over the past decade. There are key technologies that were identified as transformative and are:

- Artificial Intelligence (AI): AI is being used for predictive analytics, demand forecasting, and decision-making. Research by Choi et al. (2020) demonstrates that AI can enhance efficiency while enabling sustainable practices such as optimized routing, smart warehousing, and proactive maintenance.
- Blockchain: Known for its ability to ensure data integrity and transparency, blockchain technology is particularly useful in tracking product provenance and ensuring ethical sourcing. According to Saberi et al. (2019), blockchain enhances stakeholder trust and facilitates compliance with sustainability regulations.
- Internet of Things (IoT): IoT devices enable real-time monitoring of assets, transportation conditions, and energy consumption, allowing companies to optimize resource use and reduce waste. Studies show that IoT adoption can improve transparency and responsiveness, especially in logistics and inventory management.
- Big Data Analytics: The use of big data enables firms to gain deeper insights into supplier performance, customer demand, and environmental impact. As shown by Wamba et al. (2017), data-driven decision-making contributes to more efficient resource use and lower emissions.

Another important fact is that the intersection of digital transformation and sustainability is also heavily related to the industry. For example, manufacturing firms may benefit from predictive maintenance and energy efficiency monitoring, while retail companies may benefit from last-mile delivery as a priority and customer behavior analysis. Therefore, the context of technological adoption is pivotal in determining its impact on sustainability performance.

Some recent studies (Heinz et al. 2025) also pointed out the importance of Digital Sustainability, which refers to the practice of incorporating digital technologies and tools to enhance environmental, social, and economic sustainability within organizations. For instance, Metwally et al. (2024) highlight the mediating role of supply chain resilience and robustness in the relationship between digital technologies and sustainable environmental performance. The concept of Triple-A supply chain capabilities, introduced by Hau L. Lee (2004), describes a framework in which supply chains are characterized by agility, adaptability, and alignment. Another recent study by Mohaghegh, et al. (2024) investigates the interplay between digital transformation, Triple-A supply chain capabilities, and sustainable performance. Similarly, Zaida et al. (2025) examine how digital technologies contribute to enhanced sustainable supply chain performance by facilitating improved information exchange and greater responsiveness.

METHODOLOGY

This study adopts a qualitative, conceptual and interpretive research approach to examine the integration of digital technologies in supply chain management (SCM) as a pathway to achieving sustainability and enhanced performance. The research methodology is rooted in an extensive literature review, aiming to develop a holistic conceptual framework that links digital innovation with sustainable supply chain performance.

To ensure comprehensive coverage of the topic, the authors conducted a thorough search of peer-reviewed academic literature across leading scholarly platforms, including Scopus, Google Scholar, and Web of Science. The identification of relevant sources was guided by the use of carefully selected keywords, both in titles and abstracts, to maximize the relevance and precision of the search results. The keywords included: “digital technologies in supply chain,” “sustainable supply chain management,” “AI in logistics,” “blockchain and supply chains,” “IoT in supply chain operations,” “big data analytics in supply chain management,” “digital transformation and sustainability,” “sustainability and operational performance of the supply chain”, “Resource Based View”, “Dynamic Capabilities Theory”, and “Triple Bottom Line framework in supply chains.” These terms were used individually and in combination through Boolean operators to capture interdisciplinary perspectives on the integration of digital technologies with sustainable SCM practices.

Once the literature was identified, the authors applied inclusion criteria focused on the relevance to digital transformation and sustainability in SCM. Only peer-reviewed journal articles, conference papers published in proceedings, and empirical case studies published in English were considered. The filtering process emphasized recent contributions that provided theoretical insights regarding the use of digital technologies to optimize supply chain sustainability and performance.

Essential information from the selected literature was extracted, including the author(s), year of publication, research methodology, industry focus, digital technologies examined, and a detailed summary of each source’s unique contribution to the evolving field of digital integration in supply chains. This allowed the authors to compare findings, identify trends, and synthesize viewpoints across disciplines and industries.

To structure the analysis and uncover deeper insights, a thematic analysis was conducted. This involved a close reading of the selected literature to identify recurring themes, theoretical

frameworks, and practical approaches related to the intersection of digitalization and sustainability in SCM. The themes were grouped into four major conceptual categories:

1. **Digital Technologies** – This theme focused on Artificial Intelligence (AI), Big Data capabilities, blockchain infrastructure, and Internet of Things (IoT) technologies as foundational enablers of supply chain innovation. Key contributions were examined in terms of their impact on operational performance, decision-making, automation, and predictive analytics.
2. **Dynamic Capabilities Framework** – Literature within this theme explored how companies sense, seize, and reconfigure internal and external resources to respond to dynamic market and environmental conditions. Studies emphasizing organizational agility and digital adaptability were included in this theme to understand how capabilities are developed through digital tools.
3. **Digital Sustainability** – This theme emphasized the practice of incorporating digital technologies and tools to enhance environmental, social, and economic sustainability within organizations. Building on the concept of Digital Sustainability, this study introduces a new concept, the Digital Sustainability Integration (DSI) - a mechanism that emphasizes supply chain transparency, strategic alignment, and long-term value creation.
4. **Supply Chain Sustainability and Performance** – The final theme addressed how digital transformation influences the achievement of the Triple Bottom Line framework: economic, environmental, and social performance. This included operational key performance indicators (KPIs) such as resource efficiency, carbon footprint reduction, real-time traceability, stakeholder collaboration, agility, responsiveness, and resilience.

The combination of literature synthesis and thematic analysis provided a structured and comprehensive view of the subject. This methodological approach allowed the researchers to identify the best practices and common obstacles across industries, while also mapping theoretical concepts to the operational realities of supply chain management. The results of the analysis serve as the foundation for the “Holistic Model Integrating Digital Technologies to enhance Supply Chain Sustainability and Performance” proposed in the results section of the study. The research approach not only contributes to academic literature based on the conceptualization of the novel Digital Sustainability Integration (DSI) mechanism and the proposed integrative framework but also provides actionable insights for practitioners and policymakers working to improve the sustainability and performance of the supply chain.

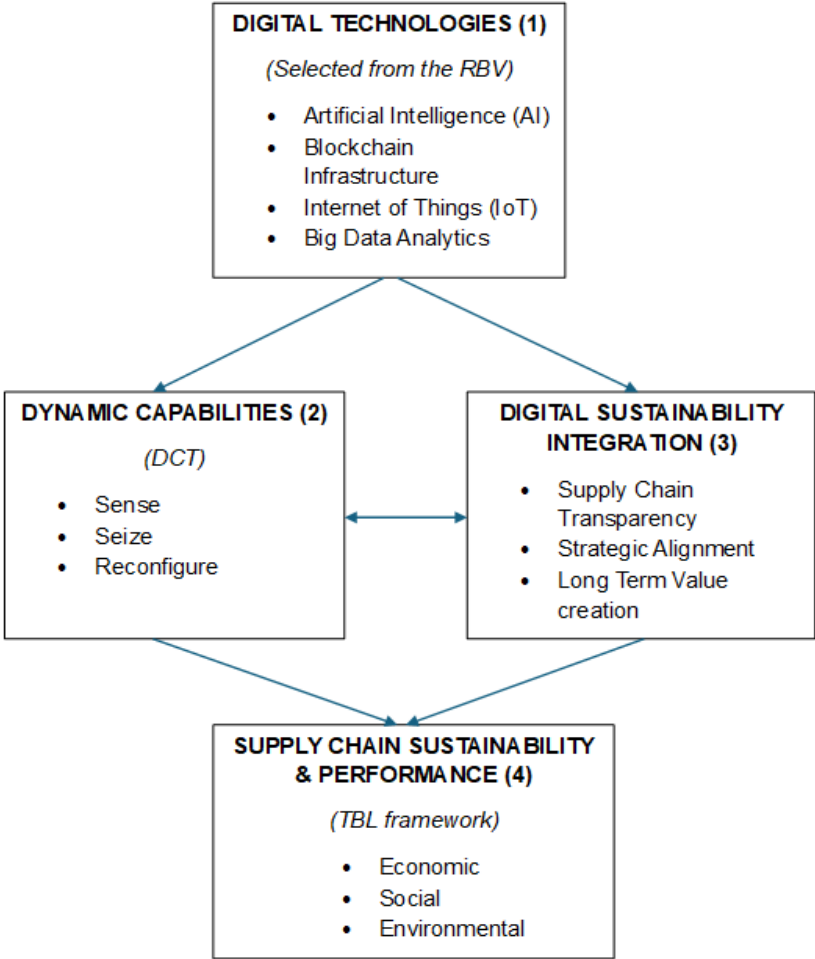
RESULTS

This study theoretically confirms that the integration of digital technologies significantly enhances the sustainability and performance of supply chains. Based on the existing literature (Resource Based View, Dynamic Capabilities Theory, Triple Bottom Line framework) and by adding one novel conceptual construct: Digital Sustainability Integration (DSI), we propose to the academic community a novel holistic model which integrates digital technologies to achieve economic, social and environmental sustainability and to improve the operational performance of the Supply Chain (Figure 1).

The model is based in four key conceptual constructs: (1) **Digital Technologies**—including AI, Big Data capabilities, blockchain infrastructure, and IoT—as foundational enablers; (2) the **Dynamic Capabilities** framework, which explains how firms sense, seize, and reconfigure resources to adapt to changing environments; (3) **Digital Sustainability Integration (DSI)**, characterized by supply chain transparency, strategic alignment, and long-term value creation; and (4) **Supply Chain Sustainability**

and Performance, measured through the Triple Bottom Line (economic, social, and environmental goals) and operational metrics such as agility, responsiveness, and resilience. Together, these constructs form an integrated framework that theorizes the strategic alignment of digital transformation and sustainability as a driver of superior supply chain outcomes.

Figure 1: Proposed Holistic Model Integrating Digital Technologies to enhance Supply Chain Sustainability and Performance



Based on the proposed model, digital technologies (1) are mediated by the dynamic capabilities (2) and the digital sustainability integration (3), which lead to the sustainability and enhanced performance of the supply chain (4). Within the supply chain management context, the relationship between digital technologies and sustainability and performance is mediated (apart from the Dynamic Capabilities framework) through the Digital Sustainability Integration (DSI) - a mechanism that emphasizes supply chain transparency, strategic alignment, and long-term value creation.

The interaction between dynamic capabilities and DSI facilitates the orchestration of digital capabilities and sustainability goals, thereby enabling firms to sense, seize, and reconfigure supply chain assets in ways that enhance agility, responsiveness, and resilience. As such, the contextual adoption of digital technologies plays a pivotal role in driving meaningful and measurable improvements in supply chain sustainability performance.

In particular, this study provides theoretical confirmation of the following:

1. Digital technologies enhance the Environmental and Operational Performance of the Supply Chain

Digital tools such as AI, IoT, blockchain infrastructure, and big data analytics reduce waste, optimize resource utilization, and lower carbon emissions. These improvements are likely to be reflected in performance metrics such as energy efficiency, transportation optimization, and reduced lead times.

2. Improved Supply Chain Transparency and Traceability

The use of blockchain and IoT improves product traceability, enhances visibility across the supply chain, and fosters ethical sourcing practices. This will not only support regulatory compliance but also strengthen stakeholder trust.

3. Strategic Alignment Between Sustainability and Business Goals leads to long-term value creation

Strategic alignment between digital technologies and supply chain sustainability and operational performance fosters long-term value creation. This alignment enables more informed decision-making, greater efficiency across the supply chain, strengthens resilience, and positions the supply chain as a source of competitive advantage.

Recent studies explored the interaction between Digital technologies (RBV) and Dynamic capabilities. According to Kero and Bogale (2023), who conducted a systematic literature review assessing 46 articles that focused on RBV and DCT across various sectors, key themes, such as technological resources (within RBV) and innovation/operational capabilities (within DCT), highlight how corporations leverage these to gain a competitive advantage in dynamic environments.

Another study, by Willie (2024), focuses on the strategic deployment of RBV using digital technologies. The study underscores the strategic importance of digital resource utilization in enhancing organizational competitiveness and driving long-term growth, and at the same time addresses dynamic capabilities by discussing agility and strategic alignment in digital environments.

CONCLUSION

This research contributes to the existing literature by offering an integrated perspective that combines digital transformation with sustainable supply chain performance, introducing a new theoretical concept of Digital Sustainability Integration and highlighting the RBV, TBL and DCT frameworks by emphasizing how digital capabilities serve as strategic assets that enable firms to achieve environmental and social goals without compromising operational performance. The proposed conceptual framework also provides the foundation for future empirical studies exploring causal relationships between digital integration and sustainable outcomes.

For supply chain professionals and decision-makers, this study offers insights into how specific digital technologies such as AI, IoT, blockchain, and big data analytics can be used to improve traceability, efficiency, and resource optimization. Managers are encouraged to view sustainability as a performance enhancer rather than a compliance cost.

Governments and regulatory bodies can benefit from these insights by formulating policies and incentives that support the digital transformation of supply chains, especially in sectors with high environmental impact. Encouraging the adoption of sustainable digital practices through grants, tax benefits, or certification programs could accelerate progress toward national and global sustainability targets.

Even though there is extensive literature that provides valuable insights into the individual effect of digital technologies on supply chain practices, there exists a gap in knowing or understanding how these tools influence sustainability under the lens of performance. There is also a need for an integrative framework that will help practitioners align digital initiatives with sustainable goals while measuring tangible outcomes. This study contributed to bridging that gap by synthesizing current knowledge and proposing a conceptual framework model that connects digital technology with

sustainability and supply chain performance. More specifically, this study integrated three existing models (Resource-Based View, Dynamic Capabilities Theory, Triple Bottom Line framework) and introduced one new concept - the Digital Sustainability Integration (DSI). The findings aim to support both practitioners, academics, governments, and regulatory bodies in developing strategies that push sustainable value creation through digital innovations with a focus on enhancing supply chain operational performance.

In conclusion, the integration of digital technologies within supply chain management has significantly enhanced both sustainability and operational performance. Key Performance Indicators (KPIs) such as resource efficiency, real-time traceability, carbon footprint reduction, and stakeholder collaboration have proven effective in driving these improvements.

The proposed model demonstrates that digital technologies, mediated by dynamic capabilities and digital sustainability integration (DSI), lead to enhanced supply chain sustainability and performance. Empirical evidence supports that digital transformation fosters supply chain resilience and robustness, which positively impacts environmental performance. On top of this, the synergy between digital technologies and DSI emphasizes transparency, strategic alignment, and long-term value creation, reinforcing the importance of a holistic approach to sustainable supply chain management. This comprehensive framework underscores the critical role of digital innovations in achieving sustainable and efficient supply chains, paving the way for future advancements in the field.

REFERENCES

- Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
- Choi, T. M., Wallace, S. W., & Wang, Y. (2020). Big data analytics in operations management. *Production and Operations Management*, 29(5), 1024–1031. <https://doi.org/10.1111/poms.13122>
- Elkington, J. (1997). *Cannibals with forks: The triple bottom line of 21st century business*. Capstone Publishing.
- Erturk, A., Colbran, S. E., Coşkun, E., Theofanidis, F., & Abidi, O. (Eds.). (2024). *Convergence of digitalization, innovation, and sustainable development in business*. IGI Global.
- Heinz, D., Hu, M., Benz, C., & Satzger, G. (2025). Digital service innovation for sustainable development: A systematic literature review. In *Transforming the digitally sustainable enterprise* (pp. 167–185). Springer.
- Kero, C. A., & Bogale, A. T. (2023). A systematic review of resource-based view and dynamic capabilities of firms and future research avenues. *International Journal of Sustainable Development and Planning*, 18(10), 3137–3154. <https://doi.org/10.18280/ijstdp.181016>
- Lee, H. (2004). Triple-A supply chain. *Harvard Business Review*, HBR Spotlight, The 21st Century Supply Chain, Part 1, 100–112.
- Metwally, A. B. M., Ali, H. A. A., Aly, S. A. S., & Ali, M. A. S. (2024). The interplay between digital technologies, supply chain resilience, robustness, and sustainable environmental performance: Does supply chain complexity matter? *Sustainability*, 16(14), 6175. <https://doi.org/10.3390/su16146175>
- Mohaghegh, M., Blasi, S., Russo, I., & Baldi, B. (2024). Digital transformation and sustainable performance: The mediating role of triple-A supply chain capabilities. *Journal of Business & Industrial Marketing*. <https://doi.org/10.1108/JBIM-02-2023-0098>
- Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2019). Blockchain technology and its relationships to sustainable supply chain management. *International Journal of Production Research*, 57(7), 2117–2135. <https://doi.org/10.1080/00207543.2018.1533261>
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533. [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7<509::AID-SMJ882>3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z)
- Teece, D. J. (2007). Explicating dynamic capabilities: The nature and micro foundations of (sustainable)

enterprise performance. *Strategic Management Journal*, 28(13), 1319–1350. <https://doi.org/10.1002/smj.640>

Theofanidis, F., Abidi, O., Erturk, A., Colbran, S., & Coskun, E. (Eds.). (2024). *Digital transformation and sustainable development in cities and organizations*. IGI Global.

Taher, M. (2011). Resource-based view theory. In Y. K. Dwivedi, M. R. Wade, & S. L. Schneberger (Eds.), *Information systems theory: Explaining and predicting our digital society*, Vol. 1 (pp. 151–163). Springer New York.

Willie, M. (2025). Leveraging Digital Resources: A Resource-Based View Perspective. *Golden Ratio of Human Resource Management*, 5(1), 01-14.

Wamba, S. F., Gunasekaran, A., Akter, S., Ren, S. J. F., Dubey, R., & Childe, S. J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. *Journal of Business Research*, 70, 356–365. <https://doi.org/10.1016/j.jbusres.2016.08.009>

Zaida, M., Farooqi, R., & Azmi, S. N. (2025). Driving sustainable supply chain performance through digital transformation: The role of information exchange and responsiveness. *Cogent Business & Management*, 12(1), 2443047. <https://doi.org/10.1080/23311975.2024.2443047>

LOGISTICS PERFORMANCE AS A LOGISTICS BARRIER FOR A COUNTRY

Zbigniew Bentyn

Poznan University of Economics and Business, 61-875 Poznan, Poland, zbigniew.bentyn@ue.poznan.pl
<https://orcid.org/0000-0002-2061-2616>

Sylwia Konecka

Poznan University of Economics and Business, 61-875 Poznan, Poland, sylwia.konecka@ue.poznan.pl
<https://orcid.org/0000-0001-9283-7059>

A. Zafer Acar

Bilgi University, 34440 Beyoğlu Istanbul, Türkiye, zafer.acar@bilgi.edu.tr

ABSTRACT

The study aimed to assess the ability of the Logistics Performance Index (LPI) to serve as a warning tool for international logistics managers dealing with logistics operations. Given the increasing wave of various supply chain disruptions, knowledge about potential logistics barriers arising in specific locations is crucial for forecasting disruptions and being prepared beforehand. The research confronted the opinions of international business logistics managers with official World Bank LPI data from 2018 and 2023. The outcome verified the information based on managers' experience, confirming a highly significant ($p < 0.01$) negative relationship between logistics managers' logistics barrier scores and LPI. Higher LPI scores are therefore associated with lower average barrier scores for a given country, which demonstrates that low logistics performance itself constitutes a logistics barrier.

KEYWORDS

Strategic, Management, Logistics barriers, Supply chain, LPI index

INTRODUCTION

In the contemporary globalized economy, efficient logistics systems are pivotal for facilitating international trade, enhancing competitiveness, and fostering economic development. Conversely, deficiencies in logistics performance can act as significant barriers, impeding a country's integration into global markets and limiting economic growth. The Logistics Performance Index (LPI), developed by the World Bank in 2007, serves as a comprehensive tool to assess and compare the logistics capabilities of countries worldwide, and has been published periodically since its launch. The International LPI is derived from a worldwide survey of logistics professionals, such as freight forwarders and express carriers, who evaluate six critical dimensions: customs efficiency, quality of trade and transport infrastructure, ease of arranging competitively priced international shipments, competence and quality of logistics services, ability to track and trace consignments, and timeliness of shipments. In recent years, economic sanctions, particularly in response to geopolitical tensions such as the Russia-Ukraine conflict, have emerged as additional logistics barriers, leading to restrictions on goods movement, increased costs, and supply chain disruptions.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

The LPI is a benchmarking tool developed by the World Bank, assessing countries' logistics systems across six key dimensions, derived from a global survey of logistics professionals combined with objective data. Poor logistics infrastructure, inefficient customs procedures, and substandard services create bottlenecks that restrict market access and elevate transaction costs, thus becoming significant trade barriers. Recent empirical studies reinforce this view, showing that countries with low LPI scores experience systematically reduced volumes of international trade, and improvements

in logistics can significantly boost trade flows. Recent disruptions, such as geopolitical conflicts (the Russia-Ukraine war, Houthi attacks), pandemic aftershocks (COVID-19), and infrastructure failures (the Ever Given incident in the Suez Canal), have underscored the fragility of global logistics systems. Logistics barriers can be systematically classified based on their origin into three primary domains: external barriers (economic, political, and social environment, e.g., trade sanctions), inter-organizational barriers (between supply chain actors, e.g., misaligned communication systems), and internal barriers (within each link of the supply chain, e.g., inadequate warehouse management).

RESEARCH METHOD

The starting point for the research was the World Bank study on the perceived logistics performance of countries, expressed by the LPI, which is the weighted average of results across six zones of influence: customs operations, infrastructure, international shipments, logistics competences, identification and tracking, and timeliness. The assumption was made that a low LPI level is in itself a logistics barrier for companies prioritizing efficient logistics. The study's aim was to check to what extent the indexed logistics efficiency of a country matches the assessments of entrepreneurs operating in the international supply chain. To this end, a purposive sample of 100 Polish enterprises actively engaged in global supply chains was selected, and they were asked to assess the risk of logistics barriers for randomly selected countries from three World Bank ranking groups (logistics-friendly, medium development, and poor performers). Data were collected using a structured questionnaire administered through face-to-face interviews, employing a quasi-double-blind procedure where respondents were not informed of the countries' LPI scores. These subjective risk assessments were then statistically compared with the corresponding LPI values from the World Bank's 2018 and 2023 datasets.

FINDINGS

Initial Pearson correlation analysis showed a negative and statistically non-significant relationship between perceived logistics barrier risk assessments and LPI 2018 scores. However, visual inspection of the data revealed the presence of an outlier, Hong Kong – China, which significantly deviated from the general pattern. Despite its objectively high logistics performance, Hong Kong was assessed by respondents as having the highest perceived risk of logistics barriers, likely because data collection occurred in January 2020, shortly after the COVID-19 epidemic emerged in China. After excluding Hong Kong – China from the dataset and recomputing the statistical analysis, a strong and statistically highly significant ($p < 0.01$) negative relationship was revealed between perceived logistics barrier assessments and LPI 2018 scores. Higher LPI scores systematically correlated with lower average barrier scores perceptions among logistics managers. Similar, strong and statistically highly significant results ($p < 0.01$) were also obtained using 2023 LPI data, which not only corroborates the initial results but also demonstrates the temporal consistency and external validity of the hypothesized relationship.

CONCLUSION AND DISCUSSIONS

In recent years, global logistics systems have demonstrated increased fragility due to factors such as the COVID-19 pandemic, geopolitical tensions, environmental disruptions, tariff volatility, and labor shortages. The study's findings support the use of the LPI as a valuable analytical tool for assessing the attractiveness of a given region for investment decisions and the establishment of relationships within global supply chains. Despite entrepreneurs participating in the study not being explicitly familiar with specific countries' LPI scores, they were able to accurately assess the risks associated with potential logistics barriers. The convergence between the potential risk of logistics barriers perceived by entrepreneurs and the empirical LPI data (from 2018 and 2023) suggests that improvements in the six key dimensions of logistics performance (customs, infrastructure, international shipments, logistics competence, tracking and tracing, and timeliness) are strongly

associated with a reduction in the perceived and actual risks of logistical barriers. From a strategic management perspective, a low level of logistics performance not only constitutes a barrier in itself but also significantly diminishes a region's strategic attractiveness for investment and supply chain integration. Therefore, strengthening logistics infrastructure and capabilities should be seen as a strategic imperative for countries seeking to enhance their position within global supply networks and attract sustainable foreign direct investment.

REFERENCES

- Acar A., Bentyn Z., Kocaoglu B. (2015). Logistic performance development of the countries on the path along the new silk road, *European Transport - Trasporti Europei*, Universita degli Studi di Trieste, nr 59, s. 1-12.
- Arvis, J.-F., Ojala, L., Wiederer, C., Shepherd, B., Raj, A., Dairabayeva, K., & Kiiski, T. (2018). *Connecting to Compete 2018: Trade Logistics in the Global Economy*. World Bank Group.
- Bentyn, Z. (2024). Bariery logistyczne międzynarodowych łańcuchów dostaw. Wydawnictwo Uniwersytetu Ekonomicznego w Poznaniu. <https://doi.org/10.18559/978-83-8211-221-4>
- Beysenbaev, R., & Dus, Y. (2020). Proposals for improving the Logistics Performance Index. *Asian Journal of Shipping and Logistics*, 36(1), 34–42. <https://doi.org/10.1016/j.ajsl.2019.11.003>
- Fugate, B. S., Mentzer, J. T., & Stank, T. P. (2010). Logistics performance: Efficiency, effectiveness, and differentiation. *Journal of Business Logistics*, 31(1), 43–62. <https://doi.org/10.1002/j.2158-1592.2010.tb00127.x>
- Ghadge, A., Dani, S., & Kalawsky, R. (2012). Supply chain risk management: Present and future scope. *The International Journal of Logistics Management*, 23(3), 313–339. <https://doi.org/10.1108/09574091211289200>
- Guner, S., & Coskun, E. (2012). Comparison of impacts of economic and social factors on countries' logistics performances: A study with 26 OECD countries. *Research in Logistics & Production*, 2(4), 277–286.
- Munim, Z. H., & Schramm, H. J. (2018). The impacts of port infrastructure and logistics performance on economic growth: The mediating role of seaborne trade. *Journal of Shipping and Trade*, 3(1), 1–19. <https://doi.org/10.1186/s41072-018-0027-0>
- Ojala, L., & Çelebi, D. (2015). The World Bank's Logistics Performance Index and drivers of logistics performance. *International Transport Forum*.
- Pan, X., Wang, Y., & Liu, Z. (2024). The impact of international logistics performance on import and export trade: Evidence from Belt and Road Initiative countries. *Humanities and Social Sciences Communications*, 11, Article 35. <https://doi.org/10.1057/s41599-024-03541-0>
- Wang, Z., Nong, D., Countryman, A. M., Corbett, J. J., & Warziniack, T. (2020). Potential impacts of ballast water regulations on international trade, shipping patterns, and the global economy: An integrated transportation and economic modeling assessment. *arXiv preprint*. <https://arxiv.org/abs/2008.11334>
- World Bank. (2023). *Connecting to Compete 2023: Trade Logistics in an Uncertain Global Economy*. World Bank LPI 2023 Report

CYBERATTACKS AS A LOGISTICAL BARRIER IN THE CONTEXT OF LPI ANALYSIS

Sylwia Konecka

Poznan University of Economics and Business, Poznań, Poland, sylwia.konecka@ue.poznan.pl
<https://orcid.org/0000-0001-9283-7059>

Zbigniew Bentyn

Poznan University of Economics and Business, Poznań, Poland, zbigniew.bentyn@ue.poznan.pl
<https://orcid.org/0000-0002-2061-2616>

A. Zafer Acar

Bilgi University, Stambul, Türkiye, zafer.acar@bilgi.edu.tr

ABSTRACT

This study explores the link between cyberattacks and the Logistics Performance Index (LPI) in global supply chains. Growing digitalization makes logistics systems increasingly vulnerable to cyber threats that disrupt efficiency and continuity. Using Check Point's ThreatMap data (Nov–Dec 2023), cyberattack frequency is compared with LPI scores to determine whether weaker logistics environments face higher exposure. The LPI, developed by the World Bank, measures six areas of logistics performance, and this research identifies which dimensions are most affected. Findings reveal a negative correlation: countries with lower LPI scores experience more cyberattacks. Such incidents targeting logistics infrastructure can cause operational paralysis, data breaches, reputational harm, and financial loss, making them a major barrier to supply chain stability. The study also reviews key sectors and malware types, addressing two questions: whether low-LPI countries are more frequently targeted, and what risk factors drive these attacks. Results highlight the importance of stronger cybersecurity protocols to enhance supply chain resilience.

KEYWORDS

cyberattacks, logistics barriers, Supply chain risk, supply chain management, LPI index, International Shipments

INTRODUCTION

According to the 2025 World Economic Forum report, cyberattacks are the fifth most frequently cited global risk. Prepared in collaboration with Zurich Insurance Group and Marsh McLennan and based on the views of more than 900 experts and business leaders, the report highlights both a deteriorating short-term outlook and unfavorable long-term projections. Among the most significant risks expected to materialize by 2025, respondents identified extreme weather events, AI-generated misinformation and disinformation, social and political polarization, and the cost-of-living crisis. Supply chains are particularly vulnerable to a broad spectrum of risks. Research indicates that their stability can be disrupted by natural disasters, climate change, geopolitical factors (e.g., conflicts, sanctions, regulatory shifts), and economic variables such as demand shocks, price volatility, or currency fluctuations. Within this context, cyberattacks are emerging as a critical source of disruption, capable of undermining information flows, operational continuity, and financial stability, while simultaneously eroding business reputation. In logistics research and practice, the Logistics Performance Index (LPI) developed by the World Bank plays a central role. The LPI evaluates six dimensions of logistics efficiency: customs performance, quality of infrastructure, international shipment competitiveness, competence of logistics services, tracking and tracing capabilities, and timeliness of deliveries. It serves as a widely used tool for diagnosing strengths and weaknesses in

national logistics systems and for designing strategies to improve their performance. This study approaches cyberattacks as a distinct category of logistical barriers—digital barriers—that threaten the efficiency and security of global supply chains.

LITERATURE REVIEW

The literature on supply chain risks is extensive, yet the topic of cyber threats remains relatively underexplored within the fields of management and economics. A bibliometric analysis of the Web of Science database (2021–2025) revealed that, out of 347 publications addressing supply chain threats, only seven explicitly dealt with cyberattacks. This indicates a clear research gap and the need for further academic inquiry. Existing studies demonstrate that cyberattacks in supply chains take diverse forms, including ransomware, phishing, distributed denial-of-service (DDoS), and vendor-based infiltrations (supply chain attacks). Their consequences include production and distribution stoppages, data breaches, financial losses, and a decline in trust among business partners.

Various typologies of cyber risks are present in the literature: by source (internal/external, intentional/unintentional), by channel (technical, human, infrastructural), or by operational impact (data theft, service disruption, sabotage of industrial control systems). Reports by ENISA and industry analyses confirm the rapid escalation in frequency and severity of cyberattacks. A notable example is the Colonial Pipeline ransomware incident in the United States, which disrupted fuel markets and created spillover effects across multiple economic sectors.

From a logistics perspective, cyberattacks can be conceptualized as digital barriers that:

- Disrupt information and decision flows within supply chains;
- Introduce operational uncertainty in areas such as production and distribution;
- Erode trust between supply chain partners and
- Trigger secondary disruptions in the physical flow of goods.

Consequently, cyber threats must be addressed with integrated security strategies, comparable in importance to traditional logistical solutions related to infrastructure and process management.

METHODOLOGY

This study employs a mixed-method approach combining bibliometric and correlation analyses to examine the relationship between cyberattacks and the Logistics Performance Index (LPI) in global supply chains. First, a bibliometric analysis of Open Access publications (2021–2025) in the Web of Science database mapped the research landscape on cyber threats in supply chains, identifying thematic clusters, disciplinary orientations, and literature gaps. Keywords included “supply chain,” “threats,” and “cyberattacks,” filtered by Management, Business, Economics, and Operations Research categories. Second, an empirical correlation analysis explored the link between cyberattacks and LPI scores using data from Check Point’s ThreatMap (Nov–Dec 2023) and the World Bank’s LPI (2023). Attack frequencies by country were compared with overall LPI scores and its six components—customs efficiency, infrastructure quality, international shipments, logistics competence, tracking and tracing, and timeliness—to identify areas of greatest vulnerability. The study addresses three research questions:

RQ1: Which countries rank highest in the LPI?

RQ2: Which countries are most vulnerable to cyberattacks?

RQ3: Are countries with lower LPI scores more frequently targeted by cyberattacks?

RESULTS

In 2023, high-performing countries (Singapore, Finland, Denmark, Germany, and the Netherlands) led the Logistics Performance Index, demonstrating consistently strong performance across

infrastructure, customs, logistics competence, shipment tracking, and timeliness. Overall, top-performing countries combine investments in infrastructure with strong institutional and organizational logistics practices, maintaining competitiveness across all LPI dimensions.

Cyberattack vulnerability varies considerably across countries. The United States is the most frequently targeted globally, while selected European and Asian nations, including Germany, France, and Poland, also face significant risks. Latin America, particularly Brazil, recorded high attack rates, exacerbated by growing internet penetration and a shortage of IT professionals. Analysis using Check Point's ThreatMap (Nov–Dec 2023) revealed that several less-developed countries face high cyber risk. Examples include Mongolia, Nepal, Vietnam, the Philippines, and Angola. Weekly data highlighted shifts in targets, including the healthcare sector and regional variations.

Comparing LPI and cyberattack data highlights key patterns:

- Vietnam and the Philippines scored similarly overall, though the Philippines showed stronger timeliness and customs efficiency.
- Kuwait performed relatively well in infrastructure and customs, but logistics service quality remained lower.
- Mongolia and Angola had the lowest LPI scores, reflecting significant weaknesses in infrastructure, customs efficiency, and logistics competence.

These findings indicate that higher LPI scores correlate with better-developed infrastructure, efficient customs, and reliable logistics services. Countries with lower LPI performance should prioritize improvements in infrastructure, customs procedures, and logistics capabilities to enhance global supply chain competitiveness.

CONCLUSION

This study highlights the growing importance of cyberattacks as critical barriers in digitally integrated supply chains. Despite their increasing frequency, cyber threats are underrepresented in logistics research. Using data from the World Bank LPI (2023), Check Point's ThreatMap (Nov–Dec 2023), and other sources, the study examines the relationship between logistics performance and cyber vulnerability. Findings reveal a dual pattern: developed economies like the U.S., Germany, and Brazil are frequently targeted due to economic and digital centrality, while less-developed countries such as Mongolia, Angola, Nigeria, and Nepal—often with low LPI scores—face heightened risk due to weak infrastructure, customs inefficiency, and limited logistics competence. Countries with stronger LPI components, such as the Philippines, Vietnam, and Kuwait, show partial resilience through better infrastructure and delivery performance. The study demonstrates a negative correlation between logistics performance and exposure to cyber threats, framing cyber risks as a novel, non-physical category of logistical barriers. In practice, countries with low LPI scores should invest in IT capacity, workforce training, and logistics modernization, whereas high-performing economies require multi-layered cyber defense strategies. Further research could focus on predictive modeling and sector-specific analyses of logistics–cyber risk interactions.

REFERENCES

- Abnormal Security. (2020). Abnormal attack stories: WHO impersonation. <https://abnormalsecurity.com/blog/abnormal-attack-stories-who-impersonation/>.
- Akter, S., Uddin, M.R., Sajib, S., Lee, W.J.T., Michael, K., & Hossain, M.A. (2022). Reconceptualizing cybersecurity awareness capability in the data-driven digital economy. *Annals of Operations Research*.
- Ariffin, K.A.Z. and Ahmad, F.H. (2021). Indicators for maturity and readiness for digital forensic investigation in era of industrial revolution 4.0. *Computers & Security*, Vol. 105, p. 102237.
- Azab, M., Alhyari, S., Awajan, A., & Abdallah, A.B. (2021). Blockchain technology in supply chain management: an empirical study of the factors affecting user adoption/acceptance. *Cluster Computing*, Vol. 24 No. 1,

pp. 83-101.

- Blackberry. (2022). Global Threat Intelligence Report. Retrieved from <https://www.blackberry.com/content/dam/bbcomv4/global/pdf/0408-Threat-ReportV17.pdf>.
- Check Point Software Technologies. (2024). Cyber Security Report 2024. Retrieved August 21, 2024, from <https://pages.checkpoint.com/2024-cyber-security-report>.
- Creazza, A., Colicchia, C., Spiezia, S., & Dallari, F. (2022). Who cares? Supply chain managers' perceptions regarding cyber supply chain risk management in the digital transformation era. *Supply Chain Management - An International Journal*, 27(1).
- Dehghani, M., Mashatan, A., & Kennedy, R.W. (2020). Innovation within networks—patent strategies for blockchain technology. *Journal of Business & Industrial Marketing*.
- Etemadi, N., Van Gelder, P., & Strozzi, F. (2021). An ISM modeling of barriers for blockchain/distributed ledger technology adoption in supply chains towards cybersecurity. *Sustainability*, Vol. 13 No. 9, p. 4672.
- Gourisetti, S.N.G., Mylrea, M., & Patangia, H. (2019). Evaluation and demonstration of blockchain applicability framework. *IEEE Transactions on Engineering Management*, Vol. 67 No. 4, pp. 1142-1156.
- Hansman, S., & Hunt, R. (2005). A taxonomy of network and computer attacks. *Computer and Security*.
- Iakovakis, G., Xarhoulacos, C.-G., Giovas, K., & Gritzalis, D. (2021). Analysis and Classification of Mitigation Tools against Cyberattacks in COVID-19 Era. *Hindawi Security and Communication Networks*, Volume 2021, Article ID 3187205, 21 pages. <https://doi.org/10.1155/2021/3187205>.
- IBM (2024a) <https://www.ibm.com/us-en>
- Interpol. (2020). Cybercrime: COVID-19 Analysis Report. Interpol, Lyon, France.
- Kjaerland, M. (2005, October). A taxonomy and comparison of computer security incidents from the commercial and government sectors. *Computers and Security*, 25, 522-538.
- Louis, F., & Saleh, M. (May 3, 2024). The Importance of Risk Management in a Globalized Supply Chain. ResearchGate. https://www.researchgate.net/publication/380316036_The_Importance_of_Risk_Management_in_a_Globalized_Supply_Chain.
- Manuj, I., & Mentzer, J.T. (2008). Strategies for Managing Risk in Global Supply Chains. *International Journal of Physical Distribution & Logistics Management*, 38(3), 192-223.
- McKinsey & Company. (August 6, 2020). Which conditions make businesses most vulnerable to value chain disruptions, including COVID-19? [Graph]. In Statista. <https://www-1statista-1com-1s8fui2bx0028.han3.ue.poznan.pl/statistics/1155422/conditions-supply-chain-vulnerability-gvc/>.
- NASCIO. (October 11, 2021). Concerning the continuity of government, what is your top cybersecurity risk today? [Graph]. In Statista. <https://www-1statista-1com-1s8fui2bx0028.han3.ue.poznan.pl/statistics/1287540/united-states-important-cybersecurity-risks-perceived-by-cios/>.
- National Cyber Security Centre (2019). Supply Chain Security Guidance. <https://www.ncsc.gov.uk/collection/supply-chain-security/supply-chain-attack-examples>.
- Naz, F., Kumar, A., Agrawal, R., Garza-Reyes, J.A., Majumdar, A., & Chokshi, H. (2023). Artificial intelligence as an enabler of quick and effective production repurposing: An exploratory review and future research propositions. *Production Planning & Control*.
- NordVPN. (2020). Cyber Risk Index. <https://s1.nordcdn.com/nord/misc/0.13.0/vpn/brand/NordVPN-cyber-risk-index-2020.pdf>.
- Ocicka, B., Rogowski, W., & Turek, J. (2022). Industry 4.0 technologies as enablers of sustainability risk management. *Ekonomia i Prawo - Economics and Law*, 21(4).
- Oral, F., & Paker, S. (2023). Risk Assessment for Maritime Container Transportation Security. *Journal of ETA Maritime Science*, 11(4).
- Pérez-Morón, J. (2021). Eleven years of cyberattacks on Chinese supply chains in an era of cyber warfare: A

- review and future research agenda. *Journal of Asia Business Studies*, 16(2), 371-395. DOI: 10.1108/JABS-11-2020-0444.
- Pilarski, G. (2023). *Wojskowy Instytut Techniczny Uzbrojenia - Zeszyt 167 nr 5/2023*, 97-106. Retrieved from https://yadda.icm.edu.pl/baztech/element/bwmeta1.element.baztech-c21637f1-3ed3-444d-baa8-c93caf6ffd0d/c/Pilarski_167.pdf.
- Pournader, M., Shi, Y., Seuring, S., & Kh, S. (2019). Blockchain applications in supply chains, transport and logistics: a systematic review of the literature. *Special Issue: Blockchain in Transport and Logistics*, pp. 2063-2081.
- Radanliev, P., De Roure, D., and Page, K. (2020). Cyber risk at the edge: current and future trends on cyber risk analytics and artificial intelligence in the industrial internet of things and industry 4.0 supply chains. *Cybersecurity*, Vol. 3, p. 13.
- Ram, J., and Zhang, Z. (2020). Belt and road initiative (BRI) supply chain risks: propositions and model development. *The International Journal of Logistics Management*, Vol. 31 No. 4, pp. 777-799.
- Simmons, C., Ellis, C., Shiva, S., Dasgupta, D., & Wu, Q. (2014). AVOIDIT: A Cyber Attack Taxonomy. https://www.researchgate.net/profile/S-Shiva/publication/229020163_AVOIDIT_A_Cyber_Attack_Taxonomy/links/544e58360cf2bca5ce90aebb/AVOIDIT-A-Cyber-Attack-Taxonomy.pdf.
- Statista Technology Market Insights. (2023). Retrieved from <https://www-1statista-1com-1s8fui2bx0028.han3.ue.poznan.pl/chart/30870/share-of-worldwide-cyber-attacks-by-type/>.
- SurfShark. (2022). <https://www-1statista-1com-1s8fui2bx0003.han3.ue.poznan.pl/statistics/1351436/most-targeted-countries-cyber-threats/>.
- U.S. Department of Commerce. (2023). Cyberattacks in Poland Occur Every 9 Minutes. Trade.gov. Retrieved from <https://www.trade.gov/market-intelligence/poland-ict-cyberattacks-poland-take-place-every-9-minutes>.
- Urquhart, L. and McAuley, D. (2018). Avoiding the internet of insecure industrial things. *Computer Law & Security Review*, Vol. 34 No. 3, pp. 450-466.
- World Bank. (2018). *Connecting to Compete 2018: Trade Logistics in the Global Economy - The Logistics Performance Index and Its Indicators*. <https://documents1.worldbank.org/curated/en/576061531492034646/pdf/Connecting-to-compete-2018-trade-logistics-in-the-global-economy-the-logistics-performance-index-and-its-indicators.pdf>.
- World Economic Forum. (2025). *The Global Risks Report 2025*. https://reports.weforum.org/docs/WEF_Global_Risks_Report_2025.pdf

EVALUATION OF AUTOMOTIVE AFTER SALES SERVICES IN TURKIYE

Adnan Corum

Bahçeşehir University, Istanbul, Türkiye, adnan.corum@bau.edu.tr

Sinem Arpacı Yigit

Bahçeşehir University, Istanbul, Türkiye, sinem.a.yigit@gmail.com

<https://orcid.org/0009-0000-5087-1355>

ABSTRACT

Türkiye's growing export-oriented economic policies and export figures increase the importance of the automotive after-sales services sector. This study analyzes the sector in line with Türkiye's demographic structure and consumption habits through a literature review and interviews with experts. It provides a projection on how automotive after-sales services will be shaped in the future within the framework of technological developments and Türkiye's geographical location. In the study, the production, procurement, distribution and storage processes of the auto parts supplier sector are analyzed in detail. In addition, evaluations are made on how investments in the auto parts supplier sector can strengthen the sector and make it a prominent component in the future.

KEYWORDS

Spare Parts, Electric vehicle, Automotive, Sub-Industry

INTRODUCTION

The automotive industry has shaped life for over a century, influencing lifestyles, consumer needs, sports, and even warfare. During the 2020 pandemic, it showed its impact on mass behavior, and despite crises, it remains a major economic driver. This strength comes from combining inputs from many sectors, adapting to technology, meeting essential mobility needs, and reflecting people's desire for status — keeping demand high.

The industry mainly consists of two branches: automobile manufacturers and auto parts suppliers. This division emerged to better track production costs and profits. The auto parts supplier sector started growing globally in the 1960s and in Türkiye in the 1980s, later joined by automotive after-sales services as an important sub-sector.

In after-sales, service quality is vital: efficient driving can reduce fuel use by 20–25%, affecting maintenance costs and timing (Khodjaev and Rakhmonova, 2022). Spare parts are also critical; profitability depends on solid supplier ties, strengthened further by trust and quality improvements during the 2020 pandemic (Gergin et al., 2022). The aftermarket includes companies that make and distribute spare parts (Kaya, 2022).

During crises in 1994, 2008, and 2020, car sales dropped by 50%, but spare parts sales stayed stable, supporting the industry financially. As global competition lowers profits from vehicle sales, after-sales remains strong: in Türkiye, it generates 10 times more profit than car sales, although investment is low due to limited expertise among managers. Since the 1990s, automakers worldwide have turned to after-sales for new revenue, while Türkiye has improved its position in exports by aligning with international standards (Aydin, 2008).

Customers expect uninterrupted service after buying a vehicle. Besides stock availability, the skill and communication of service staff greatly influence satisfaction (Özgüner and Kurtuldu, 2015).

Globally, ten leading brands produce 70% of vehicles. Many independent suppliers make essential parts like airbags and electronics, supporting large-scale production. While close ties exist between manufacturers and suppliers worldwide, in Türkiye this relationship is less developed. Türkiye's parts sector began in the 1960s, boosted by local production policies like the 1964 Assembly Industry Instruction. Until 1980, foreign currency shortages pushed for local manufacturing, attracting investment and growing the sector.

However, auto parts suppliers in Türkiye vary by expertise and production methods. Many remain below optimal size and scattered geographically, making it harder to keep up with new technologies and cost trends (Yaşlı, 2018).

In after-sales, traditional repair shops are being replaced by modern service centers. These include: (1) Authorized Services — approved by manufacturers for their brands, (2) Chain Services — serving multiple brands independently, and (3) Special Services — handling all brands without manufacturer ties.

The industry supports wide commercial activity, covering manufacturers, suppliers, employment, and sectors like steel, software, glass, tires, petrochemicals, and electronics. OEM companies also produce parts for production lines, while aftermarket companies make and distribute spare parts (Kaya, 2022).

Environmental goals also influence the sector. The European Commission targets magnesium as a lightweight material in the 2030s, mainly for wheels, dashboards, and engine blocks (Liu et al., 2023). Meanwhile, the climate crisis and pressure from investors, governments, and consumers push automakers toward EVs and greener supply chains. In India, foreign investment supports this transition, though challenges like worker safety and child labor remain (Mathivathanan et al., 2022). Financial hurdles also complicate the shift to sustainable supply chains (Palea and Santhia, 2022).

Eastern Europe focuses more on combustion engine vehicles, supported by low labor costs and investment. Despite EU efforts to cut carbon emissions, automakers hesitate to fully commit to EVs due to profit concerns. EV production in the EU rose slightly from 24.9% in 2019 to 26.2% in 2020, but the pandemic and the Ukraine war disrupted production in 2021–2022. Countries like the Czech Republic, Slovakia, and Poland play key roles.

Switching to EVs also threatens jobs: battery production needs fewer workers than traditional engine assembly, affecting employment levels (Pavlínek, 2023).

As part of this study, we examined Türkiye's automotive aftermarket's current situation and future. We gained insights from the President of the Automotive Aftermarket Products and Services Association and the General Manager of Martaş Automotive, a company with over 40 years in the sector. We also spoke to nine Martaş Automotive experts across Türkiye to understand industry trends and challenges.

METHODOLOGY

To understand the status of automotive after-sales services in our country and the projection of its future status, we first reviewed and analyzed recent and relevant documents, reports, and studies on the subject. In addition, in-depth interviews were conducted with highly respected professionals in the sector.

As a result of the information obtained throughout the study and the inferences learned from these very valuable participants, an assessment was made regarding the point where automotive after-sales services have evolved and the situation to be reached in the short-medium term.

Interviews were conducted with the President of the Turkish Automotive After-sales Products and Services Association and the General Manager of Martaş Automotive within the scope of our research.

RESULTS

The automotive industry, a global growth driver since Karl Benz's 1885 invention, includes manufacturers, parts suppliers, and the aftermarket sector. This aftermarket—serving individuals, fleets, and institutions—remains underrecognized despite its importance. Closely tied to sectors like textiles, logistics, and technology, it supports vehicles after purchase. The sector now has two main branches: independent distributors like Martaş Automotive supplying branded parts, and parts made by independents but branded by original manufacturers (e.g., OEM vs. OES). It involves a wide network of producers, distributors, retailers, mechanics, and end users.

Clusters of companies and decision-makers, such as mechanics and retailers, play key roles. Online marketplaces have expanded with e-commerce—accelerated by the pandemic—making the aftermarket more complex and trend-sensitive.

Three major megatrends are reshaping the industry: (1) Autonomous vehicles, (2) Connected vehicles, and (3) Electric vehicles (EVs), driven by sustainability goals. Yet, Türkiye's EV adoption remains low, with just 7,000 units nationwide. The aftermarket has yet to adapt fully, while battery technology poses risks due to lithium supply vulnerabilities—similar to the global chip shortage.

As automakers commit to EVs, they also explore wind, solar, and water-powered alternatives, investing in battery and charging infrastructure. For full industry adoption, EVs must reach at least 20% of the global vehicle market. Global sales dropped from 100 million pre-pandemic to 85 million by 2022. For EV aftermarkets to be viable, sales must reach 10–15 million units annually, a target projected for 2035.

Key challenges for EV expansion include: (1) High Production Costs – EVs currently cost twice as much to produce as internal combustion engine (ICE) vehicles. (2) Greater Investment Needs– EV technologies require more upfront investment. (3) Sustainability of Pricing– Current cost structures may not be financially viable long-term.

Northern Europe and China lead EV adoption due to infrastructure investment, while the U.S. remains hesitant. Türkiye entered the market with its national EV, TOGG, in 2023. Post-pandemic, cars are increasingly seen as mobile living spaces, increasing reliance on electronic components, chips, and Big Data.

In the aftermarket, manufacturers oversee production, distributors manage logistics, and service providers monitor parts and services, highlighting the importance of information flow. Türkiye's spare parts output fell from 1.5 million to 1.3 million units (2017–2022), dropping its global rank from 13th to 15th. However, with 2 million unit capacity, it's poised for growth. The \$30.1B supply sector exports \$11B and aims to reach \$50B with its skilled workforce.

Martaş Automotive's GM emphasized the industry's resilience amid crises, driven by population growth and urbanization. EV adoption will differ by income level: high-income countries will shift fastest, middle-income ones like Türkiye more slowly, and low-income nations will rely on imported used vehicles.

As global supply chains localize, Türkiye's strategic location positions it well to grow its automotive sector and improve its trade balance. TOGG's plan to control aftermarket services initially may limit independent distributors, but rising demand will likely expand the ecosystem.

CONCLUSION

Our research shows that Türkiye's automotive aftermarket sector has become deeply integrated into the supply chain, playing a key role in customer loyalty. Beyond service, it now includes manufacturing and supply functions, connecting distributors, retailers, mechanics, and end users.

Despite declines in production, exports, and imports post-pandemic, Türkiye's total automotive market grew 61.8% in 2020. The aftermarket sector expanded by 10% in 2022, with exports rising 8.52%, outpacing OEM growth (3.48%). In 2022, OEM exports reached \$31.5B, while the supply industry hit \$12.8B.

This sector spans maintenance, spare parts distribution, and OES production. Once declining, personal car ownership rebounded post-pandemic, boosting the used car market. As of January 2023, the automotive aftermarket services market has reached a size of \$2.7 billion. With its current export share, the market has the potential to triple its export volume in the coming years.

REFERENCES

- Aydın, M. (2008). An application for measuring quality in the service sector and after-sales service quality in automotive sector. Master's thesis, Kocaeli University, Institute of Social Sciences.
- Gergin, R. E., Peker, İ., & Kısa, A. C. G. (2022). Supplier selection by integrated IFDEMATEL-IFTOPSIS Method: A case study of automotive supply industry. *Decision Making: Applications in Management and Engineering*, 5(1), 169-193.
- Kaya, O. (2022). Relationship Between After-Sales Services, Customer Experience, Service Innovation and Customer Satisfaction in the Automotive Industry (Doctoral dissertation, Maltepe University).
- Khodjaev, S. M., & Rakhmonova, S. S. (2022). Saving resources in the operation, maintenance of automotive equipment. *American Journal of Interdisciplinary Research and Development*, 5, 18-27.
- Liu, B., Yang, J., Zhang, X., Yang, Q., Zhang, J., & Li, X. (2023). Development and application of magnesium alloy parts for automotive OEMs: A review. *Journal of Magnesium and Alloys*, 11(1), 15-47.
- Mathivathanan, D., Agarwal, V., Mathiyazhagan, K., Saikouk, T., & Appolloni, A. (2022). Modeling the pressures for sustainability adoption in the Indian automotive context. *Journal of Cleaner Production*, 342, 130972.
- Özgüner, Z., & Kurtuldu, H. S. (2015). The effect of after-sales services provided in authorized services on customer satisfaction: An application in the automotive sector of Istanbul province. *Çankırı Karatekin University Faculty of Economics and Administrative Sciences Journal*, 5(2), 569-589.
- Palea, V., & Santhià, C. (2022). The financial impact of carbon risk and mitigation strategies: Insights from the automotive industry. *Journal of Cleaner Production*, 344, 131001.
- Pavlínek, P. (2023). Transition of the automotive industry towards electric vehicle production in the east European integrated periphery. *Empirica*, 50(1), 35-73.
- Yaşlı, M. (2018). The role of after-sales customer service in strengthening customer loyalty: An application in the automotive industry (Master's thesis, Manisa Celal Bayar University Institute of Social Sciences).

HUMAN CAPITAL IN THE DIGITAL ERA

EYE MOVEMENTS TO STRATEGIC TALENT DECISIONS: A SUSTAINABILITY-ORIENTED APPROACH TO DIGITAL RECRUITMENT USING EYE-TRACKING TECHNOLOGY

Pelin Vardarlier

Balıkesir University, Balıkesir, Türkiye, pepin.vardarlier@balikesir.edu.tr
<https://orcid.org/0000-0002-5101-6841>

ABSTRACT

In the digital age, human resource (HR) departments are increasingly integrating advanced technologies to enhance decision-making processes. One emerging tool is eye-tracking technology, which offers valuable insights into the attention patterns of HR professionals during curriculum vitae (CV) evaluations. This study examines how eye-tracking can be strategically leveraged to streamline the recruitment process, enhance sustainability, and align candidate selection with organizational objectives in a digitally transformed economy. A qualitative research design was employed to analyze the gaze behavior of 12 HR professionals from various industries as they reviewed CVs of candidates applying for roles in communication, marketing, and human resource departments. These departments often value both professional competence and socio-emotional presentation, making them ideal for this study. The research combined eye-tracking data with semi-structured interviews, aiming to understand which elements (e.g., education, experience, visual layout, photo, consistency, intellectual capital) drew the most attention and influenced decision-making. Findings revealed that eye-tracking-supported recruitment tools can help identify the cognitive strategies HR professionals use, potentially reducing unconscious bias and accelerating the decision-making process. The results emphasize the importance of CV design and digital profiling in strategic HRM and sustainable recruitment practices. This study contributes to the growing body of knowledge on strategic digital HRM, presenting eye-tracking as a viable tool to foster data-informed, sustainable, and unbiased talent acquisition in the age of digital transformation.

KEYWORDS

Eye-tracking, strategic HRM, digital recruitment, sustainability, CV analysis.

INTRODUCTION

In today's digitally transforming economy, the efficiency, equity, and sustainability of recruitment processes have become critical concerns for human resource management (HRM). The rising complexity of candidate profiles and the increasing use of digital platforms have necessitated the integration of new tools to enhance decision-making. One such innovative tool is eye-tracking technology, which allows researchers and practitioners to examine where and how attention is allocated during information processing. In recruitment, understanding how HR professionals visually interact with curriculum vitae (CV) content provides valuable insights into the cognitive mechanisms behind selection decisions. This paper explores how eye-tracking can be strategically employed in digital recruitment systems to foster sustainability, data-informed decision-making, and organizational alignment in HRM.

Strategic HRM emphasizes aligning human capital practices with long-term organizational goals. Digitalization supports this by introducing AI-based screening tools, applicant tracking systems (ATS),

and data-driven performance analytics (Lengnick-Hall et al., 2009). However, there is a risk of overlooking the human and ethical dimensions of hiring.

Eye-tracking has been widely used in marketing, usability testing, and cognitive psychology to uncover unconscious behavior and attention distribution (Rayner, 1998). In HRM, it is an emerging tool that reveals what elements of a CV attract attention, how long they are viewed, and in what sequence (Müller & Freytag, 2022). The eye-tracking method has gained prominence in recruitment research as a valuable tool for examining candidate behavior and perception during the job search process (Pourhosein & Sabokro, 2025). By capturing real-time visual attention patterns, eye-tracking enables recruiters and researchers to better understand how candidates interact with various recruitment materials, such as job postings, résumés, and cover letters (Anderson, Kohn, & Grieve, 2015).

One of the primary advantages of using eye-tracking in recruitment is its ability to identify which elements draw the most visual attention from candidates. Eye movement data reveals which sections of a job advertisement or résumé receive longer fixation durations, indicating cognitive engagement and interest (Oh & Kim, 2017). This insight allows recruitment professionals to optimize the design and content of these materials, making them more compelling and user-centered.

Beyond design optimization, eye-tracking is also effective for analyzing the decision-making processes of job seekers. Researchers can observe how candidates allocate attention when reviewing different job elements—such as salary, job location, responsibilities, or organizational values—and how these influence their preferences and choices (Chi, Foltz, & Wang, 1995). This helps organizations align their employer branding and communication strategies with the real expectations and needs of applicants.

Moreover, the technology can be used to evaluate digital recruitment tools such as online job portals, video interviews, and interactive application interfaces. For example, studies show that during asynchronous video interviews, candidates allocate attention differently compared to live interviews, affecting how they perceive fairness and interpersonal connection (Liu & Foulsham, 2017). Eye-tracking thus becomes a powerful feedback mechanism to enhance the usability and effectiveness of digital recruitment systems (Chermack & Larson, 2014).

Importantly, the insights derived from eye-tracking support the development of evidence-based recruitment strategies. By empirically understanding where candidates look, what they read, and how long they engage with key components, organizations can create recruitment content that is more targeted, inclusive, and cognitively aligned with how decisions are made (Schultheiss & Knoch, 2017). In turn, this supports a more sustainable and candidate-centered hiring process.

Sustainable recruitment practices aim to create long-term value for both the organization and society by promoting fair, inclusive, and transparent selection processes (Zaugg et al., 2001). Digital tools such as eye-tracking can contribute by minimizing bias, standardizing evaluation, and supporting diversity and inclusion efforts.

Digital recruitment refers to the integration of technology and digital tools into the recruitment and selection processes, encompassing activities such as job advertising, CV sourcing, candidate screening, and communication throughout the hiring pipeline. This technology-driven approach has become increasingly central to modern human resource management strategies, offering both operational and strategic advantages (Taylor & Rupp, 2014).

The growing popularity of digital recruitment is largely attributed to its capacity to enhance efficiency, accuracy, and accessibility in the hiring process. As the demands of the labor market

evolve, organizations are leveraging digital tools not only to streamline operations but also to maintain competitiveness in a rapidly changing business environment (McKinney, 2013). These tools allow recruiters to adapt more swiftly to shifting candidate expectations and organizational talent needs.

Moreover, the digitalization of recruitment broadens access to a wider and more diverse candidate pool. By leveraging digital platforms—such as online job boards, social media, and professional networking sites—organizations can transcend geographical and demographic limitations inherent in traditional recruitment methods. This approach promotes diversity and inclusion while increasing the likelihood of finding the best fit for a given role (Jackson, 2017).

In conclusion, digital recruitment represents a transformative trend in human resources management, offering organizations substantial benefits in terms of efficiency, precision, and reach. As the digitalization of work continues, organizations that effectively integrate technological tools into their recruitment strategies will be better positioned to attract, assess, and retain top talent in the global marketplace (McKinney, 2013; Taylor & Rupp, 2014).

The purpose of this study is to investigate how eye-tracking technology can be integrated into digital recruitment tools to support strategic and sustainable talent acquisition decisions. It aims to uncover which CV components attract the most attention from HR professionals and how these insights can inform better design and evaluation processes aligned with organizational culture and strategic goals.

METHODOLOGY

This study employed a qualitative exploratory design combining eye-tracking simulations and semi-structured interviews to investigate how HR professionals engage with CVs visually and cognitively. 12 HR professionals from different industries (technology, finance, education, marketing) with at least 5 years of recruitment experience participated. They were selected using purposive sampling.

This study adopts a qualitative research design, integrating visual behavior analysis through eye-tracking with content-based thematic coding of semi-structured interviews. The aim is to understand how human resource professionals perceive and evaluate curriculum vitae (CV) elements, particularly in the context of digital recruitment.

The research was conducted in two stages:

Eye-tracking simulations: Participants (n=12) from diverse HR departments were shown digitally designed CVs and their gaze movements were recorded.

Semi-structured interviews: Following the simulation, participants were interviewed to explore their cognitive evaluations, strategic decision-making patterns, and experiences with CV screening tools.

Interview transcripts were analyzed using MAXQDA software. The coding framework included five main categories derived from pre-defined CV design principles:

- Format (font, structure, layout)
- Requirement (position relevance and organizational fit)
- Consistency (alignment between stated competencies and real experience)
- Experience (professional background)
- Intellectual Capital (certifications, extracurriculars, transferable knowledge)

Visual analysis (eye-tracking and word cloud) was integrated with code frequency, code co-occurrence, and matrix analysis to determine thematic saturation and interrelationships between categories.

This study employed an eye-tracking-based experimental design to analyze how human resources professionals perceive and evaluate CVs in a digital environment. The experiment was conducted at the Usability Laboratory of the Department of Computer Engineering at Istanbul Technical University, located on the Ayazağa campus under the Faculty of Computer and Informatics. The laboratory is equipped with high-resolution eye-tracking systems and observation tools that allow researchers to capture and analyze user interaction with on-screen stimuli in real-time.



Figure 1. Test Room



Figure 2. Observer Room

The eye-tracking device used in this research records detailed visual behaviors, including gaze position, fixation count, fixation duration, and scan paths, as participants engage with digital content. During the experiment, each participant interacted with a test computer connected to the eye tracker, while a second computer located in the observer room simultaneously recorded the user's screen activity and eye movement data for further analysis (Poole & Ball, 2006). The device captured real-time metrics such as fixations, dwell time, gaze sequence, and heat maps, all of which were later evaluated to interpret visual attention distribution and decision-making tendencies.

Before starting the experiment, participants arrived at the lab by appointment and were escorted to the testing room. In the first 15 minutes, each participant completed a Computer Proficiency Questionnaire to assess their familiarity with digital environments, and signed a consent form allowing screen and gaze data collection. All participants volunteered for the study and were briefed on the general procedure and the purpose of the eye-tracking device.

The experiment was conducted using Experiment Center 2.4 software to record both eye and mouse movements. The recorded data were then analyzed using BeGaze 2.4, a specialized eye-tracking data analysis software. Areas of analysis included: (1) total number of fixations, (2) fixations within Gridded Areas of Interest (AOIs), (3) gaze sequence order, (4) dwell time within AOIs, (5) scan path patterns, and (6) heatmaps that visualize the density of visual attention (Duchowski, 2007; Holmqvist et al., 2011). These metrics enabled a comprehensive understanding of how recruiters interact with digital CV layouts and content.

In this study, ten different CV samples were included in the eye-tracking experiment, each designed with varying section sequences, visual hierarchies, and formatting styles. Care was taken to ensure diversity in layout and content structure so as to observe how different design elements influence recruiters' visual attention and evaluation behaviors. Each CV maintained core components such as

education, work experience, language proficiency, and personal information, yet presented these sections in distinct orders and stylistic arrangements to elicit varying eye-movement patterns.

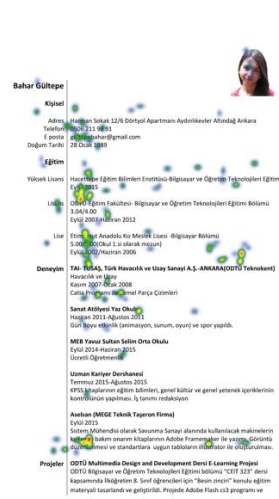


Figure 3. Heat Map



Figure 4. Scan Path

The eye-tracking method provided visual output in the form of heatmaps, which reveal the intensity and location of visual attention across the CVs. These heatmaps were generated for each participant and CV combination. The visual data allowed the identification of zones where gaze fixations were concentrated and which areas were overlooked.

Each heatmap was analyzed individually, and insights were interpreted in combination with qualitative data gathered from participants during post-experiment interviews. This triangulation of visual and verbal data enabled a deeper understanding of participant reasoning behind attention patterns—such as prioritization of experience sections, neglect of personal interests, or confusion due to cluttered layouts.

Ultimately, the combination of eye-tracking heatmaps and qualitative feedback offered a robust foundation for interpreting how the structure and sequence of information in digital CVs influence recruiter perception, cognitive load, and decision-making processes.

RESULTS

In qualitative research, selecting the appropriate participants is essential to uncover deep, contextual insights about human behavior. In this study, the focus group method was employed to identify and select participants for the interview process. Focus groups are designed to explore the underlying motivations, perceptions, and experiences of participants by facilitating interactive discussions within a structured framework (Kitzinger, 1995). This method is particularly effective for revealing collective meanings and nuanced group dynamics that may not surface in individual surveys (Morgan, 1997). In the participant selection phase, individuals with expertise and experience in human resources and recruitment processes were deliberately chosen to ensure that the data collected would be both reliable and relevant to the study's objectives.

The matrix diagram (Figure 5) indicates strong co-occurrence between Format – Requirement, and Requirement – Experience, showing that:

- A well-formatted CV increases the likelihood that job-relevant experience is noticed.

- Visual organization (e.g., Times New Roman, 12 pt, structured layout) correlates with quicker decision-making during screening.

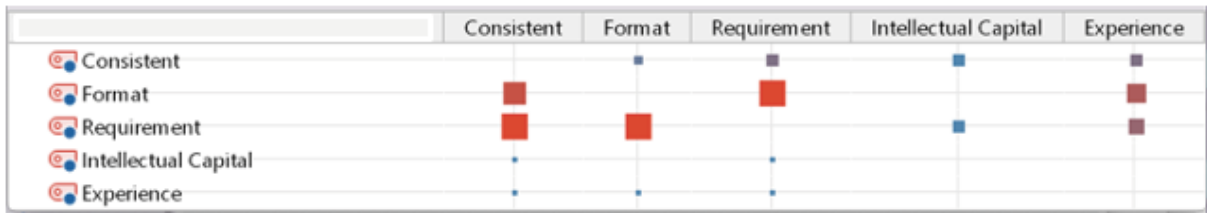


Figure 5. Code Relationship Scanner

Additionally, Intellectual Capital codes co-occurred frequently with Consistency, suggesting that recruiters perceive certifications or social projects positively only when they match the candidate’s stated career goals and fit the applied position.

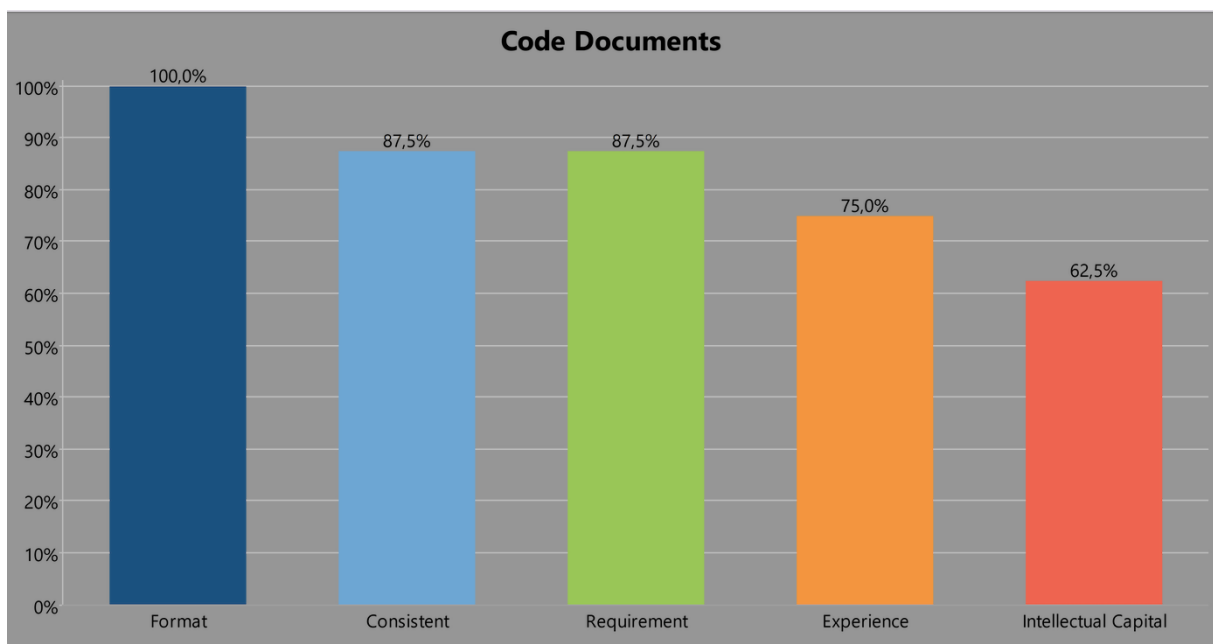


Figure 6. Code Based Frequency Analysis

Another data obtained with the MAXQDA 21 program is the code-based frequency analysis presented in Figure 2. In this analysis, the frequency of emphasis of each code assigned to the answers given in the text of the answer is analyzed. The answers received from the interviewed professionals were analyzed. According to the frequency bar chart (Figure 6), the most frequently referenced themes were:

- Format (e.g., font size, order, image placement)
- Requirement (relevance to the job/department)
- Experience
- Intellectual Capital
- Consistent

The research found that 5 codes were concentrated at different rates. It is seen that 100% of the people included in the research emphasized the code "Format", 87,5% "Consistent", 87,5% "Requirement ", 75% "Experience" and 62,5% "Intellectual Capital".

Single - Case Model

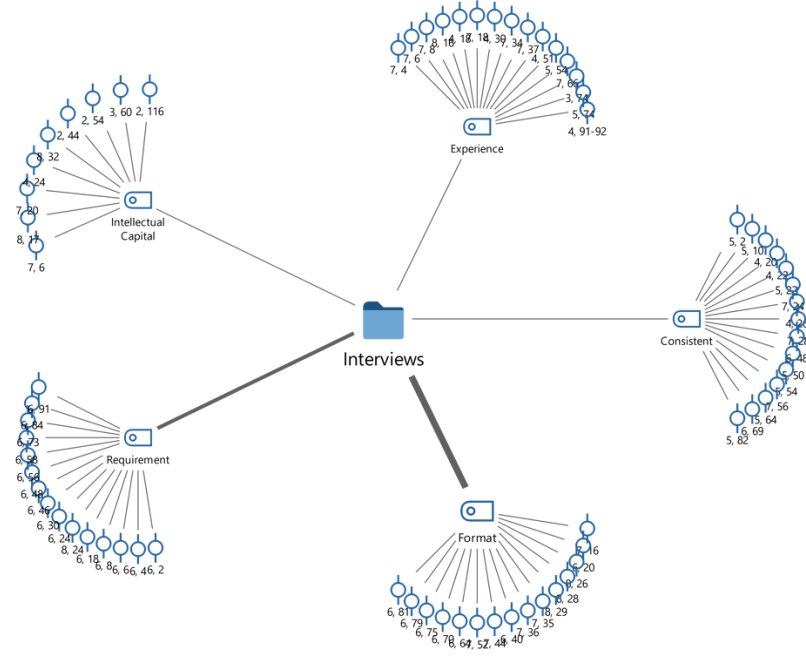


Figure 7. Single-Case Model

While code-based frequency analysis evaluates each answer sheet as a single person as usual, the single case model combines all answers together. The single case model is presented in Figure 7.

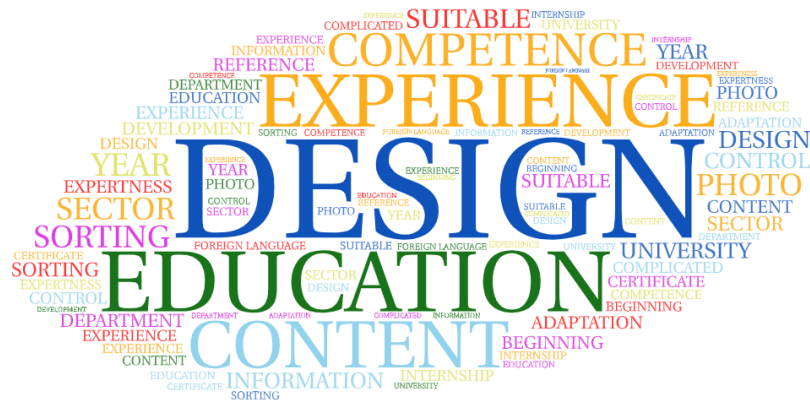


Figure 8. Word Cloud

As shown in the word cloud (Figure 8), the most prominent keywords were "Design," "Education," "Experience," and "Content", suggesting that participants placed strong emphasis on the structural and visual arrangement of information alongside core competencies.

These results indicate that recruiters prioritize a balance between visual clarity and strategic alignment with organizational goals.

This study has demonstrated that CV evaluation in digital recruitment is a multi-dimensional and strategic process, influenced by factors such as visual design, job relevance, content consistency, and intellectual capital. Clean, professional, and logically organized CVs were consistently preferred by recruiters, especially those that presented key information—like education and work experience—at the top. Furthermore, CVs that reflected a strong alignment with the specific requirements and culture of the organization were evaluated more positively than those with generic or unrelated content. Consistency between listed qualifications and the candidate's overall professional identity enhanced trust, while inflated or disjointed claims raised skepticism. Additionally, interdisciplinary experiences, certifications, and involvement in social projects were appreciated when they were clearly relevant to the applied role. The integration of eye-tracking technology with qualitative content analysis allowed the study to uncover nuanced recruiter behaviors and provided objective insights into how attention and decision-making unfold during the screening process.

Based on these findings, several practical recommendations can be made. Organizations should revise their CV screening policies to emphasize not only content but also layout and visual clarity. Standardized templates that support readability and structure should be encouraged. HR professionals would benefit from training programs that raise awareness of unconscious visual biases and teach the use of digital tools like eye-tracking for more effective decision-making. Job applicants should also be given clear, position-specific guidelines on CV formatting and content strategy. Future research could expand on this work by exploring cross-cultural recruiter responses, integrating real-time eye-tracking with AI-driven applicant tracking systems (ATS), and examining the long-term impact of visual tools on diversity and fairness. Ultimately, eye-tracking has strong potential as a sustainable, bias-reducing innovation in digital human resources management.

CONCLUSION

This study shows that digital eye-tracking tools, when properly integrated, can enhance recruitment strategy by identifying what truly matters in candidate profiles. It highlights the gap between visual attention and verbal reasoning, suggesting that HR professionals may benefit from structured guidance on how to read CVs more effectively. Moreover, the findings support the strategic use of eye-tracking as a sustainability-enabling technology, contributing to fairer, faster, and more inclusive hiring.

This research contributes to both academic and practical HRM by proposing that eye-tracking is more than a diagnostic tool—it is a strategic enabler for organizations seeking to align talent acquisition with sustainable and digital transformation goals. Future studies can explore cross-cultural differences, integrate AI-based prediction models, and expand into video-based recruitment.

CV Design Guidelines: Organizations should encourage candidates to design CVs with strategic alignment in mind—prioritizing relevant information, using consistent fonts (e.g., Times New Roman, 12 pt), and including a professional photo if the role is communication-intensive.

HR Training: HR departments should be trained to use eye-tracking insights to enhance decision-making and avoid visual bias traps.

This study reveals that curriculum vitae (CV) evaluation in digital recruitment settings is not merely an administrative screening task but rather a complex, strategic and visual process shaped by multiple interrelated dimensions. As organizations strive to adopt sustainable and inclusive human

resource management (HRM) practices, understanding how recruiters interpret visual information and make hiring decisions becomes increasingly vital.

One of the most prominent findings from both the eye-tracking data and interview analysis is the central importance of CV format. Recruiters consistently responded more favorably to CVs that demonstrated a clean, structured, and professional appearance. Elements such as the use of standard fonts (e.g., Times New Roman, 12 pt), logical ordering of sections, and clear headings contributed to a smoother visual processing experience. Eye-tracking heatmaps showed early and longer fixations on CVs that began with education and professional experience, suggesting that these sections are viewed as both informational anchors and indicators of strategic alignment with job requirements. These results support previous findings that visual hierarchy and layout strongly influence recruiter judgment during early screening phases (Müller & Freytag, 2022).

Furthermore, the qualitative data emphasized the critical role of job relevance in CV evaluation. HR professionals expected candidates to tailor their CVs in alignment with the responsibilities and cultural expectations of the position they were applying for. Experience that directly corresponded to the job's demands was considered more valuable than a longer list of unrelated roles or generalized duties. This reinforces the notion that contextual fit—both in terms of skills and workplace culture—is a dominant criterion in strategic recruitment. When CVs demonstrated an understanding of the job's context and reflected a degree of customization, they were more likely to be shortlisted.

Another key theme that emerged was the significance of consistency. Recruiters expressed skepticism towards CVs that contained exaggerated claims, extensive but loosely connected certifications, or ambiguous job titles. Such inconsistencies were often interpreted as a lack of clarity, self-awareness, or even integrity. This finding aligns with the broader literature emphasizing that authenticity and alignment between stated competencies and actual experiences are vital for establishing credibility in professional self-presentation (Van der Heijden et al., 2009). The eye-tracking results further revealed that inconsistent layouts or disorganized content led to increased cognitive load, suggesting that inconsistency not only affects trust but also disrupts visual engagement.

A fourth dimension, intellectual capital, was also a key focus. Certifications, social responsibility projects, interdisciplinary collaborations, and extracurricular involvement were generally perceived positively—but only when relevant to the applied position. HR professionals emphasized that while such elements can help a candidate stand out, they must enhance rather than distract from the core competencies required for the role. In this sense, intellectual capital acted as a differentiating factor, particularly when candidates possessed similar levels of experience and education. The co-occurrence of “Intellectual Capital” with “Requirement” and “Consistency” in the coding matrix underscores that these elements are valued most when they contribute to an integrated, coherent professional identity.

The integration of eye-tracking insights with thematic analysis presents a novel methodological contribution to strategic HRM research. The fusion of visual and verbal data offers a comprehensive understanding of recruiter behavior—one that captures both unconscious visual tendencies and articulated decision-making strategies. This multi-method approach also highlights the potential of eye-tracking as a sustainability-oriented digital tool, capable of supporting more objective and equitable recruitment decisions. As digital transformation continues to reshape HR practices, tools that provide real-time, data-informed feedback on candidate materials could help reduce bias, promote diversity, and enhance organizational performance through better hiring matches.

In sum, the findings suggest that effective CV evaluation depends on more than just content quality—it is a multidimensional interplay between visual design, strategic alignment, and authenticity. By understanding how recruiters navigate and interpret digital CVs, organizations can not only improve the efficiency of their hiring processes but also promote fairness and sustainability in talent acquisition. Future research could build on these findings by incorporating larger samples, cross-cultural comparisons, or integrating machine learning with gaze-tracking systems for adaptive recruitment platforms.

REFERENCES

- Anderson, J. P., Kohn, R. A., & Grieve, J. K. (2015). Exploring the use of eye-tracking as a tool in recruitment and selection. *International Journal of Selection and Assessment*, 23(1), 1–8. <https://doi.org/10.1111/ijsa.12095>
- Chermack, C. T., & Larson, S. A. (2014). The impact of technology on the recruitment process: An empirical study. *Journal of Business and Psychology*, 29(4), 555–564.
- Chi, M. G., Foltz, P. J., & Wang, D. R. (1995). Eye movements in reading, visual search, and hypertext navigation: An eye-fixation study of basic processes. *Cognitive Science*, 19(3), 407–439. https://doi.org/10.1207/s15516709cog1903_3
- Duchowski, A. T. (2007). *Eye Tracking Methodology: Theory and Practice* (2nd ed.). Springer.
- Holmqvist, K., Nyström, M., Andersson, R., Dewhurst, R., Jarodzka, H., & van de Weijer, J. (2011). *Eye Tracking: A Comprehensive Guide to Methods and Measures*. Oxford University Press.
- Jackson, G. (2017). The role of technology in the future of recruitment. *Journal of Business and Psychology*, 32(1), 65–72.
- Kitzinger, J. (1995). Qualitative research: Introducing focus groups. *BMJ*, 311(7000), 299–302. <https://doi.org/10.1136/bmj.311.7000.299>
- Lengnick-Hall, C. A., Beck, T. E., & Lengnick-Hall, M. L. (2009). Developing a capacity for organizational resilience through strategic human resource management. *Human Resource Management Review*, 19(3), 243–255.
- Liu, S. J., & Foulsham, S. H. K. (2017). Eye-tracking analysis of job seekers' attitudes towards video interviews. *Journal of Business and Psychology*, 32(1), 117–130. <https://doi.org/10.1007/s10869-016-9471-7>
- McKinney, R. J. (2013). The impact of technology on recruitment: An examination of trends and future possibilities. *Journal of Business and Psychology*, 28(4), 401–413.
- Morgan, D. L. (1997). *Focus Groups as Qualitative Research* (2nd ed.). SAGE Publications.
- Müller, T., & Freytag, M. (2022). Visual hiring: The effect of résumé formatting on recruiter attention and selection decisions. *Journal of Occupational and Organizational Psychology*, 95(1), 101–118. <https://doi.org/10.1111/joop.12345>
- Oh, J., & Kim, H. K. (2017). The effect of online job advertisements on job seekers' attention: An eye-tracking study. *Journal of Business and Psychology*, 32(1), 55–67. <https://doi.org/10.1007/s10869-016-9455-7>
- Poole, A., & Ball, L. J. (2006). Eye tracking in human-computer interaction and usability research: Current status and future prospects. In C. Ghaoui (Ed.), *Encyclopedia of Human Computer Interaction* (pp. 211–219). IGI Global. <https://doi.org/10.4018/978-1-59140-562-7.ch034>
- Pourhosein, M., & Sabokro, M. (2025). Unveiling the gaze: deciphering key factors in selecting knowledge workers through eye-tracking analysis. *European Journal of Management Studies*.
- Rayner, K. (1998). Eye movements in reading and information processing: 20 years of research. *Psychological Bulletin*, 124(3), 372–422.
- Schultheiss, M. J., & Knoch, B. (2017). Eye tracking and attention allocation during recruitment processes.

Journal of Business and Psychology, 32(2), 245–257. <https://doi.org/10.1007/s10869-017-9496-2>

Taylor, J. K., & Rupp, J. D. (2014). The role of technology in the evolution of recruitment and selection. *Human Resource Management Review*, 24(1), 42–51.

Van der Heijden, B. I. J. M., Scholarios, D., Van der Schoot, E., Bozionelos, N., Epitropaki, O., Jedrzejowicz, P., ... & De Vos, A. (2009). Employability enhancement through formal and informal learning: An empirical study among European ICT professionals. *European Journal of Training and Development*, 33(1), 72–90. <https://doi.org/10.1108/03090590910924304>

Zaugg, R. J., Blum, A., & Thom, N. (2001). Sustainability in human resource management. *European Journal of Sustainable Development*, 9(2), 50–57

STRATEGIC PERFORMANCE MANAGEMENT IN THE DIGITAL ERA: DATA-DRIVEN HR & LEADERSHIP

Mirna Safi

Australian University, Kuwait, m.safi@au.edu.kw
<https://orcid.org/0000-0002-4253-5869>

Yamen Nissi

Australian University, Kuwait, y.nissi@au.edu.kw
<https://orcid.org/0000-0001-9080-8289>

Oualid Abidi

Australian University, Kuwait, o.abidi@au.edu.kw
<https://orcid.org/0000-0002-0099-889X>

ABSTRACT

In the fast-paced business world of today, performance management is a phrase that is used in many different fields and at all levels of an organisation. Global rivalry, quick technology advancement, interconnectedness, and economic liberalisation have all made it harder for organisations to survive, according to Huyett and Viguere (2005). In order to improve agility and boost business outcomes, companies are using strategic performance management (SPM) frameworks that incorporate goal alignment, real-time analytics, and continuous feedback, as traditional performance appraisal systems are insufficient in the face of rapid innovation (Armstrong, 2020). This shift is particularly relevant in the context of Kuwait, where digital transformation—a major pillar of Vision 2035 aimed at transitioning the nation toward a knowledge-based, diversified economy—demands modern, data-driven approaches to performance management (Government of Kuwait, 2023).

Consequently, the use of data-driven analytics into HRM has become a crucial advancement in contemporary organisational activities. Businesses must be able to make strategic, well-informed decisions about their human capital as complexity and competition increase (Okon et al., 2024). This study examines how SPM is implemented in Kuwaiti organisations, with a particular emphasis on how HR departments monitor performance, improve leadership development, and encourage innovation through the use of digital technologies and data analytics. Additionally, it looks into the obstacles that must be overcome for performance technologies to be successfully adopted, including a lack of digital infrastructure, aversion to change, and skills' gaps (Deloitte, 2023).

A strategic framework for incorporating SPM into Kuwait's digital ecosystem is provided by this study, which draws on qualitative insights from HR leaders and stakeholders in digital transformation across several industries. This study adds to the expanding body of knowledge on digital-era HR practices by linking people management to the goals of national development. Furthermore, it offers practical recommendations for establishing sustainable, high-performing workplaces in Kuwait (CIPD, 2022; Boudreau & Jesuthasan, 2020).

KEYWORDS

Strategic Performance Management, Digital Transformation, Data-Driven HR, Leadership Development, Organisational Innovation

INTRODUCTION

OBJECTIVES

The primary objective of this research is to examine the ways in which Strategic Performance Management (SPM) facilitates the digital transformation of Kuwaiti companies. In particular, our study looks at how HR departments use data-driven performance tools to align employee capabilities with national and corporate digital strategies. More specifically, the first aim of this study is to investigate the SPM techniques currently in use in Kuwaiti organisations going through digital transformation. Second, we intend to evaluate HR's contribution to the integration of digital technologies for innovation, leadership development, and performance tracking. Next, this research will result in determining the main obstacles to performance technology adoption in Kuwait, including skill shortages, opposition to change, and limits in digital infrastructure. The final outcome is to put out a strategy plan that facilitates SPM's connection with Kuwait Vision 2035.

THEORETICAL BACKGROUND

The Technology Acceptance Model (TAM), created by Davis (1989) to explain how people accept and use technology, asserts that perceived utility and perceived ease of use have a major impact on the adoption of new digital systems. As a result, these views probably influence HR directors' readiness to integrate analytics and artificial intelligence (AI) into performance monitoring systems for strategic performance management (SPM). Additionally, Lewin's (1951) unfreeze–change–refreeze paradigm, which emphasises the necessity of destabilising current behaviours prior to introducing and institutionalising change, provides a fundamental framework for comprehending resistance to digital transition. HR personnel must manage organisational changes relating to competency, culture, and structure if SPM integration is to be successful in Kuwait. Additionally, Rogers' (2003) Diffusion of Innovations theory sheds light on how variables like relative advantage, compatibility, and organisational preparedness affect the pace and success of technological adoption. In support of Kuwait's digital transformation plan, these theoretical frameworks collectively highlight the significance of user acceptance and strategic change management in easing the shift to data-driven HR practices.

LITERATURE REVIEW

Strategic Performance Management in the Digital Age

Strategic Performance Management (SPM) has evolved in the digital era from conventional, recurring assessments to dynamic, data-driven solutions that instantly match organisational objectives with employee aspirations. The importance of digital transformation in improving organisational performance is highlighted by recent studies. For example, a study by Masoud and Basahel (2023) shows that IT innovation, customer experience, and digital transformation all have a major impact on business performance, with the largest effect being seen in the customer experience. Furthermore, it has been demonstrated that incorporating artificial intelligence (AI) into performance management systems increases organisational effectiveness. Supriadi and Mulyani's (2024) systematic research highlights contemporary methods and trends in digital transformation within operational management, pointing to a move towards more adaptable and responsive performance assessment systems. Furthermore, through increases in total factor productivity and innovation outputs, Zhao et al. (2024) discovered that digital transformation has a favourable impact on firm performance, especially in small and medium-sized firms (SMEs). These developments call for a methodical approach to change management, guaranteeing that technical breakthroughs are successfully

incorporated into organisational cultures and structures. In order to maintain competitiveness and promote continuous improvement, organisations must adopt sophisticated SPM techniques as they traverse the challenges of the digital age.

Digital Transformation in Kuwait: Vision 2035 & Data-Driven Performance Management

Human Resource Management (HRM) is a crucial element in incorporating SPM into digital systems. Talent dashboards, performance analytics platforms, and AI-enhanced feedback systems are examples of data-driven HR solutions that help improve the alignment of human competencies with strategic goals. According to recent research, integrating AI and big data analytics into HRM greatly improves employee retention and engagement. In the Jordanian banking industry, for example, Qawasmeh et al. (2024) discovered a positive relationship between work happiness and AI usage, suggesting that these technologies can improve The necessity of technical skills and strategic alignment for successful adoption is further highlighted by Sharma et al. (2025), who stress that HR analytics and AI have a substantial impact on HR functions, capacities, and decision-making in the IT sector. According to these results, incorporating cutting-edge technologies into HRM improves organisational competitiveness in the digital era while also streamlining performance management procedures.

This shift is particularly significant in the context of national digital strategies. A conscious shift to a knowledge-based economy through improved digital infrastructure and governance is embodied in Kuwait Vision 2035 (Government of Kuwait, 2023). Digital transformation is emphasised in this strategy as a key component of government and private sector expansion. As a result, HR's role is changing from administrative to strategic when it comes to implementing digital change, particularly when it comes to performance management that is in line with national development goals (CIPD, 2022). In Kuwait's digital era, the integration of SPM with digital HRM systems is thus both a technological advancement and a calculated reaction to state priorities.

Barriers to Technology Adoption in the Gulf Context – The Need for National Development

Digital change in the Gulf, and Kuwait in particular, is fraught with difficulties despite the opportunities. Al-Haddad and Kotnour (2024) state that opposition to change, a lack of digital skills, and antiquated legacy systems are the primary obstacles to digital transformation. Furthermore, many Kuwaiti companies have a hierarchical and conservative working culture, which might make it difficult to implement agile performance management techniques and real-time feedback systems.

Furthermore, the adoption of real-time feedback mechanisms and the application of agile performance management approaches are frequently hampered by the strongly ingrained hierarchical and conservative organisational cultures seen in many Kuwaiti businesses (Al-Ghamdi & Aboelmaged, 2023). Through data-driven people management, Strategic Performance Management (SPM) propels organisational success beyond simple assessment. To prepare leaders for success in quickly changing digital environments, Boudreau and Jesuthasan (2020) stress that agile organisations use performance analytics to identify high-potential individuals, customise leadership development programs, and cultivate an innovative culture.

HR procedures must be closely linked with Kuwait's Vision 2035 development strategy in order to produce public value that is in line with national priorities. The achievement of the Vision depends on innovation, agility, and employee empowerment, all of which are made possible by efficient performance management systems, according to the Chartered Institute of Personnel and

Development (CIPD, 2022). In order to ensure that HR directly supports the country's efforts at economic diversification and digital transformation, SPM provides a useful framework for converting Kuwait Vision 2035's overarching strategic objectives into achievable workforce goals.

METHODOLOGY

Using a qualitative research approach, this study will examine how strategic HR practices, leadership, and performance management interface with Kuwait's digital transformation using semi-structured interviews and document analysis. Particularly in understudied situations, the qualitative approach is ideal for comprehending intricate organizational processes and lived experiences (Creswell & Poth, 2018; Braun & Clarke, 2019).

An estimated sample of 15 to 20 participants will participate in semi-structured interviews to gather primary data. These participants will include HR managers, leaders of digital transformation, and senior executives from the oil and gas, banking, healthcare, and public administration sectors—key industries in Kuwait that are rapidly undergoing digital transformation. In organisational research, semi-structured interviews are useful for revealing complex perspectives and practices because they permit flexibility while preserving uniformity among participants (Kallio et al., 2016).

Purposive sampling will be used to choose participants, with an emphasis on mid-to-large businesses that are actively involved in digital transformation projects. Purposive sampling guarantees the inclusion of instances with a wealth of information that are in line with the goals of the study (Palinkas et al., 2015). Variation in sector, size, and degree of digital maturity will be considered during the hiring process to further improve diversity and relevance.

Depending on participant option, all interviews will take place in either Arabic or English and run between 45 and 60 minutes. Interviews will be audio recorded and verbatim transcribed with informed consent. To guarantee accuracy and efficiency, AI-assisted transcribing technologies (such as Otter.ai and Descript) will be employed, with manual review for data validation.

In order to offer organisational context and triangulate findings, a thorough document analysis will be carried out. Examining national strategy reports (such as Kuwait Vision 2035), performance management frameworks, digital transformation roadmaps, and internal HR policy documents will all be part of this. To correlate interview data with institutional narratives and comprehend formal organisational systems, document analysis is crucial (Bowen, 2009).

RESULTS

It is expected that the findings would suggest that performance management practices in Kuwaiti organizations are projected to experience substantial transformation in response to the nation's advancing digitalization agenda and its commitment to aligning with international best practices. Traditional systems, previously characterized by infrequent appraisals and subjective assessments, are expected to be progressively replaced by more sophisticated models that are data-driven, continuous, and strategically integrated with organizational objectives. It is anticipated that leading organizations across Kuwait will increasingly implement continuous feedback frameworks, leverage real-time performance analytics, and utilize KPI-based tracking systems. These developments are likely to enhance accountability, responsiveness, and the overall effectiveness of performance management processes in both public and private sector institutions. The focus will emphasize the specific processes, tools, and metrics used alongside the associated challenges.

Additionally, as strategic performance management becomes more dynamic and data-driven, organisations are likely to see improvements in productivity, employee engagement, and talent retention. Consequently, this implies that Kuwait will be positioned to enhance institutional

performance. In other words, this study aims to prove that applying Strategic Performance Management in the current digital era through data-driven HR will develop a digitally proficient and resilient talent pool and will sustain long-term national competitiveness in alignment with the objectives outlined in Vision 2035.

CONCLUSION

IMPLICATIONS

The transformation of performance management in Kuwaiti organizations carries important practical and policy-related implications, particularly as the country moves toward a digitally advanced, knowledge-driven economy under its Vision 2035 agenda (General Secretariat of the Supreme Council for Planning and Development, 2020). One significant outcome is the redefinition of the HR function—from a largely administrative role to that of a strategic partner (Ulrich, Younger, & Brockbank, 2019). With the increasing adoption of data-driven approaches, HR professionals in Kuwait will need to acquire new skills in data analysis, digital tool implementation, and strategic workforce management (Al-Mutairi & Al-Tamimi, 2022; Chartered Institute of Personnel and Development [CIPD], 2021). This will require investment in training and a cultural shift within organizations to prioritize data-informed decisions and ongoing performance improvement (KPMG, 2023).

Another implication is the potential for enhanced employee productivity and engagement, driven by more frequent and personalized performance feedback (Gallup, 2021). By replacing outdated annual reviews with real-time feedback and continuous dialogue—supported by modern HR technologies—organizations can create a more adaptive and motivated workforce (Deloitte, 2021). This shift enables more effective talent development and supports nationalization efforts by helping identify and close skills gaps among Kuwaiti nationals, thus promoting workforce sustainability and long-term employment stability (Al-Fadli & Al-Dabbous, 2023; World Bank, 2023).

ORIGINALITY VALUE

The originality of this research lies in its specific focus on the relationship between strategic performance management and digital transformation in the context of Kuwait's economic and cultural environment (Al-Mutairi & Al-Tamimi, 2022). Much of the current research in this area is based on Western or multinational experiences (Ulrich et al., 2017; Deloitte, 2021), leaving a gap in understanding how such concepts are applied in GCC nations (Al-Harthy, 2020). This study offers fresh insights by exploring how Kuwaiti organizations are adapting global trends to fit local realities (Al-Fadli & Al-Dabbous, 2023). It introduces a tailored HR framework, identifies regionally relevant digital tools and strategies, and provides practical recommendations for both private and public sector leaders (GCC HR Summit Report, 2022). As such, it delivers unique contributions to regional literature and offers a model that other Gulf countries can follow as they navigate similar transformations (Khan & Al-Kuwari, 2021). The findings highlight the increasingly strategic role of HR in national development and support the broader objectives of digital advancement and workforce empowerment in Kuwait (Kuwait Vision 2035; World Bank, 2023).

CONTRIBUTION

This study contributes to academic and practical knowledge by creating a link between digital leadership, strategic HR, and national development goals. By providing Kuwaiti organisations with useful information to align people performance with innovation, efficiency, and sustainability, it advances the broader objectives of Kuwait Vision 2035. This study provides Kuwaiti organisations

with practical, actionable insights by focussing on how talent performance is integrated with key pillars including innovation, efficiency, and sustainability. In fact, institutions can use these insights to optimise their human resources in ways that increase competitiveness, promote a continuous improvement culture, and guarantee alignment with key national interests. The study's ultimate goal is to provide a path for matching workforce competencies to the ever-changing needs of digital transformation and sustained national growth.

REFERENCES

- Al-Fadli, S., & Al-Dabbous, N. (2023). Workforce sustainability and digital transformation: Challenges and opportunities in the GCC. *Gulf Business Journal*, 15(2), 42–56. <https://doi.org/10.1002/gbj.235>
- Al-Ghamdi, S., & Aboelmegeed, M. (2023). Culture and change readiness in Gulf Cooperation Council firms: Implications for digital transformation success. *International Journal of Human Resource Management*, 34(4), 759–778. <https://doi.org/10.1080/09585192.2022.2134217>
- Al-Haddad, S., & Kotnour, T. (2024). Digital transformation challenges in the Middle East: Organizational culture and legacy systems in focus. *Journal of Organizational Change Management*, 37(2), 253–272. <https://doi.org/10.1108/JOCM-11-2023-0321>
- Al-Harthy, A. (2020). Digital HR transformation in the GCC: A review of barriers and opportunities. *Journal of Middle Eastern Business*, 22(4), 189–205. <https://doi.org/10.1002/jmeb.341>
- [5] Al-Mutairi, F., & Al-Tamimi, H. (2022). The digitalization of HR in Kuwait: Emerging practices and challenges. *Middle East Journal of Human Resources*, 10(1), 34–49. <https://doi.org/10.1002/ejhr.246>
- Armstrong, M. (2020). *Armstrong's handbook of performance management: An evidence-based guide to delivering high performance* (6th ed.). Kogan Page.
- Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal*, 9(2), 27–40. <https://doi.org/10.3316/QRJ0902027>
- Boudreau, J. W., & Jesuthasan, R. (2020). *Lead the work: Navigating a world beyond employment*. Wiley.
- Boudreau, J. W., & Jesuthasan, R. (2020). Reimagining talent management for the digital age. *MIT Sloan Management Review*. <https://sloanreview.mit.edu/article/reimagining-talent-management-for-the-digital-age/>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, 11(4), 589–597. <https://doi.org/10.1080/2159676X.2019.1628806>
- Chartered Institute of Personnel and Development (CIPD). (2021). *People profession 2021: Insights into HR practices in the digital age*. <https://www.cipd.org/uk/knowledge/reports/people-profession-2021/>
- Chartered Institute of Personnel and Development (CIPD). (2022). *People profession 2022: International insights on people practice*. <https://www.cipd.org/uk/knowledge/reports/people-profession-international-insights/>
- Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE Publications.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
- Deloitte. (2021). *2021 Global human capital trends: The social enterprise in a world disrupted*. Deloitte Insights. <https://www2.deloitte.com/global/en/pages/human-capital/articles/global-human-capital-trends.html>
- Deloitte. (2023). *2023 global human capital trends: New fundamentals for a boundaryless world*.

<https://www2.deloitte.com/global/en/pages/human-capital/articles/introduction-human-capital-trends.html>

- Gallup. (2021). State of the global workplace: 2021 report. Gallup, Inc. <https://www.gallup.com/workplace>
- GCC HR Summit Report. (2022). Human capital transformation in the GCC: Trends, tools, and strategies. [Publisher information missing].
- General Secretariat of the Supreme Council for Planning and Development. (2020). Kuwait Vision 2035: New Kuwait. Government of Kuwait. <https://www.newkuwait.gov.kw>
- Government of Kuwait. (2023). Kuwait digital transformation strategy 2023–2035. Ministry of Communications and Information Technology.
- Huyett, B., & Viguerie, S. P. (2005). Extreme competition. *McKinsey Quarterly*, (1), 47–57.
- Kallio, H., Pietilä, A. M., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: Developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing*, 72(12), 2954–2965. <https://doi.org/10.1111/jan.13031>
- Khan, M. H., & Al-Kuwari, M. (2021). Adapting digital HR practices in GCC countries: A roadmap for future success. *Journal of Gulf Economic Studies*, 14(3), 76–91. <https://doi.org/10.1108/jges.2021.32456>
- KPMG. (2023). Future of HR: Navigating digital transformation in the Middle East. KPMG International. <https://home.kpmg/xx/en/home/insights/2023/01/future-of-hr.html>
- Lewin, K. (1951). *Field theory in social science: Selected theoretical papers*. Harper & Row.
- Masoud, R., & Basahel, S. (2023). The effects of digital transformation on firm performance: The role of customer experience and IT innovation. *Digital*, 3(2), 109–126. <https://doi.org/10.3390/digital3020008>
- Okon, R. I. C. H. A. R. D., Odionu, C. S., & Bristol-Alagbariya, B. E. R. N. A. D. E. T. T. E. (2024). Integrating data-driven analytics into human resource management to improve decision-making and organizational effectiveness. *IRE Journals*, 8(6), 574.
- Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*, 42(5), 533–544. <https://doi.org/10.1007/s10488-013-0528-y>
- Qawasmeh, E., Qawasmeh, F., & Daoud, M. K. (2024). Digital transformation in HRM: Leveraging AI and big data for employee engagement and retention. *Journal of Ecohumanism*, 3(3), 3479. <https://doi.org/10.62754/joe.v3i3.3479>
- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.
- Sharma, P., Bhattacharya, S., & Bhattacharya, S. (2025). HR analytics and AI adoption in IT sector: Reflections from practitioners. *Journal of Work-Applied Management*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/JWAM-12-2024-0179>
- Supriadi, A., & Mulyani, A. S. (2024). Digital transformation in operational management: A systematic review of current trends and practices. *Management Studies and Business Journal (PRODUCTIVITY)*, 1(3), 496–506. <https://doi.org/10.62207/07xvt585>
- Ulrich, D., Brockbank, W., Johnson, D., Sandholtz, K., & Younger, J. (2017). *HR competencies: Mastery at the intersection of people and business*. Society for Human Resource Management.
- Ulrich, D., Younger, J., & Brockbank, W. (2019). *HR transformation: Building human resources from the inside out*. McGraw-Hill Education.
- Woolf, N. H., & Silver, C. (2017). *Qualitative analysis using NVivo: The five-level QDA method*. Routledge. <https://doi.org/10.4324/9781315181660>

World Bank. (2023). The future of work and digital transformation in the MENA region. World Bank Group. <https://www.worldbank.org/en/news/feature/2023/03/02/future-of-work-mena>

Zhao, X., Li, X., Li, Y., & Wang, Z. (2024). The impact of digital transformation on firm performance. *Industrial Management & Data Systems*, 124(8), 2567–2587. <https://doi.org/10.1108/IMDS-09-2023-0661>

DIGITAL COMPETENCE MAPPING OF LOCAL GOVERNMENT EMPLOYEES IN HERAKLION PREFECTURE BASED ON THE DIGCOMP 2.2 FRAMEWORK

Nikos Kounoupas

Hellenic Mediterranean University, Dept of Management Science & Technology, Agios Nikolaos, Crete, Greece

Yiannis Dimotikalis

Hellenic Mediterranean University, Dept of Management Science & Technology, Agios Nikolaos, Crete, Greece

<https://orcid.org/0000-0002-8829-5856>

Christos H. Skiadas

ISAST, Athens, Greece

<https://orcid.org/0000-0001-9147-521X>

ABSTRACT

Modern public administration is built on digital skills, which improve operational effectiveness, service quality, transparency, and citizen engagement. This empirical study uses the European Digital Competence Framework, DigComp 2.2, as the analytical framework to examine the digital competency levels of local government workers in the Heraklion region. Information and data literacy, teamwork and communication, digital content production, safety, and problem-solving are the model's five main components. A structured 67-item questionnaire was distributed to a representative sample of 140 employees. Reliability scores ranged from 0.894 to 0.925 (Cronbach's Alpha). Statistical analyses included descriptive measures, exploratory factor analysis (EFA), Ward linkage clustering, and Chi-square tests. Strong correlations were identified between digital familiarity and key skills such as remote work ($\chi^2=66.511$), use of digital signatures ($\chi^2=45.795$), and GDPR compliance ($\chi^2=41.272$). Additional significant associations included phishing awareness ($\chi^2=52.688$) and accessibility ($\chi^2=44.239$). Factor analysis identified ten thematic clusters, highlighting "Critical Digital Literacy" (loading=0.797), "Digital Responsibility," and "Content Security" as central dimensions. Four more general thematic groupings were identified through ward linkage: (1) Digital literacy and misinformation, (2) privacy and technical safeguards, (3) content creation and legal compliance, and (4) advanced technologies and artificial intelligence. Five profiles of digital competency—Basic, Routine, Networked, Analytical, and Advanced Users—were delineated based on role, education, and experience. According to these profiles, which show varying degrees of digital maturity, the public sector needs specialized training that is in line with digital transformation plans.

KEYWORDS

Digital skills, DigComp 2.2, public administration, local government, digital transformation

INTRODUCTION

One of the main objectives of the European Union's "Digital Decade 2030" program is the axis focused on the digital transformation of public administration. The main objective is to improve digital literacy among all citizens, while at the same time emphasizing the need to address the digital shortcomings of public services, especially at the level of local government. Within the framework of the European Union, it is recognized that digital skills are vital in the modern digital era, as they contribute to enhancing citizen participation, faster implementation of procedures, as well as improving the transparency and quality of services provided by public bodies. Strengthening the digital literacy of public sector employees is considered essential for the sustainability of the sector itself and for promoting citizens' trust in the administrative system. The DESI (Digital Economy and Society Index) records the progress of EU member states in terms of their digital readiness. While the European Union average is 55.6%, Greece records a rate of 52.4% in terms of basic digital skills. According to the European Commission's Digital Compass (2021), by 2030, 80% of the population is expected to have basic digital skills, while all public services will be fully accessible online.

The European Union, to support the goal of improving digital skills, has developed the DigComp 2.2 framework, which, through the analysis of five clear areas and twenty-one skills, aims to achieve this goal (Vuorikari et al., 2022). DigComp 2.2 serves as a modern tool with a clear direction for assessment and training at the European level (Punie et al., 2019), with the potential to support organizational culture and continuous professional development at the local level (Kampylis et al., 2015; CEDEFOP, 2022). Particularly in Greece, public services, and especially local government bodies (municipalities), demonstrate quite low levels of digital practice integration due to bureaucracy, inadequate infrastructure, and lack of leadership (Stasis & Papastyliou, 2022; Barboutidis & Stiakakis, 2023). The implementation of DigComp 2.2 remains largely a modern theoretical exercise in the context of human resource management in public administration (Katsaounou, 2022; Vuorikari et al., 2022). The lack of evaluation indicators and mechanisms for monitoring digital performance makes it difficult to measure progress (Dobrolyubova, 2021). Linking digital capabilities to key performance indicators (KPIs), such as speed of service, interoperability, and citizen experience, is crucial (Simonidis, 2023; OECD, 2023).

The concept of the "digital citizen" reinforces accountability and participation (Choi, 2023; Mossberger et al., 2008), while "digital governance" promotes transparency and democratic functioning (UNDP, 2022; Harrison et al., 2012). Our research focuses on mapping the digital readiness of employees in local government organizations (municipalities in the Heraklion Prefecture), based on the DigComp 2.2 framework. It explores levels of digital skills, the influence of professional and social factors, and the formation of training and development strategies. Familiarity with ICT, higher income levels, and continuous learning are positively correlated with the development of digital competence (van Laar et al., 2017; Ghomi & Redecker, 2019; Chetty et al., 2018; Ilomäki et al., 2016; Redecker, 2020; Katsaounou, 2022). The connection of these findings with modern training platforms and empowerment mechanisms, such as DigCompSAT, SELFIE for Work-Based Learning, and other microlearning digital platforms, highlights the potential for leveraging personalized and targeted interventions to strengthen the digital skills of local government employees.

METHODOLOGY

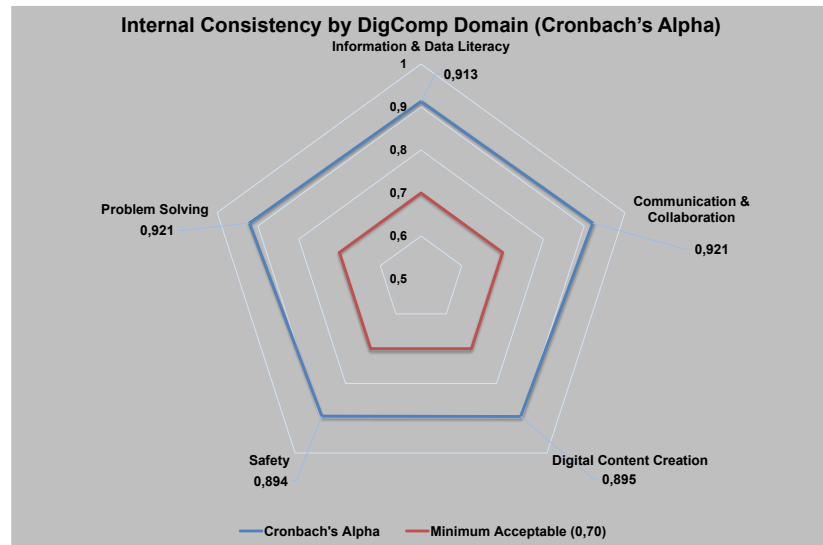
The methodological approach of this empirical study was based on quantitative analysis, aiming to assess the digital readiness in the local government organizations (municipalities) in the Region of Crete, using the DigComp 2.2 framework as a theoretical foundation (Vuorikari et al., 2022). A total

of 140 employees from eight municipalities participated in the study, with attention to diversity in terms of geographic distribution, administrative function, and socio-demographic characteristics (Stiakakis & Barboutidis, 2023). The self-administered questionnaire, designed around the 21 competencies of the DigComp framework, included 57 questions covering the five core dimensions: information literacy, communication, content creation, safety, and problem-solving (Carretero et al., 2017). Additional questions were incorporated regarding ICT familiarity, type of education, and organizational variables such as role and access to training (Ghomi & Redecker, 2019; Cedefop, 2022). About 10% of the total workforce (roughly 1,400 employees) in the eight participating municipalities is represented by the final sample of 140 employees. To guarantee representativeness regarding demographic diversity, job roles, and geographic distribution, stratified sampling was used. Everyone who took part in the study gave their informed consent, and participation was entirely voluntary. The relevant institutional review board provided ethical approval, and all procedures followed accepted ethical standards for studies involving human subjects.

Four main statistical techniques were applied to analyze the data, selected based on their methodological suitability for interpreting multidimensional phenomena related to digital competence within the DigComp 2.2 framework. Initially, descriptive measures were used to capture basic sample characteristics and to form a general profile of the participants. Means, percentages, and standard deviations were calculated to produce preliminary insights into trends within specific socio-demographic and professional groups. Subsequently, Exploratory Factor Analysis (EFA) was conducted to conceptually confirm the internal consistency of the questionnaire. This technique helped identify underlying structures within the five dimensions of DigComp 2.2 and group the questions into components with a shared interpretative basis. EFA is widely recognized as particularly suitable for validating measurement tools in the social sciences (Costello & Osborne, 2005). Next, Hierarchical Cluster Analysis using the Ward linkage method was applied to classify participants into groups based on the homogeneity of their responses. This method is commonly used in research involving social and professional variables and offers reliability in analyzing digital behavior (Tzafilkou, Perifanou, & Economides, 2022; Hair et al., 2010). Finally, Chi-square (χ^2) tests were used to examine statistically significant relationships between categorical variables such as gender, job role, and income level. Chi-square tests are appropriate for investigating associations among non-parametric data and are widely employed in social statistics to map group-level differences (Chetty et al., 2018; Katsaounou, 2022).

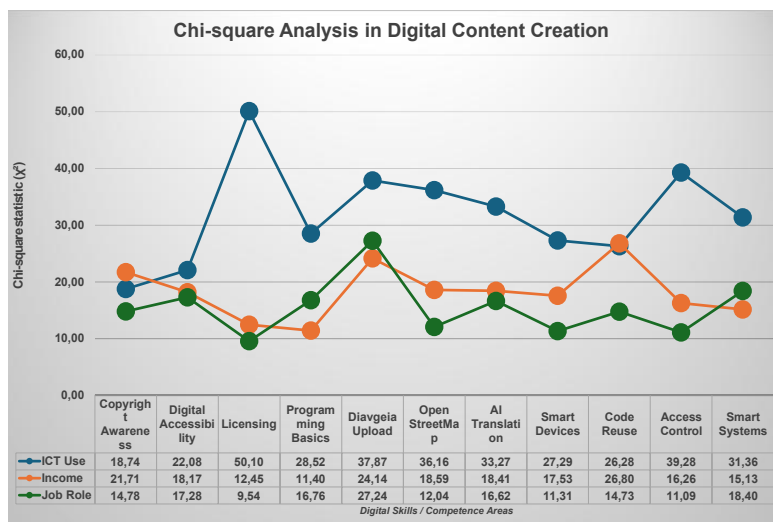
RESULTS

Fig. 1. Cronbach's Alpha by DigComp 2.2 domain, confirming high internal consistency.



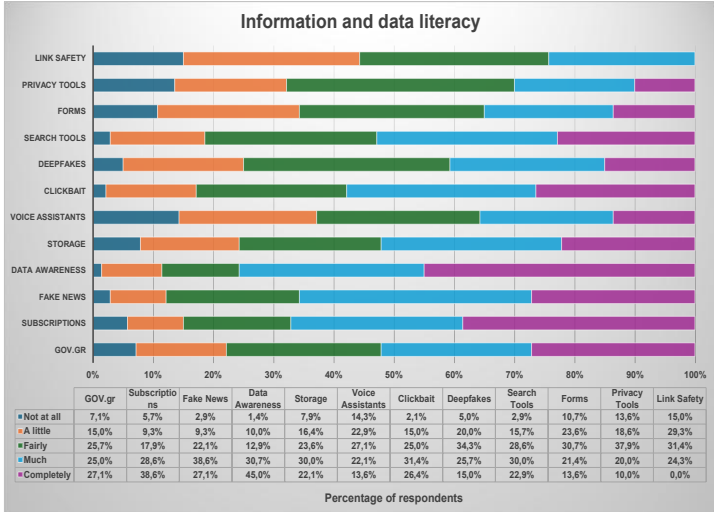
An empirical research study was carried out among the employees of 8 municipalities in the Heraklion Prefecture, located in Crete. The goal was to assess their digital competencies according to the European DigComp 2.2 model. Data were gathered using a questionnaire as part of a quantitative research approach, and the analysis revealed significant differences across all dimensions of the DigComp 2.2 framework: information literacy, communication and collaboration, digital content creation, digital safety, and problem-solving. The internal consistency of the assessment tool was reflected in high Cronbach's Alpha coefficients (0.894–0.925), confirming the validity of the individual dimensions (Figure 1).

Fig. 2. Self-assessed familiarity with digital skills under Axis 1 of the DigComp 2.2 framework (Information and Data Literacy).



The statistical analysis of the data was conducted using descriptive measures, and Figure 2 illustrates the participants' levels of familiarity with specific skills under Axis 1 of the DigComp 2.2 framework: Information Literacy. The chart shows differences in self-assessment levels across various skills like information search, privacy protection tool usage, and fake news evaluation. This indicates varying levels of digital readiness within related areas. These discrepancies highlight the need for systematic skill mapping and targeted training in areas where self-perception or actual functional usage is low.

Fig. 3. Chi-square analysis of digital skills under Axis 1 (Information and Data Literacy) by ICT use, income, and job role.



Moreover, the use of Chi-Square (χ^2) tests revealed significant relationships between familiarity with ICT and specific digital skills. Additionally, Chi-Square (χ^2) tests demonstrate a significant connection between ICT familiarity and distinct digital skills. For instance, the top figures were noted in telecommuting ($\chi^2=66.511$), digital signature utilization ($\chi^2=45.795$), understanding of GDPR ($\chi^2=41.272$), and recognition of phishing threats ($\chi^2=52.688$). These relationships suggest that everyday digital knowledge significantly influences key skills in public administration, particularly in Local Government. Figure 3 presents the analysis for Axis 3 of the DigComp 2.2 framework: Digital Content Creation, highlighting the diversity across professional groups and income levels.

The Exploratory Factor Analysis (EFA) revealed ten thematic skill groups, including notable references to Critical Digital Literacy (loading = 0.797), Digital Responsibility (loading = 0.749), and Content Security (loading = 0.730). This finding enhances the framework's conceptual consistency and offers additional insights into the digital profile of the participants. The factor loadings illustrated in Figure 4 highlight the significant variation in digital skills across thematic axes, with high scores in factors related to the identification of false information, the use of ICT in the workplace, and privacy management. The distribution of the questionnaire items confirms the multidimensional nature of digital competence in public administration, substantiating the need for differentiated educational and training interventions, particularly for employees in Local Government. These customized methods can greatly improve digital participation and effectiveness, promote organizational flexibility, innovative services, and sustainable digital readiness. Addressing these gaps is not just a

matter of skill development but a strategic priority for effective governance. Empowering local employees digitally is key to achieving resilient, citizen-centered public services.

Fig. 4. Factor loadings of survey items across ten components extracted through Exploratory Factor Analysis (EFA), illustrating thematic groupings of digital skills.

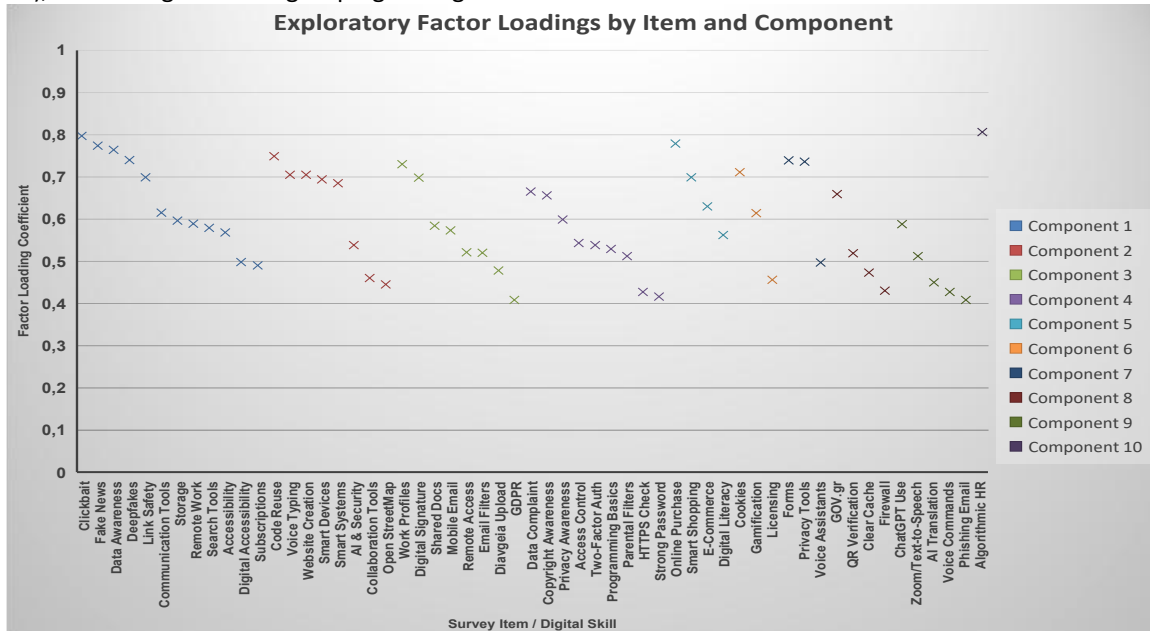
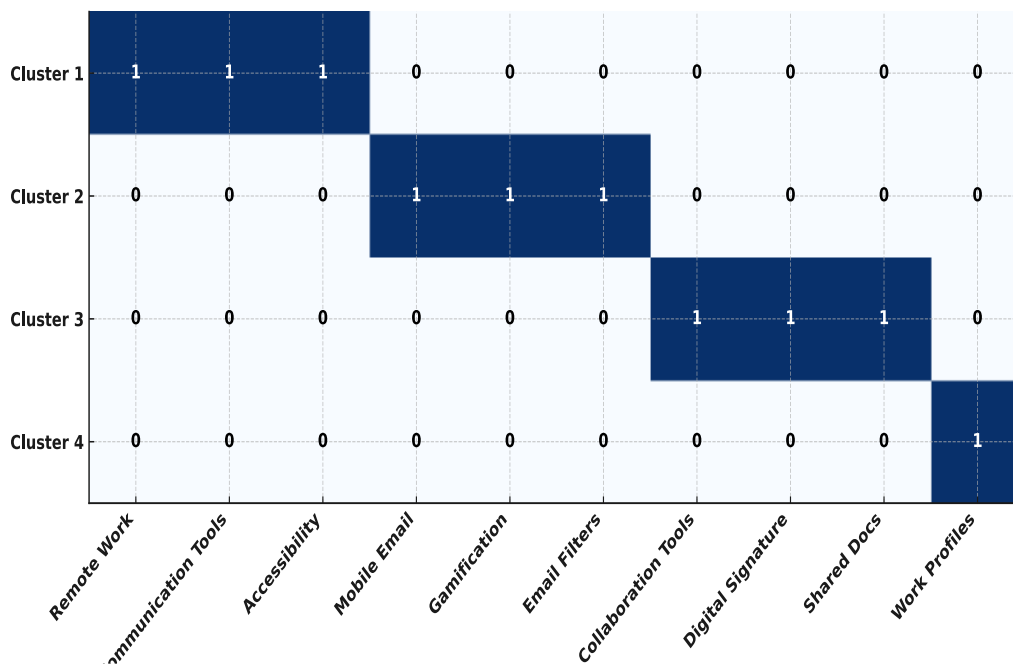


Fig. 5. Communication and collaboration skill clusters based on Hierarchical Analysis. Cells marked “1” indicate core skills per cluster.



Hierarchical Cluster Analysis (Ward linkage method) was also conducted across all five main domains of the DigComp 2.2 framework, aiming to identify patterns of digital behavior. Figure 5 presents the results for Domain 1 (Information Literacy), where four active skill clusters emerged, revealing differences in the critical evaluation of information and protection against digital threats among the employees who participated in the study. Similar patterns of digital behavior were observed in the other domains as well, indicating the complex nature of digital competence. This analysis supports targeted training based on user profiles, enhancing the organizational capacity of the public sector by aligning educational interventions with employees' actual needs, improving the efficiency of administrative services, and strengthening institutional resilience and adaptability to the demands of the digital age.

Finally, summarizing the findings of our research, we highlight that the correlation between social and professional factors and digital competence profiles revealed five main user types: Basic, Everyday, Connected, Analytical, and Advanced Users. These distinctions are primarily related to job role and nature of work, educational level, familiarity with ICT, age group, and years of professional experience. The synthesis and analysis of the results provide a coherent tool for the strategic planning of digital empowerment training policies in the public sector. The aim is to support digital modernization and the transformation of administrative structures, which is directly linked to strengthening the digital competence of public employees.

CONCLUSION

The study we conducted represents an innovative approach to evaluating the digital competencies of employees in local government in Greece. The study utilizes the updated European DigComp 2.2 framework to draw its conclusions. Results from a study involving 140 employees across 8 municipalities in the Heraklion Prefecture of Crete reveal notable disparity in digital abilities, social inequalities, and the necessity for digital advancement in public governance (Katsaounou, 2022; Vuorikari et al., 2022). A significant discovery is the recognition of five distinct levels of digital skills, ranging from basic to advanced users, linked to factors such as educational level, professional role, prior training, and access to upskilling opportunities. This confirms that digital readiness in the public sector is not uniform but reflects broader socio-economic inequalities (Chetty et al., 2018; Koustenis, 2023). The application of multiple statistical analyses, including Exploratory Factor Analysis (EFA), Ward clustering, and chi-square (χ^2) tests, showed that critical digital skills, such as remote working ability, use of digital signatures, and GDPR compliance, statistically vary according to ICT familiarity, managerial responsibility, and income level (Carretero et al., 2017; Ilomäki et al., 2023). This correlation underscores the need for targeted training and education interventions (reskilling/upskilling), as emphasized by European strategies for Digital Transformation (European Commission, 2023; Cedefop, 2022).

The contribution of this study is threefold. First, it confirms the utility of DigComp 2.2 as a tool for assessing digital skills in the public sector, not only in theory, but also in practice for evaluation and policy planning. Second, it documents, with statistical accuracy, the gaps and digital needs of employees in terms of knowledge, attitudes, and practical competencies. Third, it proposes a simple framework for designing personalized interventions based on digital maturity levels, as recommended by contemporary research on the concept of digital maturity (Obermayer et al., 2023; Aras & Büyüközkan, 2023). The originality of the research lies in its combination of international tools such as the DigComp 2.2 framework with the specific characteristics of Greek public administration, particularly in the challenging field of local government, and in its in-depth analysis through

combined statistical methods. It is also strengthened by using both self-reported data and empirical statistical classification models, which is rare in the Greek academic literature (Redecker, 2020; Tzelepi, 2021). This study provides well-documented evidence that digital education policies for public sector staff, particularly within local government, must be multi-level and role adapted. They should include blended learning approaches, peer mentoring, and open badges. Recognizing the different levels of digital maturity among public administration employees and linking skills development to institutional practices are critical factors for the successful digital transformation of public administration (UNESCO, 2021; OECD, 2022). These findings align with new management writing that sees digital growth as a skill for organizations that helps public sector change and adjustment (Aras & Büyüközkan, 2023; Obermayer et al., 2023). More than just a basic job needs, the workers' digital skill growth is now seen as an important tool that improves resilience and competitiveness (OECD, 2022; European Commission, 2023). Plans for growing skills should then be integrated into broader transformation strategies that support leadership, innovation, and learning aligned with digital goals (UNESCO, 2023; Ilomäki et al., 2023).

REFERENCES

- Aras, A., & Büyüközkan, G. (2023). Digital Transformation Journey Guidance: A Holistic Digital Maturity Model Based on a Systematic Literature Review. *Systems*, 11(4), 213. <https://doi.org/10.3390/systems11040213>
- Barboutidis, G., & Stiakakis, E. (2022). Digitization and International Development: A Descriptive Analysis of the Networked Readiness Index in Eight European Union Countries. In N.E. Myridis, (Ed), *Poverty and Quality of Life in the Digital Era* (pp. 53-79). SpringerBriefs in Well-Being and Quality of Life Research. Springer, Cham. https://doi.org/10.1007/978-3-031-04711-4_3
- Carretero, S., Vuorikari, R., & Punie, Y. (2017). *DigComp 2.1: The Digital Competence Framework for Citizens with eight proficiency levels and examples of use*. Publications Office of the European Union. <https://doi.org/10.2760/38842>
- Cedefop. (2022). *Microcredentials for labour market education and training: First look at mapping microcredentials in European labour-market-related education, training and learning: Take-up, characteristics and functions* (Cedefop research paper No 87). Luxembourg: Publications Office of the EU. <https://doi.org/10.2801/351271>
- Cedefop. (2022). *Setting Europe on course for a human digital transition: New evidence from Cedefop's second European skills and jobs survey* (Cedefop reference series No 123). Luxembourg: Publications Office of the EU. <https://doi.org/10.2801/253954>
- Chetty, K., Liu, Q., Gcora-Vumazonke, N., Josie, J., Wenwei, L., & Fang, C. (2018). Bridging the digital divide: Measuring digital literacy. *Economics: The Open-Access, Open-Assessment E-Journal*, 12, 1–20. <https://doi.org/10.5018/economics-ejournal.ja.2018-23>
- Choi, J. Y., Choi, S., Song, K., Baek, J., Kim, H., Choi, M., Kim, Y., Chu, S. H., & Shin, J. (2023). Everyday digital literacy questionnaire for older adults: Instrument development and validation study. *Journal of Medical Internet Research*, 25, e46871. <https://doi.org/10.2196/46871>
- Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation*, 10(7), 1–9. <https://doi.org/10.7275/jyj1-4868>
- Directorate-General for Communications Networks, Content and Technology. (2024). *Digital Skills and Jobs Platform – Country Report: Greece*. European Commission. Retrieved from <https://digital-skills-jobs.europa.eu> and <https://ec.europa.eu/newsroom/dae/redirection/document/106700>
- Dobrolyubova, E. (2021). Measuring Outcomes of Digital Transformation in Public Administration: Literature Review and Possible Steps Forward. *NISPAcee Journal of Public Administration and Policy*, 14(1), 61–86. <https://doi.org/10.2478/nispa-2021-0003>
- European Commission. (2021). *2030 Digital Compass: The European Way for the Digital Decade* (COM(2021) 118 final). Luxembourg: Publications Office of the European Union. <https://doi.org/10.2759/425691>
- European Commission. (2022). *DESI – Digital Economy and Society Index 2022*. Luxembourg: Publications Office

- of the European Union. Ανακτήθηκε από <https://digital-strategy.ec.europa.eu/en/library/digital-economy-and-society-index-desi-2022>
- European Commission. (2023). Digital Education Action Plan 2021–2027 (Catalogue No NC-09-23-175-EN-C). Luxembourg: Publications Office of the European Union. <https://doi.org/10.2766/491921>
- European Institute for Gender Equality (EIGE). (2023). Gender and digitalisation: Analysis of gender gaps in digital skills in the EU. Luxembourg: Publications Office of the European Union. Retrieved from <https://eige.europa.eu>
- European Institute for Gender Equality (EIGE). (2023). Gender Equality Index 2023: Digitalisation and the future of work. Luxembourg: Publications Office of the European Union. Retrieved from <https://eige.europa.eu>
- Ghomi, M., & Redecker, C. (2019, April). Digital Competence of Educators (DigCompEdu): Development and evaluation of a self-assessment instrument for teachers' digital competence. Στα πρακτικά του 11ου Διεθνούς Συνεδρίου Computer Supported Education (CSEDU 2019), σελίδες 541–548. <https://doi.org/10.5220/0007679005410548>
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis* (7th ed.). Pearson. ISBN 978-0138132637.
- Harrison, T. M., Guerrero, S., Burke, G. B., Cook, M. E., & Cresswell, A. (2012). Open government and e-government: Democratic challenges from a public value perspective. *Information Polity*, 17(2), 83–97. <https://doi.org/10.3233/IP-2012-0269>
- Ilomäki, L., Paavola, S., Lakkala, M., & Kantosalo, A. (2016). Digital competence – An emergent boundary concept for policy and educational research. *Education and Information Technologies*, 21(3), 655–679. <https://doi.org/10.1007/s10639-014-9346-4>
- Kampylis, P., Punie, Y., & Devine, J. (2015). Promoting effective digital-age learning: A European framework for digitally competent educational organizations. Publications Office of the European Union. <https://publications.jrc.ec.europa.eu/repository/handle/JRC98209>
- Katsaounou, T. (2022). e-Governance: Digital governance and digital literacy during the COVID-19 pandemic. The role of training. Case study: The views of public administration supervisors [Master's thesis, Department of Economics, University of Piraeus]. Retrieved from <https://dione.lib.unipi.gr/xmlui/handle/unipi/14955>
- Mossberger, K., Tolbert, C. J., & McNeal, R. S. (2008). *Digital citizenship: The internet, society, and participation*. MIT Press. <https://doi.org/10.7551/mitpress/7428.001.0001>
- Obermayer, N., Csizmadia, T., Banász, Z., & Purnhauser, P. (2023, September 5–7). The importance of digital and soft skills in the digital age. In *Proceedings of the 24th European Conference on Knowledge Management (ECKM 2023)* (Vol. 24, No. 2). Academic Conferences International. Retrieved from <https://papers.academic-conferences.org/index.php/eckm/article/view/1550>
- OECD. (2022). *Digital government review of Greece: Strengthening the governance of digital government*. OECD Publishing. <https://doi.org/10.1787/4de9f5bb-en>
- OECD. (2023). *Digital Government Review of Greece*. OECD Digital Government Studies. OECD Publishing. Retrieved from https://www.oecd.org/en/publications/oecd-digital-government-studies_24131962.html
- OECD. (2023). *Public Employment and Management 2023: Towards a more flexible public service*. OECD Publishing. <https://doi.org/10.1787/5b378e11-en>
- Organisation for Economic Co-operation and Development (OECD). (2022). Digital transformation projects in Greece's public sector: Governance, procurement and implementation. *OECD Public Governance Reviews*. <https://doi.org/10.1787/33792fae-en>
- Punie, Y., Carretero, S., Vuorikari, R., & Cabrera, M. (2019). *DigComp into action: Get inspired, make it happen*. Publications Office of the European Union. <https://doi.org/10.2760/112945>
- Redecker, C. (2020). *European framework for the digital competence of educators: DigCompEdu*. Publications Office of the European Union. <https://doi.org/10.2760/159770>
- Simonidis, C. (2021). E-government and public administration reform: Civil servants' attitudes and acceptance towards the necessity and use of digital tools – Case study in a N.D ministry's productive unit [Master's thesis, University of West Attica, MSc in Public Economics and Policy]. Institutional Repository Polyno. Retrieved from https://www.openarchives.gr/aggregator-openarchives/edm/polynoe/000125-11400_595
- Stasis, A., & Papastylianou, A. (2022). Advanced digital skills towards interoperable e-government services:

- European and Greek case studies. *International Journal of Electronic Governance*, 14(1/2), 145–171.
<https://doi.org/10.1504/IJEG.2022.123249>
- Stiakakis, E., & Barboutidis, G. (2022): Exploring the construct of the new way of thinking in the digital environment. *Behaviour & Information Technology*, 41(13), 2779-2795.
<https://doi.org/10.1080/0144929X.2021.1949042>
- Tzafilkou, K., Perifanou, M., & Economides, A. (2022). Development and validation of students' digital competence scale (SDiCoS). *International Journal of Educational Technology in Higher Education*, 19(1), Article 30. <https://doi.org/10.1186/s41239-022-00330-0>
- Tzelepi, I. (2021). PSIFIDA: Assessment of trainees' digital skills based on the DigComp 2.1 framework [Master's thesis, University of Macedonia]. Retrieved from the Institutional Repository of the University of Macedonia: <https://dspace.lib.uom.gr/handle/2159/25641>
- UNESCO. (2018). UNESCO ICT Competency Framework for Teachers: Version 3. UNESCO Publishing.
Ανακτήθηκε από <https://unesdoc.unesco.org/ark:/48223/pf0000265721>
- UNESCO. (2021). Digital literacy for sustainable development. UNESCO Publishing.
<https://unesdoc.unesco.org/ark:/48223/pf0000377065>
- Vuorikari, R., Kluzer, S., & Punie, Y. (2022). DigComp 2.2: The Digital Competence Framework for Citizens – with new examples of knowledge, skills and attitudes. Publications Office of the European Union.
<https://doi.org/10.2760/115376>

INDUSTRY 5.0 – THE IMPACT OF ROBOTS AND CYBORGS ON ORGANIZATIONS FROM THE PERSPECTIVES OF ORGANIZATIONAL BEHAVIOR AND HUMAN RESOURCE MANAGEMENT

Seda Demir

Gebze Technical University, Gebze, Turkey, sedademir@gtu.edu.tr
<https://orcid.org/0009-0002-4015-1113>

Kadir Alpaslan Demir

Texas A&M University – Corpus Christi, Corpus Christi, Texas, USA, kadiralpaslan.demir@tamucc.edu
<https://orcid.org/0000-0002-8304-6324>

Meral Elci

Gebze Technical University, Gebze, Turkey, emeral@gtu.edu.tr
<https://orcid.org/0000-0002-0547-0250>

ABSTRACT

Industry 5.0 is making way for the future in which human-robot co-working will be the norm in many organizations and workplaces. In the future, robots will handle mundane tasks and humans will focus on more creative tasks. In Industry 5.0, not only robots but also cyborgs will take their place in organizations and at workplaces. Cyborgs are organisms with both organic and artificial parts. While most of the current studies focus on robots and human-robot co-working, the effect of cyborgs on organizations has not been discussed in the literature yet. In this study, we discuss the potential effects of robots and cyborgs on organizations from the perspectives of organizational behavior and human resource management. We first compare the strengths and weaknesses of humans, robots, and cyborgs. Then, we highlight the organizational behavior and human resource management areas that will need evolution or adaptation to fully utilize the benefits of Industry 5.0 with human, robot, and cyborg employees.

KEYWORDS

Industry 5.0, human-robot co-working, robot, cyborg, human resource management, organizational behavior

INTRODUCTION

Industry 5.0 will bring robots into organizations, including office workplaces (Doven et al., 2025). Figure 1 presents the industrial revolutions in a timeline. The complexity of the technologies utilized for these industrial revolutions naturally increases over time. In Industry 5.0, not only robots but also cyborgs are likely to be a part of organizations. While robots have already been widely integrated into industrial and service settings, the emergence of cyborgs—entities that have organic and artificial components—introduces unprecedented opportunities and challenges for organizations (Ferrando, 2019; Hayles, 2000). There are already companies that implant microchips in employees, such as the Swedish startup Epicenter (CNBC, 2017). These microchips are used to tag employees for identification and other purposes. Naturally, these implants are under discussion for privacy and security.

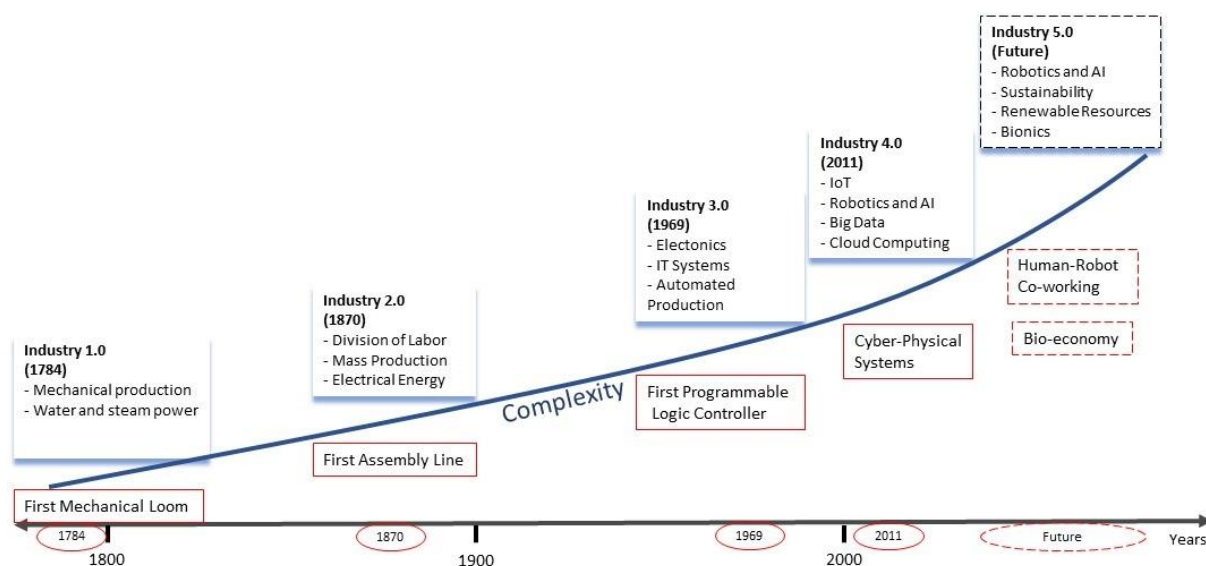


Figure 1 From Industry 1.0 to Industry 5.0 (Demir et al., 2019)

Robots are typically defined as autonomous or semi-autonomous machines capable of performing tasks with a high degree of precision, especially those that are repetitive or hazardous to humans (*International Federation of Robotics*, 2020). The word cyborg is the combination of “Cyber” and “Organism”. Cyborgs refer to organisms enhanced with artificial cyber abilities (Demir, 2017). Cyborgs are hybrid beings composed of biological and artificial elements, often described as humans whose physical or cognitive capabilities have been enhanced through technological augmentation (Gray et al., 1995; Warwick, 2013). Cyborgs do not have to be humans. There may be other types of cyborgs based on animals or plants. However, for the organizational context, we naturally focus on human cyborgs. While both are non-traditional agents in the workplace, robots are fully synthetic, whereas human cyborgs retain human capabilities and physiology.

More advanced prosthetics and implants, such as microchips, will make many disabled people’s lives better in many aspects. These disabled people will have more chances to be a part of the workforce. Also, not only disabled people, but also people without disabilities may want to enhance their capabilities with artificial enhancements. For example, exoskeletons will enable workers to carry more weight and complete tasks that were not possible with normal human strength and endurance. In some cases, these enhancements may be voluntary; in some other cases, organizations may require such enhancements for the role. All these issues will open many discussions in terms of work definition, performance, ethics, and culture.

Robots and cyborgs share the capacity to increase efficiency, reduce errors, and perform in environments unsuitable for humans. However, their organizational implications may differ significantly. Robots are likely to be ideal for automating structured tasks in bureaucratic systems, while cyborgs offer a blend of human flexibility and machine-like capabilities that may be valuable in dynamic, innovation-driven environments (Nahavandi, 2019).

From an organizational behavior (OB) perspective, robots and cyborgs raise critical questions about team dynamics, leadership, motivation, and decision-making. How will human employees co-work with augmented colleagues or robots? Will robots and cyborgs reshape traditional leadership hierarchies or challenge existing ethical frameworks?

In the field of human resource management (HRM), robots and cyborgs disrupt conventional paradigms related to recruitment, training, performance appraisal, and workplace inclusion. For example, the selection process for cyborgs may require criteria beyond conventional human metrics, while training for human employees may need to include modules on human-machine collaboration (Brougham & Haar, 2018).

In the future, organizations must prepare for a hybrid workforce where humans, robots, and cyborgs coexist. This transformation demands new theoretical models and practical strategies to manage identity, equity, inclusion, and governance in the workplace (Dignum, 2019).

This paper explores the potential impact of robots and cyborgs on organizational behavior and human resource management. This study will help shape organizational behavior and human resource management research for a hybrid workforce future in which human, robot, and cyborg employees co-exist.

The importance of this study lies in its examination of a key aspect of Industry 5.0: the collaborative work of humans, robots, and cyborgs within the same organization. Although previous studies have thoroughly investigated automation, artificial intelligence, and human-robot collaboration (Brougham & Haar, 2018; Doven et al., 2025; Nahavandi, 2019), the concept of cyborgs as active participants in organizations has garnered scant scholarly attention (Ferrando, 2019; Gray et al., 1995; Warwick, 2013). This disparity is especially pronounced in light of the swift progress in bioengineering, neural interfaces, and wearable augmentation technologies, which are poised to transform the essence of work and workers imminently (Demir, 2017; Hayles, 2000).

From an academic standpoint, the uniqueness of this paper arises from its dual contribution. First, it conceptually differentiates robots from cyborgs within the realms of organizational behavior (OB) and human resource management (HRM), providing a systematic comparison of their respective advantages, disadvantages, and implications for the workplace (Armstrong & Taylor, 2023; Robbins & Judge, 2009). Second, it presents a thorough, two-dimensional framework that classifies organizational challenges into individual and organizational-level factors, aligning them with human, robot, and cyborg profiles. This integrative approach enhances theoretical comprehension while offering a pragmatic perspective for managers, policymakers, and researchers aiming to navigate the intricacies of a hybrid workforce (Autor, 2015; Dignum, 2019).

Literature Review

Robots have been extensively researched in manufacturing, service, and office environments, enhancing productivity, minimizing errors, and executing dangerous tasks (Autor, 2015; International Federation of Robotics, 2020; Nahavandi, 2019). Research on human-robot collaboration shows that it can be more efficient, but it can also be hard to trust, understand roles, and adapt to different cultures (Brougham & Haar, 2018; Doven et al., 2025).

Cyborgs, or organisms that have been improved with artificial parts, are not very common in organizational research. While technological advancements such as neural interfaces and exoskeletons render cyborg workers increasingly feasible (Demir, 2017; Gray et al., 1995; Warwick, 2013), current discourse predominantly addresses ethics and privacy (Dignum, 2019; Ferrando, 2019; Hayles, 2000) rather than practical workplace integration.

Industry 5.0 imagines a mixed workforce of people, robots, and cyborgs, but most of the writing focuses on technology rather than how organizations work and how HRM strategies work (Armstrong

& Taylor, 2023; Robbins & Judge, 2009). This study fills this gap by conceptually comparing humans, robots, and cyborgs and outlining their implications in the fields of OB and HRM.

Theoretical Background

Technology acceptance has been one of the primary research areas for the management of information systems discipline. There have been widely used models, frameworks, and theories utilized to analyze the acceptance of various technologies, such as computers, mobile applications, smartphones, and banking systems. The two most widely used technology acceptance models are the Technology Acceptance Model (TAM) (Davis, 1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). The TAM basically states that if a technology is perceived as useful and easy to use, then it will lead to an increase in the attitude toward using, which in turn leads to behavioral intention to use, and finally leads to actual system use. The UTAUT states that performance expectancy, effort expectancy, and social influence will lead to behavioral intention to use, and then this intention to use, combined with facilitating conditions, will lead to actual system use. Both models have been extended and utilized in many related studies. Recently, these models have been modified and enhanced to be used in robot acceptance studies (Alaiad & Zhou, 2014; Cippelletti et al., 2024, 2024; Guggemos et al., 2020; Kim, 2023; Komariyah et al., 2025; Saari et al., 2022). For example, a recent study on whether robots will be accepted as co-workers in office environments or not utilized the UTAUT model as the theoretical framework (Doven et al., 2025). These frameworks and models will be the starting point for future research endeavors related to the analysis of acceptance and impact of these technologies in organizations.

METHODOLOGY

This study adopts a conceptual analysis methodology aimed at exploring the impact of robots and cyborgs on organizations. The analysis is structured along two core dimensions: Organizational Behavior (OB) and Human Resource Management (HRM). Within each dimension, key areas were identified based on literature in management and organizational theory (Armstrong & Taylor, 2023; Robbins & Judge, 2009).

Cyborgs and robots were analyzed in parallel across these dimensions using a dual-level categorization framework, separating issues into individual-level and organizational-level concerns. For example, in the OB domain, constructs such as stress, motivation, and learning were considered at the individual level, while leadership and organizational culture were examined from a structural perspective. In the HRM domain, topics such as selection, training, and performance management were categorized and analyzed similarly.

Organizations should identify their strengths and weaknesses for their employees (human, cyborg and robot employees), taking into account their own business sector (based on Table 1 and Table 2). Also, they reconsider a hybrid workplace environment (based on Table 3 and Table 4). The workflow of this transformation process is provided in Figure 2.

Table 1 Strengths of Human, Cyborgs, and Robots Employees

Dimension	Humans – Strengths	Cyborgs – Strengths	Robots – Strengths
Cognitive Ability	Ethical judgment, critical thinking	Enhanced information processing + intuition	High-speed data processing
Emotional Intelligence	Empathy, interpersonal awareness	Potential for emotional response retention	Not applicable
Creativity	Original idea generation, lateral thinking	Creative augmentation via integrated intelligence	Structured problem-solving in known tasks
Adaptability	Context-based flexibility	High adaptability to changing environments	Performs well in routine-based settings
Communication	Verbal and non-verbal nuance	Potential for advanced interfaces	Effective for structured input/output communication
Physical Capability	Dexterity, sensation-based control	Enhanced strength, durability, and precision	Consistent mechanical performance

Table 2. Weaknesses of Human, Cyborgs, and Robot Employees

Dimension	Humans – Weaknesses	Cyborgs – Weaknesses	Robots – Weaknesses
Cognitive Limits	Bias, cognitive overload, and emotional fluctuation	Ethical ambiguity, risk of malfunction	No self-awareness, limited to programming
Fatigue & Health	Prone to physical and mental exhaustion	Biological limitations + system wear	No fatigue, but mechanical failure risk
Consistency	Variability due to emotion, stress	Dependent on interface maintenance	Operates only within defined parameters
Learning Speed	Slow learning curve in technical fields	Risk of over-reliance on augmentation	Needs large data sets; no experiential learning
Team Integration Barriers	Subjective conflicts, emotional misinterpretation	Potential social resistance from human teams	Limited collaboration capacity
Cost & Maintenance	Salaries, benefits, leave	High cost of upgrades and maintenance	High initial investment; rigid post-deployment changes

Organizations will need to reorganize workplace environments based on the following factors related to organizational behavior and human resource management topics.

Table 3. Areas to Rethink for a Hybrid Workplace from an Organizational Behavior Perspective

Organizational Behavior (OB) Areas to Rethink for a Hybrid Workplace	
Individual	Job Performance Job Satisfaction Organizational Commitment Stress and Motivation Trust, Justice, and Ethics Learning and Decision-Making Personality and Cultural Values Skills and Ability
Organizational	Workforce Planning Organizational Culture Teams and Teamwork Leadership Communication Trust, Justice, and Ethics (organizational climate)

Table 4. Areas to Rethink for a Hybrid Workplace from a Human Resource Management Perspective

Human Resource Management (HRM) Areas to Rethink for a Hybrid Workplace	
Individual	Selection and Placement Training and Education Performance Management Employee (Human, Cyborg, Robot) Career Development Separation & Retention (from employee perspective) Employee Benefits
Organizational	Redefinition and restructuring of HRM for a hybrid work environment Job/Role/Task Redefinitions Strategic HRM & Competitive Advantage Legal and Regulatory Environment Analysis and Design of Work HR Planning & Recruitment Separation & Retention (from strategic/turnover planning) Pay Structure Decisions Labor Relations

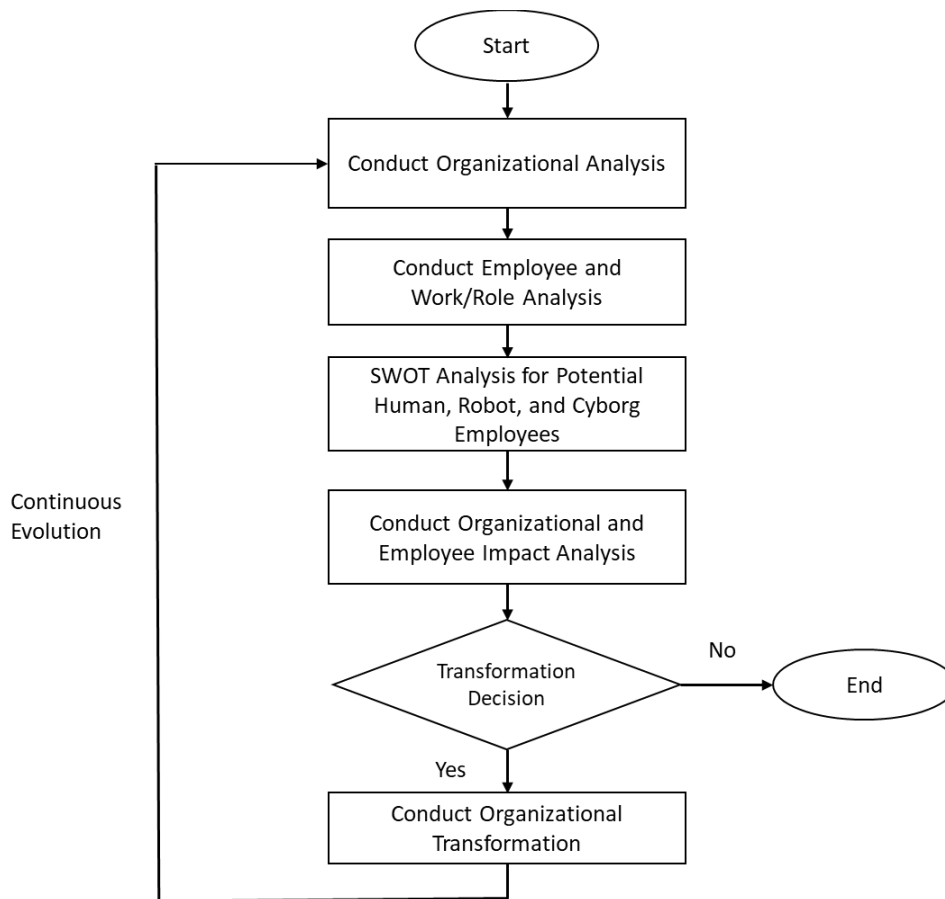


Figure 2 Hybrid Work Environment, Impact Analysis, and Organizational Transformation Process

RESULTS

The conceptual analysis yields the following insights:

- In Industry 5.0, with humans, robots, and cyborgs in a hybrid workplace environment, organizational behavior and human resource management disciplines will evolve. New organizational types and structures, as well as new job and role types, will emerge.
- Different types of organizations may be affected differently since organizations have different work environments, business goals, and employee needs. Therefore, each organization should conduct a Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis based on its specific organizational goals and needs, and undertake organizational transformation when necessary.
- Human-robot-cyborg co-working may create many issues in legal, regulatory, cultural, and ethical areas.
- HRM systems must evolve to support a hybrid workforce: new recruitment models, legal redefinitions of human, robot, cyborg employee rights and responsibilities, and adaptive performance metrics.

- Technology companies and organizations will need to work closely to create an effective and efficient work environment. In some cases, organizations would like to have custom robots for specific needs and tasks.
- Lawmakers will need to write new labor laws, and governments and regulatory bodies will need to create new regulations to utilize cyborg and robot employees effectively.
- Organizations will need to train and encourage their human employees to co-work with robots and cyborg employees.

Implications for Organizations and HRM

Industry 5.0 is not just a technological shift; it is also a significant transformation in how we perceive work, workers, and workplaces. To prepare for this future, we may need to revisit and reevaluate many organizational theories and perspectives.

The findings of this conceptual study offer forward-looking insights for organizations preparing for Industry 5.0. The coexistence of humans, robots, and cyborgs will reshape traditional assumptions about task design, leadership, and co-working. In the domain of organizational behavior, issues such as motivation, trust, and decision-making must be re-evaluated in light of new workplace actors with non-human capabilities.

From a human resource management (HRM) perspective, current systems related to recruitment, training, performance management, and legal compliance will require substantial adaptation. For instance, hiring processes must consider not only technical qualifications but also ethical and regulatory implications of augmenting the workforce with cyborgs. Furthermore, performance evaluation systems must distinguish between algorithmic efficiency and human judgment.

While existing literature has extensively explored automation and artificial intelligence, the role of robots and cyborgs as hybrid organizational actors needs to be envisioned, discussed, and investigated. By categorizing workplace issues into individual and organizational levels and mapping them across human–cyborg–robot profiles, the study provides a visionary perspective. Additionally, the analyses of OB and HRM perspectives highlight the need for an interdisciplinary approach for the upcoming organizational evolution. In this aspect, this study is especially relevant for both management scholars and technology researchers interested in workplace transformation.

Practical Implications

The results of this study offer practical guidance for organizations readying themselves for a hybrid workforce comprising humans, robots, and cyborgs. For human resource management, hiring processes will need to include standards for judging technological augmentation, and training programs should teach people how to work with machines (Brougham & Haar, 2018). Performance evaluation systems must distinguish between human judgment and machine-driven efficiency, necessitating a redefinition of compensation structures to reflect enhanced capabilities (Armstrong & Taylor, 2023).

From an organizational behavior standpoint, leaders must cultivate trust and inclusivity within teams comprising human, robotic, and cyborg members (Nahavandi, 2019). Organizational culture must adjust to emerging ethical, communicative, and decision-making standards (Dignum, 2019).

Additionally, policymakers and industry regulators ought to establish legal frameworks that safeguard employee rights, safety, and data privacy for both augmented and non-human workers (Ferrando, 2019). By taking these steps, businesses can anticipate and capitalize on the opportunities that Industry 5.0 presents.

Limitations and Future Research

This study has some limitations. The proposed framework and its implications remain untested in practical organizational contexts, since most robotic and cyborg technologies are not yet widely utilized in organizations. As these technologies are more widely adopted in organizations, future research should focus on investigating the acceptance of robots and cyborg colleagues by their human counterparts, as well as related organizational behavior and human resource management issues. Moreover, cultural and sectoral disparities may impact the acceptance and efficacy of human-robot-cyborg co-working. Establishing novel performance metrics for different types of workers and creating regulatory frameworks for human-technology collaboration in hybrid work environments are essential research areas for the upcoming organizational evolution, driven by Industry 5.0.

REFERENCES

- Alaiad, A., & Zhou, L. (2014). The determinants of home healthcare robots adoption: An empirical investigation. *International Journal of Medical Informatics*, 83(11), 825–840. <https://doi.org/10.1016/j.ijmedinf.2014.07.003>
- Armstrong, M., & Taylor, S. (2023). *Armstrong's handbook of human resource management practice: A guide to the theory and practice of people management*. Kogan Page Publishers.
- Autor, D. H. (2015). Why Are There Still So Many Jobs? The History and Future of Workplace Automation. *Journal of Economic Perspectives*, 29(3), 3–30. <https://doi.org/10.1257/jep.29.3.3>
- Brougham, D., & Haar, J. (2018). Smart technology, artificial intelligence, robotics, and algorithms (STARA): Employees' perceptions of our future workplace. *Journal of Management & Organization*, 24(2), 239–257.
- Cippelletti, E., Fournier, É., Jeoffrion, C., & Landry, A. (2024). Assessing Cobot's Acceptability of French Workers: Proposition of a Model Integrating the TAM3, the ELSI and the Meaning of Work Scales. *International Journal of Human-Computer Interaction*, 1–13. <https://doi.org/10.1080/10447318.2024.2384832>
- CNBC (Accessed on 13 July 2025). (2017). <https://www.cnn.com/2017/04/03/start-up-epicenter-implants-employees-with-microchips.html>
- Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319. <https://doi.org/10.2307/249008>
- Demir, K. A. (2017). RESEARCH QUESTIONS IN ROBOETHICS. *Mugla Journal of Science and Technology*, 160–165. <https://doi.org/10.22531/muglajsci.359648>
- Demir, K. A., Döven, G., & Sezen, B. (2019). Industry 5.0 and human-robot co-working. *Procedia Computer Science*, 158, 688–695.
- Dignum, V. (2019). *Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way*. Springer International Publishing. <https://doi.org/10.1007/978-3-030-30371-6>
- Döven, G., Sezen, B., Demir, K. A., & Balcioglu, Y. S. (2025). Industry 5.0: Are We Going to Accept Robots as Co-Workers in Office Environments? An Empirical Analysis. *Applied Sciences*, 15(3), 1591.
- Ferrando, F. (2019). *Philosophical posthumanism*. Bloomsbury Publishing.

- Gray, C. H., Figueroa-Sarriera, H. J., & and Mentor, S. (1995). *The Cyborg Handbook*. Eweb:148257. <https://repository.library.georgetown.edu/handle/10822/879709>
- Guggemos, J., Seufert, S., & Sonderegger, S. (2020). Humanoid robots in higher education: Evaluating the acceptance of Pepper in the context of an academic writing course using the UTAUT. *British Journal of Educational Technology*, 51(5), 1864–1883. <https://doi.org/10.1111/bjet.13006>
- Hayles, N. K. (2000). *How we became posthuman: Virtual bodies in cybernetics, literature, and informatics*. IOP Publishing. <https://iopscience.iop.org/article/10.1088/0963-6625/9/4/704/meta>
- International Federation of Robotics. (2020). *World Robotics 2020 Highlights*. Retrieved from <https://ifr.org>
- Kim, Y. (2023). Examining the Impact of Frontline Service Robots Service Competence on Hotel Frontline Employees from a Collaboration Perspective. *Sustainability*, 15(9), 7563. <https://doi.org/10.3390/su15097563>
- Komariyah, D., Inoue, K., Suyama, N., Buwana, C., & Ito, Y. (2025). The acceptance of the potential use of social robots for children with autism spectrum disorder by Indonesian occupational therapists: A mixed methods study. *Disability and Rehabilitation: Assistive Technology*, 20(2), 397–407. <https://doi.org/10.1080/17483107.2024.2378946>
- Nahavandi, S. (2019). Industry 5.0—A Human-Centric Solution. *Sustainability*, 11(16), 4371. <https://doi.org/10.3390/su11164371>
- Robbins, S. P., & Judge, T. (2009). *Organizational behavior*. Pearson South Africa.
- Saari, U. A., Tossavainen, A., Kaipainen, K., & Mäkinen, S. J. (2022). Exploring factors influencing the acceptance of social robots among early adopters and mass market representatives. *Robotics and Autonomous Systems*, 151, 104033. <https://doi.org/10.1016/j.robot.2022.104033>
- Venkatesh, Morris, Davis, & Davis. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, 27(3), 425. <https://doi.org/10.2307/30036540>
- Warwick, K. (2013). *Artificial intelligence: The basics*. Routledge. <https://www.taylorfrancis.com/books/mono/10.4324/9780203802878/artificial-intelligence-basics-kevin-warwick>

***FROM GREEN
INNOVATION TO
SMART CITIES***

STRATEGIC GOVERNANCE FOR SUSTAINABLE PERFORMANCE: ESG IMPACTS OF BOARD AND FINANCIAL STRUCTURES IN INTERNATIONAL LOGISTICS

Mert Demir

Balıkesir University, Balıkesir, Türkiye, mert.demir@balikesir.edu.tr
<https://orcid.org/0009-0001-9403-2542>

Bahaudin G. Mujtaba

Nova Southeastern University, Florida, USA, mujtaba@nova.edu
<https://orcid.org/0000-0003-1615-3100>

Pelin Vardarli

Balıkesir University, Balıkesir, Türkiye, pelin.vardarli@balikesir.edu.tr
<https://orcid.org/0000-0002-5101-6841>

ABSTRACT

This study examines how board structures and financial factors relate to sustainability performance within international logistics. Focusing on the “Freight and Logistics Services” sub-sector, we compile annual data for 62 firms from 19 countries over 2016–2023 drawn from Refinitiv Eikon. Sustainability performance is operationalized by the standardized composite ESG score (0–100), which enables cross-country comparability in a disclosure-based setting. We estimate firm fixed-effects models with year fixed effects and, for comparison, random-effects and pooled OLS specifications. Results show that board independence and the presence of a board-level CSR committee are positively associated with ESG performance, while CEO duality is negatively associated—consistent with the view that role consolidation weakens stakeholder-oriented oversight. Evidence on board gender diversity is specification-sensitive: it is positive in pooled OLS but loses statistical significance when firm heterogeneity is modeled. Turning to profitability (ROA), CEO duality is negatively related to ROA, whereas gender diversity is positively related; in contrast, independence and CSR committee do not display direct effects on ROA, suggesting possible indirect channels via ESG. Financial covariates such as firm size and profitability are positively associated with ESG scores, and leverage reduces ROA as expected. By providing sub-sector-specific evidence with a standardized ESG measure, the study informs governance reforms in logistics—prioritizing CEO–chair separation, institutionalizing CSR committees, and cultivating gender-diverse boards—to strengthen sustainability outcomes and long-run value creation.

KEYWORDS

Corporate Governance, ESG Performance, Logistics Industry, Board Structure, Sustainability Performance

INTRODUCTION

The acceleration of globalization and the successive waves of financial crises, corporate scandals, and large-scale bankruptcies since the 1990s have underscored the imperative for firms to safeguard their long-term sustainability (Aktan, 2013; İşcan & Kaygın, 2009). These developments have elevated the strategic importance of corporate governance at the global level, compelling organizations to reconfigure their governance frameworks, decision-making processes, and operational strategies.

Corporate governance is defined as a system of principles—encompassing the board of directors, shareholders, and other stakeholders—that underpins long-term value creation, transparency, and accountability (OECD, 2016; TÜSİAD, 2002).

The rise of the sustainability concept has further amplified the importance of governance principles. Firms are now expected to manage not only economic performance but also environmental and social responsibilities with equal rigor. Principles such as transparency, accountability, fairness, and responsibility play a pivotal role in achieving corporate sustainability objectives (SPK, 2014; Pamukçu, 2011).

The logistics sector, due to its central role in global supply chains, faces particularly acute external pressures regarding sustainability. Its operations are directly linked to fossil fuel consumption, greenhouse gas emissions, and natural resource utilization, rendering it a critical focus for environmental and social impact analyses (Karaman et al., 2020; Kuzey et al., 2022). Consequently, sustainable logistics practices have evolved from being a strategic choice to an operational necessity (Özdemir, 2019; Rogers & Tibben-Lembke, 2001). Green logistics strategies—such as optimizing resource usage, implementing waste management protocols, enhancing energy efficiency, and adopting eco-friendly technologies—significantly reduce the sector’s environmental footprint and contribute to broader sustainable development goals (Büyükkelik & Senir, 2017).

However, the logistics sector is not homogeneous in terms of operational processes, stakeholder expectations, and environmental impacts. The distinct characteristics of its sub-sectors limit the generalizability of broad sector-wide analyses. This heterogeneity calls for context-specific empirical research that addresses the unique dynamics of individual sub-sectors.

This study addresses this gap by focusing on the "Freight and Logistics Services" sub-sector. Its primary objective is to evaluate how corporate governance structures influence sustainability performance within this context using comprehensive panel data analysis. Specifically, we examine the effects of board independence, gender diversity, the existence of a Corporate Social Responsibility (CSR) committee, and CEO duality on ESG outcomes, while controlling for firm size, financial leverage, return on assets (ROA), free float, and board size.

The dataset comprises annual information for 62 international logistics firms from 19 countries over the period 2016–2023, sourced from the Refinitiv Eikon database (formerly Thomson Reuters Eikon). ESG performance is measured using Refinitiv’s continuous 0–100 composite ESG score. By providing a nuanced understanding of governance–sustainability linkages at the sub-sector level, this research offers novel insights for policymakers, industry leaders, and investors seeking to implement targeted strategies that foster long-term sustainable growth in the logistics industry.

The contemporary business landscape has seen the logistics and transportation sector re-evaluate its corporate social responsibility (CSR) and sustainability practices in response to heightened public scrutiny and regulatory mandates (Govindan et al., 2016). The literature on corporate governance and sustainability broadly encompasses three thematic areas: (1) governance dynamics shaping sustainability performance; (2) drivers and motivations underpinning sustainability reporting; and (3) the impact of sustainability initiatives on firm reputation and financial outcomes.

Governance Dynamics and Sustainability Performance: Research in this stream investigates how internal governance mechanisms—particularly board composition and specialized committees— influence ESG outcomes. International studies within the logistics sector demonstrate that gender diversity on boards positively correlates with ESG performance. Govindan et al. (2021), examining 100 global logistics firms, found that female directors significantly enhance overall ESG outcomes. Kuzey et al. (2022) further show that gender diversity fosters eco-innovation, resource efficiency, and

emission reduction. CSR committees also emerge as pivotal, with characteristics such as independence, absence of the CEO, or female leadership amplifying their positive effect (Eberhardt-Toth, 2017). Gündoğdu et al. (2023), using a multi-criteria decision-making framework, highlight the role of governance structures in promoting eco-efficiency strategies that mitigate environmental risks. In line with this literature, Taşkın et al. (2025) find that board-driven governance quality is a key determinant of sustained ESG performance, while Shakil et al. (2024) show that board gender diversity mitigates the negative impact of environmental initiatives on financial outcomes.

Sustainability Reporting Drivers and Motivations: This theme explores the factors motivating transparent sustainability disclosures. High-performing logistics firms leverage robust ESG reporting as a signaling mechanism rather than greenwashing (Uyar et al., 2020). Karaman et al. (2020) identify a positive association between the Logistics Performance Index (LPI) and sustainability reporting, particularly in lower-governance contexts, where reporting substitutes for weaker oversight. In emerging markets, board attributes and audit committee effectiveness positively influence disclosure quality (Erin et al., 2022). Contrastingly, Shamil et al. (2014) document in Sri Lanka that larger boards and CEO–chair separation increase reporting likelihood, whereas female director presence unexpectedly reduces it. Sierra-García et al. (2015) confirm that assurance of sustainability reports boosts integrated reporting adoption, while Garcia-Sanchez et al. (2021) note that powerful CEOs may hinder such practices. Pratama et al. (2025) reveal that when sustainability committees are dominated by managerial members, they may inadvertently facilitate greenwashing. Similarly, Shen et al. (2024) find that digital supply chain innovation contributes to more effective ESG disclosure by strengthening governance mechanisms and alleviating financial constraints.

Sustainability Initiatives and Corporate Outcomes: The third theme examines the tangible impacts of sustainability practices on firm outcomes. In logistics, short-term financial returns may lag, but long-term benefits are evident (Govindan et al., 2021). De Lucia et al. (2020), focusing on European public enterprises, document significant positive correlations between ESG scores and financial metrics (ROA, ROE). Assurance-supported disclosures also strengthen corporate reputation and stakeholder trust (Odriozola & Baraibar-Diez, 2017; Sierra-García et al., 2015). However, Garcia-Sanchez et al. (2021) argue that increased CEO power can weaken reporting transparency, undermining reputation over time. In a similar vein, Yu et al. (2024) show that digital transformation initiatives, especially when combined with strong board oversight, further enhance ESG performance in logistics firms.

Table 1: Key Literature Overview of Corporate Governance and Sustainability in the Logistics Sector

Study (Author(s), Year)	Focus & Objective	Sample & Period	Methodology	Key Findings & Contribution
Kuzey vd. (2022)	The impact of gender diversity on the board of directors and CSR strategy on environmentally friendly practices (eco-innovation, resource use, emissions) in the logistics sector.	International transportation and logistics companies (TR Eikon), 2002–2019.	Fixed effects panel regression, moderation analysis.	They found that board gender diversity and CSR strategies both directly enhance environmental performance, and that CSR strategies further strengthen the relationship between gender diversity and eco-innovation.
Govindan vd. (2021)	The impact of board characteristics (gender diversity, CSR committee) on ESG performance and the impact of ESG performance on company value in the logistics sector.	100 international logistics companies (TR Eikon), 2011–2018.	Fixed effects panel regression.	They demonstrated that board gender diversity and the presence of a CSR committee improve ESG performance, although ESG performance does not have a significant positive effect on firm value (Tobin's Q).
Uyar vd. (2020)	Testing whether the relationship between CSR performance and CSR reporting in the logistics sector is "signaling" or "greenwashing."	International logistics companies (TR Eikon), 2012–2018.	Logistic and Poisson regression, fixed effects.	They observed that firms with high CSR performance engage in more extensive sustainability reporting, supporting the signaling theory.

Karaman vd. (2020)	The relationship between country-level green logistics performance (LPI) and sustainability reporting, and the regulatory role of corporate governance quality.	117 countries, 2007–2016.	Logistic and Poisson regression, moderation analysis.	They showed that higher Logistics Performance Index (LPI) scores are associated with increased reporting, and that this relationship is even stronger in environments with weaker governance (a substitution effect).
Erin vd. (2022)	The relationship between corporate governance (board and audit committee characteristics) and sustainability reporting quality in Nigeria.	120 listed companies in Nigeria, 2013–2018.	Ordinal logistic regression.	They found that board size, gender diversity, board expertise, and audit committee effectiveness all enhance the quality of sustainability disclosures, providing evidence in a developing-country context.
Pratama vd. (2025)	The effectiveness of sustainability-focused corporate governance mechanisms in preventing “greenwashing” practices in Southeast Asia.	132 companies from 4 Southeast Asian countries, 2021–2022.	Logistic regression.	They revealed that sustainability committees—particularly those dominated by executives—fail to prevent greenwashing and may even encourage it.
Eberhardt-Toth (2017)	The impact of the demographic composition of the CSR committee on corporate social performance.	177 international companies with CSR committees, 2012.	Binary logistic regression.	They identified the characteristics of high-performing CSR committees (more independent members, absence of the CEO, female chair, and smaller size).
Odriozola & Baraibar-Diez (2017)	The impact of CSR reporting quality on corporate reputation in the next period.	Ibex35 companies in Spain, 2006–2011.	Logistic regression.	They demonstrated that higher sustainability reporting quality, as measured by assurance standards, leads to improvements in corporate reputation.
Shamil vd. (2014)	The impact of board characteristics on the likelihood of sustainability reporting in Sri Lanka.	148 listed companies in Sri Lanka, 2012.	Hierarchical binary logistic regression.	They reported that larger boards and separation of the CEO and chair roles increase reporting likelihood, whereas the presence of female directors unexpectedly exerts a negative effect.
Sierra-García vd. (2015)	Examining the determinants of Integrated Reporting (IR), particularly its relationship with CSR report assurance.	7.144 international observations from the GRI database, 2009–2011.	Logistic regression.	They showed that external assurance of CSR reports, firm size, and use of sector-specific GRI supplements all raise the probability of adopting integrated reporting (IR).
Garcia-Sanchez vd. (2021)	The role of CEO power in the adoption of Integrated Reporting (IR).	1.588 international companies, 2009–2017.	Logistic panel regression.	Within an agency-theoretical framework, they found that more powerful CEOs resist adopting integrated reporting.
De Lucia vd. (2020)	Testing whether good ESG performance leads to better financial performance.	1.038 European public enterprises, fiscal years 2018–2019.	Machine learning models + ordered logistic regression.	They established a positive relationship between ESG practices and financial performance metrics (ROE, ROA).
Gündoğdu vd. (2023)	Analyzing the importance levels of ESG criteria for a multinational logistics company and selecting the most ideal environmental competitive strategy.	Single multinational logistics company; expert panel (n=7); cross-sectional.	Multi-criteria decision-making (q-ROF-EDAS); expert panel aggregation.	Greenhouse gas emissions is prioritized as the highest-weighted ESG criterion; eco-efficiency is identified as the top-ranked environmental competitive strategy for the case firm.
Govindan vd. (2016)	Reviewing the literature on Sustainable Supply Chain Management (SSCM) and highlighting the themes of governance, relationship management, and innovation.	Literature review 1993–2015.	Literature review and editorial review.	They reviewed the sustainable supply chain management literature to highlight core dynamics, research gaps, and future directions, thereby contributing to the field’s theoretical foundations.
Taşkın et al. (2025)	Whether past ESG (as a governance signal) predicts future ESG performance.	BIST Sustainability Index firms, 2017–2021	ML classifiers (DT, RF, k-NN, logit); out-of-sample validation	They show that historical ESG strongly predicts future ESG, indicating persistence of board-driven governance effects.
Shakil et al. (2024)	Board gender diversity as a moderator of the ESG–CFP trade-off in logistics.	56 transport and logistics firms, 18 countries, 2013–2017	Panel FE/RE with moderation tests	They find that gender-diverse boards attenuate the negative E-to-CFP link, positioning board composition as a strategic lever.
Shen et al. (2024)	Identify the causal impact of supply-chain digitization policy on enterprise ESG and probe mechanisms (governance improvement, eased financing	China A-share non-financial firms, 2011–2021	Quasi-natural experiment (DID), mechanism & heterogeneity analyses	Digitization raises ESG via stronger governance and alleviated financing constraints; effects are stronger in SOEs, in low-digitization settings, and in high-attention contexts.

	constraints) with heterogeneity			
Yu et al. (2024)	Assess whether firm-level digital transformation improves ESG in transport & logistics and through which channels (green innovation; financing constraints; ownership/size heterogeneity).	95 A-share transportation firms, 2011–2021	Two-way FE; mediation (green innovation), heterogeneity (SOE/size)	Digital transformation elevates ESG; the impact is stronger in SOEs and large firms; green innovation mediates, and lower financing constraints amplify the gains.

In summary, while existing literature addresses governance–sustainability linkages across diverse contexts, few studies capture the heterogeneity within logistics sub-sectors. This research fills this void by systematically analyzing how board structures affect ESG outcomes in the "Freight and Logistics Services" sub-sector, thereby generating actionable insights for both academic and practitioner audiences.

Independent directors serve as a key governance mechanism to mitigate conflicts of interest and limit managerial opportunism. In logistics, where long-term environmental investments can be sacrificed for short-term profit targets, independent oversight is particularly crucial. From a stakeholder perspective, independent board members bring diverse stakeholder concerns—including environmental and community impacts—into strategic decision-making. Empirical evidence supports the positive effect of board independence on ESG outcomes (Jo & Harjoto, 2011; Hussain et al., 2018).

H1: Board independence is positively associated with firms' sustainability performance.

Gender diversity on boards fosters a wider range of perspectives and creative problem-solving, which is vital in managing logistics' environmental and social responsibilities. Resource Dependence Theory suggests that female directors expand the board's strategic competencies through unique social networks and viewpoints, while Stakeholder Theory highlights women's greater sensitivity to social and environmental issues. Empirical studies confirm that higher proportions of female directors enhance ESG performance (Shaukat et al., 2016; Ben-Amar et al., 2017; Govindan et al., 2021).

H2: Board gender diversity is positively associated with firms' sustainability performance.

A formal Corporate Social Responsibility (CSR) committee institutionalizes sustainability oversight by embedding ESG priorities into board agendas. Stakeholder Theory posits that CSR committees strengthen stakeholder trust by ensuring that environmental and social responsibilities are systematically addressed. Empirical research shows that CSR committee presence improves both sustainability performance and reporting quality (Michelon & Parbonetti, 2012; Velte, 2016; Hussain et al., 2018).

H3: The presence of a CSR committee is positively associated with firms' sustainability performance.

The combination of CEO and board chair roles centralizes decision-making authority, potentially weakening oversight and deprioritizing long-term ESG commitments in favor of short-term financial gains. Agency Theory suggests that such role consolidation can undermine firms' sustainability investments. Nonetheless, the literature offers mixed evidence on the CEO duality–ESG relationship (Garcia-Sanchez et al., 2021; Velte, 2016). This study seeks to clarify this relationship within the freight and logistics services context.

H4: CEO duality is negatively associated with firms' sustainability performance.

Table 2: Variables and Measurement Constructs Employed in the Study

Variable Type	Variable Name	Symbol	Measurement	
Dependent Variable	Sustainability Performance	ESG Score	Refinitiv’s aggregated ESG score, normalized on a 0–100 scale.	
Independent Variables	Board Independence	Bindep	Proportion of independent directors to total board members (%).	
	Gender Diversity	Bgenderdiv	Proportion of female directors to total board members (%).	
	CSR Committee	CSRcommittee	Dummy indicator of whether the firm has a CSR or Sustainability Committee at the board level (1 = Yes; 0 = No).	
	CEO Duality	CEOdual	Dummy indicator of whether the CEO also serves as the board chair (1 = Yes; 0 = No).	
Control Variables	Firm Size	Tassets	Natural logarithm of total assets. (ln)	
	Leverage	Lvrage	Total liabilities divided by total assets.	
	Profitability	Profitability		Net profit after tax divided by total revenues.
		ROA		Net profit after tax divided by total assets.
		ROE		Net profit after tax divided by total shareholders’ equity.
	Free Float Ratio	Freefloat	Natural logarithm of the proportion of freely tradable shares to total shares outstanding. (ln)	
	Board Size	Bsize	Total number of board members.	

Note: ESG performance is measured using the Refinitiv Eikon aggregated ESG score. Board characteristics are hand-coded from annual reports and cross-checked with data-provider disclosures. Financial ratios conform to international accounting standards and are winsorized at the 1st and 99th percentiles to mitigate outlier effects. Refinitiv maps heterogeneous issuer disclosures into comparable pillar-level and composite ESG scores.

METHODOLOGY

This study empirically examines the effect of corporate governance structures on sustainability performance within logistics firms operating internationally. The sample is confined to firms in the “Freight and Logistics Services” sub-sector and comprises annual panel data for the period 2016–2023, sourced from the Refinitiv Eikon database. After cleaning for missing observations, the final dataset includes 62 firms and 496 firm-year observations. Focusing on this sub-sector reduces heterogeneity and strengthens the validity and originality of our findings.

All firm-level data are obtained from the Refinitiv Eikon database. By restricting the analysis to the “Freight and Logistics Services” sub-sector, this study addresses the heterogeneity critique often levied at broad logistics sector analyses. The eight-year panel structure (2016–2023) comprises 496 firm-year observations, allowing for comprehensive cross-sectional and time-series variation analysis. The sampling frame consists of all firms classified by Refinitiv Eikon under “Freight and Logistics Services.” Firms are included if (i) composite ESG scores and core financials are available for the 2016–2023 window with consistent fiscal coverage; (ii) board characteristics (independence, gender composition, CSR committee, CEO duality) can be validated from annual reports and data-vendor disclosures; and (iii) no material inconsistencies exist between vendor records and issuer filings.

Firms with missing ESG or financial observations, discontinuities, or unresolved data discrepancies are excluded. The final sample comprises 62 firms from 19 countries and 496 firm-year observations. Cross-country differences in accounting and sustainability reporting are mitigated by Refinitiv's standardized ESG and accounting definitions, which map heterogeneous firm disclosures into comparable pillar and composite scores, thereby supporting sector- and cross-national comparability.

The variables employed in the panel data analysis are defined in accordance with established measurement standards in the corporate governance literature and the definitions provided by data-providers. Sustainability performance is proxied by the Refinitiv Eikon aggregated ESG score, which captures a firm's integrated environmental, social, and governance performance on a normalized 0–100 scale widely used by international investors and policymakers. In this study, sustainable performance denotes the firm's overall environmental–social–governance achievement as captured by Refinitiv Eikon's standardized composite ESG score on a 0–100 scale. We interpret this composite as a higher-order sustainability construct; higher values indicate superior integrated performance across the E, S, and G pillars on a standardized, cross-country comparable scale.

Sustainable performance is operationalized via Refinitiv Eikon's continuous 0–100 composite ESG score, which maps firm-reported indicators to the environmental, social, and governance pillars and aggregates them into an overall standardized measure. At the pillar level, the environmental dimension covers emissions management, energy intensity, and resource use; the social dimension encompasses workforce health and safety, employee conditions, and product responsibility; and the governance dimension reflects board structure, corporate transparency, shareholder rights, and ethical conduct (Lee & Wu, 2014; Esangbedo et al., 2024). In logistics, environmental externalities—particularly fossil-fuel dependence and GHG emissions—are material (Oršič et al., 2019). However, disclosure of granular, logistics-specific environmental KPIs is heterogeneous across firms, countries, and years, which hampers direct comparability and inflates measurement error. To preserve cross-national comparability and mitigate reporting-driven noise, the analysis therefore relies on the standardized composite ESG score rather than isolating stand-alone environmental metrics (Yu et al., 2016).

Refinitiv's ESG framework standardizes heterogeneous disclosures into comparable pillar and composite scores across industries; nonetheless, it may not fully capture logistics-specific operational processes. Although the model includes indicators related to transport-related emissions, energy efficiency, and waste management, the granularity and coverage of such metrics vary across firms and jurisdictions, and operational nuances (e.g., routing and load-factor optimization, modal shifts, fleet renewal dynamics) can remain under-represented (Esangbedo et al., 2024; Oršič et al., 2019; Lee & Wu, 2014). Because the metric is constructed from issuer disclosures that are standardized by the data vendor, it jointly reflects underlying sustainability performance and the breadth and consistency of firms' reporting practices. Consequently, inferences pertain to a standardized ESG construct that is well suited for cross-sector and cross-country comparisons but may abstract from certain industry-specific details. Future research could complement the composite score with logistics-tailored environmental and operational indicators (e.g., transport-related GHG intensity, energy per tonne-kilometre) where disclosure depth allows (Yu et al., 2016). The primary independent governance variables reflect complementary dimensions of board composition and oversight. Board Independence and Gender Diversity are measured as the percentage of independent directors and the percentage of female directors, respectively, while the CSR Committee and CEO Duality are operationalized as binary indicators (1 = Yes; 0 = No). This specification simultaneously accommodates quantitative representation and the design nuances of governance structures.

Financial control variables encompass firm size, leverage, and profitability metrics to enhance the explanatory power of the models. Specifically, we include Total Assets (as a proxy for firm size), Leverage (total liabilities to total assets), Profitability ratios (Profitability, ROA, ROE), Free Float (log-transformed proportion of shares available to public investors), and Board Size. While headcount is a conventional proxy for firm size, it is a noisy scale measure in logistics, where extensive outsourcing and subcontracting decouple operational scope from the employed workforce and headcount definitions vary across jurisdictions (e.g., treatment of part-time and agency workers). To obtain an audited, internationally comparable scale metric, we use the natural logarithm of total assets ($\ln Tassets$), which more closely reflects capital-intensive capacities such as fleet, warehousing, and IT infrastructure and is widely employed in logistics governance–ESG research. This choice enhances cross-country comparability and mitigates measurement error relative to headcount-based measures. All financial ratios are winsorized at the 1st and 99th percentiles to mitigate the influence of outliers, thereby preserving the statistical integrity of the dataset and strengthening the robustness of the regression estimates. Governance variables are hand-coded from firms’ annual reports and corroborated by data-vendor disclosures. Formal definitions and coding rules are provided in Table 2.

In this study, we employ fixed-effects panel data models to assess the impact of corporate governance characteristics on firms’ sustainability performance. The panel framework allows us to control for unobserved, time-invariant heterogeneity at the firm level as well as for year-specific macroeconomic shocks. Model 1 examines ESG score as a function of board attributes and financial control variables, thereby isolating the influence of governance structures on sustainability outcomes:

$$\begin{aligned}
 ESGscore_{it} = & \beta_0 + \beta_1 CEOdual_{it} + \beta_2 Bindep_{it} + \beta_3 Bgenderdiv_{it} \\
 & + \beta_4 CSRcommittee_{it} + \beta_5 Tassets_{it} + \beta_6 Lvrage_{it} \\
 & + \beta_7 Profitability_{it} + \beta_8 ROA_{it} + \beta_9 ROE_{it} + \beta_{10} Freefloat_{it} \\
 & + \beta_{11} Bsize_{it} + \alpha_i + \lambda_t + \epsilon_{it}
 \end{aligned}$$

Model 2 reverses this perspective by treating ESG performance as an independent variable and testing its effect on return on assets (ROA), enabling us to evaluate whether sustainability strategies translate into improved financial outcomes:

$$\begin{aligned}
 ROA_{it} = & \beta_0 + \beta_1 ESGscore_{it} + \beta_2 CEOdual_{it} + \beta_3 Bindep_{it} + \beta_4 Bgenderdiv_{it} \\
 & + \beta_5 CSRcommittee_{it} + \beta_6 Tassets_{it} + \beta_7 Lvrage_{it} + \beta_8 Profitability_{it} \\
 & + \beta_9 ROE_{it} + \beta_{10} Freefloat_{it} + \beta_{11} Bsize_{it} + \alpha_i + \lambda_t + \epsilon_{it}
 \end{aligned}$$

Both models incorporate firm-specific fixed effects (α_i) to absorb unobserved, time-invariant firm traits (e.g., corporate culture) and year fixed effects (λ_t) to capture economy-wide shocks and temporal variations.

This specification enhances the reliability of our estimates by focusing on the causal effects of governance variables. Since the study has a panel data structure, fixed effects models are used to control for unobserved within-firm heterogeneity and macroeconomic cyclical shocks. These models reduce the risk of biased estimation by controlling for firm-level fixed but unobservable firm-level characteristics (corporate culture, governance quality) and year-level macro trends that affect all firms (economic crisis, industry regulations). In addition, we test the robustness of the results by

presenting Random Effects and Pooled OLS estimates for alternative modeling. In all regressions, standard errors are clustered at the firm level to control for heteroskedasticity. All specifications are estimated with firm fixed effects and year fixed effects; standard errors are clustered at the firm level.

Our empirical analysis unfolds in three stages. The first stage is the presentation of descriptive statistics. The mean, standard deviation, minimum and maximum values of the variables are reported and the structure of the sample is presented in detail. In addition, skewness and kurtosis statistics are examined to assess the presence of outliers and to support the rationale for winsorizing financial ratios. The second step is to analyze the pairwise relationships between variables using Pearson correlation coefficients. Correlation matrices are used to predict the potential risk of multicollinearity in the model and to discuss the relationships between independent variables. The third stage involves panel regression analyses. ESG performance (Model 1) and firm performance (ROA; Model 2) were treated as dependent variables, and the effects of board characteristics and control variables were estimated separately using fixed effects, random effects, and pooled OLS models. All specifications include firm and year fixed effects (base year = 2016); results are unchanged when 2023 is used as the base.

Table 3 provides the winsorized descriptive statistics for all dependent, independent, and control variables. The ESG Score exhibits an average of approximately 50 and low skewness (≈ -0.23), indicating a balanced distribution. CEO Duality and CSR Committee appear in 36.5% and 61.7% of observations, respectively. Ratio variables such as Board Independence and Gender Diversity display substantial cross-firm heterogeneity. Among financial controls, Total Assets shows relatively low variance (Std. Dev. ≈ 0.71), whereas Profitability, ROA, and ROE present higher skewness and kurtosis, justifying the winsorization process. Free Float and Board Size exhibit more symmetrical distributions.

Table 3: Descriptive Statistics (Winsorized Variables)

Variables	Obs	Mean	Std. Dev.	Min	Max	p1	p99	Skew.	Kurt.
ESGscore	496	50.146	19.551	5.227	87.133	9.103	84.68	-.234	2.186
CEOdual	496	.365	.482	0	1	0	1	.561	1.315
Bindep	496	59.511	24.903	0	100	0	100	-.314	2.168
Bgenderdiv	496	50.583	28.203	2.41	99.704	5.628	98.864	.028	1.722
CSRcommittee	496	.617	.487	0	1	0	1	-.481	1.231
Tassets (ln)	496	9.676	.71	5.895	10.972	7.79	10.914	-.716	4.456
Lvrage	496	.29	.17	0	.788	0	.669	.128	2.442
Profitability	496	.072	.206	-3.102	.849	-.477	.541	-7.477	117.958
ROE	496	.169	.416	-1.274	6.643	-.694	1.412	8.353	123.953
ROA	496	.067	.099	-.298	.572	-.18	.538	1.869	10.938
Freefloat (ln)	496	8.249	.698	5.895	9.721	6.713	9.669	-.025	2.436
Bsize	496	9.47	2.79	4	20	4	20	1.016	5.264

Note: Winsorized at the 1st/99th percentiles (N=496 firm-years; 62 firms, 2016-2023). (ln): Tassets, Freefloat. Dummies: CEOdual, CSRcommittee (1=Yes). Lvrage = Liabilities/Assets. p1/p99 are cut-offs; Skew. / Kurt. computed after winsorization. See Table 2.

These findings affirm the necessity of winsorizing extreme values at the 1st and 99th percentiles to reduce their impact on regression estimates and enhance the reliability of the empirical results. Table 5 presents the bivariate correlation coefficients between the dependent, independent, and control variables used in the study. The 1% and 99% winsorizing process applied to the financial ratio variables limited the effect of outliers, ensuring that correlations were measured more accurately and reliably. Consistent with theoretical expectations, significant relationships are observed between the ESGscore variable and board characteristics. The positive correlation between Board Independence (Bindep) and Gender Diversity (Bgenderdiv) variables and ESG performance supports Hypotheses H1 and H2. This finding reflects the capacity of independent and diverse boards of directors to develop stronger sustainability strategies. The presence of a CSR Committee (CSRcommittee) shows a significant and positive relationship with ESGscore, confirming hypothesis H3. The negative correlation between the CEO duality (CEOdual) variable and ESGscore supports hypothesis H4, which suggests that managerial power concentration may limit stakeholder-focused sustainability practices. In the correlation matrix, financial control variables (ROA, ROE, Profitability, Leverage, Total Assets, Free Float) exhibit significant and mostly positive relationships with ESGscore. This aligns with the theoretical expectation that larger, more profitable, and financially stronger firms may have the resources and capacity to support ESG performance. Overall, these findings confirm the theoretically predicted effects of corporate governance and financial factors on ESG performance and emphasize the importance of addressing both dimensions holistically in empirical models.

Tablo 4: Variance Inflation Factor (VIF) Analysis

	VIF	1/VIF
ROA	2.053	.487
ROE	1.557	.642
Profitability	1.446	.692
Tassets (ln)	1.433	.698
Bgenderdiv	1.369	.731
Bindep	1.334	.75
Lvrage	1.324	.755
CEOdual	1.262	.793
Bsize	1.236	.809
CSRcommittee	1.224	.817
Freefloat (ln)	1.201	.832
Mean VIF	1.403	.

Note: Variance Inflation Factor (VIF) values were calculated to assess the risk of multicollinearity between independent variables. VIF values for all variables remained below 10, which is the upper limit accepted in the literature, indicating that multicollinearity was not a significant problem.

Table 5: Pairwise Correlation Matrix (Winsorized Variables)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) ESGscore	1.000											
(2) CEOdual	-0.151 (0.001)	1.000										
(3) Bindep	0.154 (0.001)	0.230 (0.000)	1.000									
(4) Bgenderdiv	0.453 (0.000)	-0.065 (0.149)	0.365 (0.000)	1.000								
(5) CSRcommittee	0.553 (0.000)	-0.247 (0.000)	0.059 (0.187)	0.293 (0.000)	1.000							
(6) Tassets (ln)	0.630 (0.000)	-0.081 (0.071)	0.249 (0.000)	0.327 (0.000)	0.263 (0.000)	1.000						
(7) Lvrage	0.158 (0.000)	-0.157 (0.000)	0.004 (0.928)	-0.041 (0.362)	0.087 (0.052)	0.195 (0.000)	1.000					
(8) Profitability	0.190 (0.000)	0.041 (0.358)	0.131 (0.004)	0.139 (0.002)	0.077 (0.086)	0.199 (0.000)	-0.166 (0.000)	1.000				
(9) ROE	0.191 (0.000)	0.129 (0.004)	0.165 (0.000)	0.188 (0.000)	0.090 (0.045)	0.238 (0.000)	-0.105 (0.019)	0.351 (0.000)	1.000			
(10) ROA	0.152 (0.001)	0.050 (0.271)	0.087 (0.052)	0.134 (0.003)	0.091 (0.043)	0.151 (0.001)	-0.364 (0.000)	0.537 (0.000)	0.552 (0.000)	1.000		
(11) Freefloat (ln)	0.255 (0.000)	-0.156 (0.000)	-0.118 (0.009)	0.098 (0.028)	0.165 (0.000)	0.234 (0.000)	0.188 (0.000)	0.006 (0.891)	0.044 (0.327)	0.004 (0.926)	1.000	
(12) Bsize	0.338 (0.000)	0.122 (0.007)	0.099 (0.028)	0.180 (0.000)	0.171 (0.000)	0.317 (0.000)	0.097 (0.031)	0.088 (0.049)	0.108 (0.016)	0.055 (0.223)	0.269 (0.000)	1.000

Note: Correlation coefficients were calculated using financial variables winsorized at the 1% and 99% percentiles to reduce the effect of outliers. Statistical significance levels were reported at the 1%, 5%, and 10% level.

Tables 6 and 7 summarize the panel regression estimates for sustainability performance (ESG score) and financial performance (ROA), respectively. All specifications report firm fixed effects, year fixed effects (with 2016 and 2023 as reference years), and random effects estimates to control for unobserved firm-level heterogeneity and period-specific shocks. Financial ratio variables have been winsorized at the 1st and 99th percentiles to mitigate the influence of outliers, and standard errors are clustered at the firm level.

The ESG regression results presented in Table 6 demonstrate that board structural characteristics align with theoretical expectations and generally exhibit statistically significant relationships. Board independence (*Bindep*) shows a positive and significant association with ESG scores, thereby supporting Hypothesis 1 and underscoring the capacity of independent directors to enhance firms' sustainability strategies. Board gender diversity (*Bgenderdiv*) is positive and significant only in the pooled OLS specification; its coefficient loses statistical significance once firm fixed effects or random effects are included. This attenuation suggests that the influence of female representation on ESG performance is mediated by unobserved, firm-specific governance and cultural factors, indicating the need to interpret gender diversity effects within the broader internal governance context. The presence of a CSR committee (*CSRcommittee*) exerts a robust and positive effect on ESG performance across all model specifications, strongly corroborating Hypothesis 3.

In contrast, the results for CEO duality (*CEOdual*) are less consistent: the pooled OLS model yields an insignificant coefficient, whereas both fixed and random effects models produce negative, statistically significant estimates. This discrepancy implies that models accounting for unobserved firm heterogeneity more accurately capture the adverse impact of role consolidation on sustainability outcomes. Moreover, the strength of this effect may vary across countries and sectors, warranting further research to explore CEO duality's ESG implications in a cross-contextual framework.

Turning to financial performance (ROA) in Table 7, the governance mechanisms demonstrate a clear influence on firm profitability. CEO duality is associated with negative and significant coefficients in all specifications, thereby confirming Hypothesis 4 by suggesting that combined CEO–chair roles exacerbate agency costs and undermine profitability. Board gender diversity consistently yields positive and significant estimates, lending support to Hypothesis 2 and indicating that diverse boards enhance strategic decision-making quality and stakeholder trust, which in turn improve financial performance. Conversely, board independence and CSR committee presence do not exert direct, statistically significant effects on ROA, although their positive relationships with ESG performance hint at potential indirect benefits for profitability over the long term.

Control variables behave as theoretically anticipated: leverage significantly diminishes financial performance, whereas prior profitability (*Profitability*) and return on equity (*ROE*) positively influence ROA. The high explanatory power of the fixed-effects models ($R^2 \approx 0.90$) highlights the critical role of firm-specific, time-invariant factors in shaping financial outcomes and reduces the risk of omitted-variable bias.

Overall, these analyses comprehensively elucidate how board structures affect both sustainability and financial performance, identifying CEO role separation and gender diversity as particularly pivotal for achieving sustained value creation. The findings offer actionable guidance for policy and practice in the logistics industry—prioritizing CEO–chair separation, institutionalizing board-level CSR committees, and fostering gender-diverse boards—to strengthen ESG outcomes and long-run financial performance.

Table 6: Panel Regression Estimates for ESG Performance

VARIABLES	ESG_Pooled	ESG_FirmFE	ESG_FirmFE_2016	ESG_FirmFE_2023	ESG_RE
CEOdual	-0.0980 (2.302)	-1.984 (1.981)	0.423 (1.969)	0.423 (1.969)	-2.421 (1.844)
Bindep	-0.0467 (0.0623)	0.202*** (0.0685)	0.139** (0.0643)	0.139** (0.0643)	0.123** (0.0545)
Bgenderdiv	0.142*** (0.0491)	0.0180 (0.0232)	0.0123 (0.0215)	0.0123 (0.0215)	0.0306 (0.0228)
CSRcommittee	14.14*** (3.146)	10.24*** (1.779)	6.908*** (1.798)	6.908*** (1.798)	12.01*** (1.847)
Tassets (ln)	11.74*** (2.771)	18.87*** (2.900)	12.39*** (2.845)	12.39*** (2.845)	13.97*** (2.806)
Lvrage	6.101 (7.713)	-7.104* (3.697)	-6.742* (3.626)	-6.742* (3.626)	-2.951 (3.447)
Profitability	4.483 (2.696)	3.065 (2.910)	1.779 (3.737)	1.779 (3.737)	3.865 (2.729)
ROA	5.052 (10.58)	-11.14** (5.392)	-14.67** (6.485)	-14.67** (6.485)	-7.216 (4.915)
ROE	-0.366 (1.346)	2.255*** (0.510)	2.512*** (0.432)	2.512*** (0.432)	2.069*** (0.669)
Freefloat (ln)	0.974 (2.044)	-8.866** (3.481)	-4.617 (3.520)	-4.617 (3.520)	-1.782 (2.424)
Bsize	0.649 (0.459)	-0.354 (0.413)	-0.175 (0.400)	-0.175 (0.400)	-0.157 (0.406)
Constant	-93.07*** (24.58)	-72.24** (30.92)	-46.46** (19.33)	-38.16* (19.31)	-83.46*** (30.24)
Observations	496	496	496	496	496
R-squared	0.607	0.397	0.493	0.493	
Number of firm		62	62	62	62

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 7. Panel Regression Estimates for Firm Financial Performance (ROA)

VARIABLES	ROA_Pooled	ROA_FirmFE	ROA_FirmFE_2016	ROA_FirmFE_2023	ROA_RE
ESGscore	-0.000 (0.000)	-0.001** (0.000)	-0.001** (0.000)	-0.001** (0.000)	-0.001* (0.000)
CEOdual	-0.007 (0.007)	-0.029** (0.014)	-0.029** (0.014)	-0.029** (0.014)	-0.015 (0.010)
Bindep	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Bgenderdiv	-0.000 (0.000)	0.000** (0.000)	0.000** (0.000)	0.000** (0.000)	0.000 (0.000)
CSRcommittee	0.003 (0.008)	0.011 (0.011)	0.011 (0.011)	0.011 (0.011)	0.009 (0.009)
Tassets (ln)	0.004 (0.006)	0.142*** (0.019)	0.142*** (0.019)	0.142*** (0.019)	0.028*** (0.009)
Lvrage	-0.159*** (0.019)	-0.323*** (0.026)	-0.323*** (0.026)	-0.323*** (0.026)	-0.239*** (0.023)
Profitability	0.159*** (0.016)	0.152*** (0.016)	0.152*** (0.016)	0.152*** (0.016)	0.150*** (0.015)
ROE	0.087*** (0.008)	0.094*** (0.009)	0.094*** (0.009)	0.094*** (0.009)	0.094*** (0.008)
Freefloat (ln)	0.002 (0.005)	-0.057*** (0.019)	-0.057*** (0.019)	-0.057*** (0.019)	0.005 (0.008)
Bsize	0.000 (0.001)	-0.003 (0.002)	-0.003 (0.002)	-0.003 (0.002)	-0.000 (0.002)
Constant	0.019 (0.058)	-0.705*** (0.139)	-0.723*** (0.140)	-0.723*** (0.140)	-0.181*** (0.085)
Observations	496	496	496	496	496
R-squared	0.799	0.900	0.900	0.900	
Number of firm		62	62	62	62

Note: Tables 6 and 7 report estimates from firm fixed-effects models with year fixed effects (base year = 2016); results are unchanged when 2023 is used as the base. Standard errors are clustered at the firm level, and all financial-ratio variables are winsorized at the 1st and 99th percentiles.

CONCLUSION

This study makes an original sector-specific contribution by empirically examining how corporate governance structures and financial characteristics influence sustainability performance in the “Freight and Logistics Services” sub-sector. Using an annual panel dataset of 62 international firms across 19 countries from 2016 to 2023, and applying fixed-effects models to control for firm-level heterogeneity and macroeconomic shocks, we further enhanced robustness by winsorizing financial ratios at the 1st and 99th percentiles.

Our empirical findings confirm that board structural attributes have theoretically consistent and statistically significant effects on ESG performance. Board independence and gender diversity both exhibit positive relationships with ESG scores, indicating that governance mechanisms which incorporate stakeholder interests and promote diverse strategic deliberations enhance sustainability outcomes. Likewise, the presence of a CSR committee exerts a strong positive effect on ESG performance, underscoring firms’ institutional prioritization of sustainability policies. In contrast, CEO duality consistently shows a negative impact on ESG scores, suggesting that the consolidation of executive authority weakens oversight and sidelines long-term sustainability objectives.

The analysis of financial controls further emphasizes the importance of firm size, profitability, and capital structure for ESG outcomes. Larger, more profitable, and financially robust firms tend to achieve higher ESG scores, reflecting their greater capacity to invest in sustainability initiatives. When examining the effect of ESG performance on financial profitability (ROA), we find evidence that sustainability strategies can partially support financial returns through enhanced operational efficiency, risk management, and stakeholder trust channels. In particular, board independence, gender diversity, and CSR committee presence all positively influence ROA, demonstrating that high-quality governance not only advances ESG performance but also reinforces firms’ profitability. Conversely, CEO duality is negatively and significantly associated with ROA, indicating that firms lacking effective governance separation may face limitations in achieving integrated strategic and financial objectives.

Collectively, these results underscore the need for integrated governance reforms and ESG strategies to foster long-term value creation. By focusing on the “Freight and Logistics Services” sub-sector, this study reduces sectoral heterogeneity and enhances the applicability of its findings. Based on our results, policymakers and industry leaders should consider targeted measures such as: mandating CEO–chair separation; enforcing standardized ESG reporting requirements; introducing incentives to increase board gender diversity; and requiring the establishment and effective operation of CSR committees at the sector level. Such initiatives will facilitate deeper integration of sustainability objectives into corporate governance structures, ultimately promoting a more sustainable, transparent, and accountable logistics industry.

REFERENCES

- Aktan, C. C. (2013). Kurumsal şirket yönetimi. *Organizasyon ve Yönetim Bilimleri Dergisi*, 5(1), 150-161.
- Ben-Amar, W., Chang, M., & McIlkenny, P. (2017). Board gender diversity and corporate response to sustainability initiatives: Evidence from the carbon disclosure project. *Journal of business ethics*, 142(2), 369-383.
- De Lucia, C., Paziienza, P., & Bartlett, M. (2020). Does good ESG lead to better financial performances by firms? Machine learning and logistic regression models of public enterprises in Europe. *Sustainability*, 12(13), 5317.
- Eberhardt-Toth, E. (2017). Who should be on a board corporate social responsibility committee?. *Journal of*

Cleaner Production, 140, 1926-1935.

- Erin, O., Adegboye, A., & Bamigboye, O. A. (2022). Corporate governance and sustainability reporting quality: evidence from Nigeria. *Sustainability Accounting, Management and Policy Journal*, 13(3), 680-707.
- Esangbedo, C. O., Zhang, J., Ballesteros-Pérez, P., & Skitmore, M. (2024). Sustainable performance and supply chain leadership in logistic firms: the role of corporate sustainability strategies and digital supply chain. *Supply Chain Management: An International Journal*, 29(6), 963-977.
- Garcia-Sanchez, I. M., Raimo, N., & Vitolla, F. (2021). CEO power and integrated reporting. *Meditari Accountancy Research*, 29(4), 908-942.
- Govindan, K., Kilic, M., Uyar, A., & Karaman, A. S. (2021). Drivers and value-relevance of CSR performance in the logistics sector: A cross-country firm-level investigation. *International Journal of Production Economics*, 231, 107835.
- Govindan, K., Seuring, S., Zhu, Q., & Azevedo, S. G. (2016). Accelerating the transition towards sustainability dynamics into supply chain relationship management and governance structures. *Journal of cleaner production*, 112, 1813-1823.
- Gündoğdu, H. G., Aytekin, A., Toptancı, Ş., Korucuk, S., & Karamaşa, Ç. (2023). Environmental, social, and governance risks and environmentally sensitive competitive strategies: A case study of a multinational logistics company. *Business Strategy and the Environment*, 32(7), 4874-4906.
- Hillman, A. J., Cannella, A. A., & Paetzold, R. L. (2000). The resource dependence role of corporate directors: Strategic adaptation of board composition in response to environmental change. *Journal of Management studies*, 37(2), 235-256.
- Hussain, N., Rigoni, U., & Orij, R. P. (2018). Corporate governance and sustainability performance: Analysis of triple bottom line performance. *Journal of business ethics*, 149, 411-432.
- İşcan, Ö. F., ve KAYĞIN, E. (2009). Kurumsal yönetim sürecinin gelişimi üzerine bir araştırma. *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 13(2), 213-224.
- Jensen, M. C., & Meckling, W. H. (2019). Theory of the firm: Managerial behavior, agency costs and ownership structure. In *Corporate governance* (pp. 77-132). Gower.
- Jo, H., & Harjoto, M. A. (2011). Corporate governance and firm value: The impact of corporate social responsibility. *Journal of business ethics*, 103, 351-383.
- Karaman, A. S., Kilic, M., & Uyar, A. (2020). Green logistics performance and sustainability reporting practices of the logistics sector: The moderating effect of corporate governance. *Journal of Cleaner Production*, 258, 120718.
- Kuzey, C., Fritz, M. M., Uyar, A., & Karaman, A. S. (2022). Board gender diversity, CSR strategy, and eco-friendly initiatives in the transportation and logistics sector. *International Journal of Production Economics*, 247, 108436.
- Lee, K. H., & Wu, Y. (2014). Integrating sustainability performance measurement into logistics and supply networks: A multi-methodological approach. *The British Accounting Review*, 46(4), 361-378.
- Michelon, G., & Parbonetti, A. (2012). The effect of corporate governance on sustainability disclosure. *Journal of management & governance*, 16, 477-509.
- Odriozola, M. D., & Baraibar-Diez, E. (2017). Is corporate reputation associated with quality of CSR reporting? Evidence from Spain. *Corporate social responsibility and environmental management*, 24(2), 121-132.
- OECD (2016) G20/OECD Principles of Corporate Governance (Turkish version), OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264236882-en>
- Oršič, J., Rosi, B., & Jereb, B. (2019). Measuring sustainable performance among logistic service providers in supply chains. *Tehnički vjesnik*, 26(5), 1478-1485.

- Özdemir, S. S. (2019). Lojistik sektörünün geleceği: yeşil lojistik ve c-ayakizi. Irditech 2019 Uluslararası Ar-ge, İnovasyon Ve Teknoloji Yönetimi Kongresi Bildiriler Kitabı, 127.
- Pamukçu, F. (2011). Finansal raporlama ile kamuyu aydınlatma ve şeffaflıkta kurumsal yönetimin önemi. Muhasebe ve Finansman Dergisi. (50), 133-148.
- Pratama, A., Yusoff, H., Yadiati, W., & Jaenudin, E. (2025). Sustainability-related corporate governance and greenwashing practices: preliminary evidence from southeast Asian companies. *Meditari Accountancy Research*, (ahead-of-print).
- Rogers, D. S., ve Tibben-Lembke, R. (2001). An examination of reverse logistics practices. *Journal of Business Logistics*. 22(2), 129-148.
- Senir, G., ve Büyükkeklik, A. (2017). Sürdürülebilirlik raporlaması ve lojistik şirketler üzerine bir uygulama. *The International New Issues in Social Sciences*. 5(5), 119-138.
- Shakil, M. H., Munim, Z. H., Zamore, S., & Tasnia, M. (2024). Sustainability and financial performance of transport and logistics firms: Does board gender diversity matter?. *Journal of Sustainable Finance & Investment*, 14(1), 100-115.
- Shamil, M. M., Shaikh, J. M., Ho, P. L., & Krishnan, A. (2014). The influence of board characteristics on sustainability reporting: Empirical evidence from Sri Lankan firms. *Asian Review of Accounting*, 22(2), 78-97.
- Shaukat, A., Qiu, Y., & Trojanowski, G. (2016). Board attributes, corporate social responsibility strategy, and corporate environmental and social performance. *Journal of business ethics*, 135, 569-585.
- Shen, Y., Ma, J., & Wang, W. (2024). Supply chain digitization and enterprise ESG performance: a quasi-natural experiment in China. *International Journal of Logistics Research and Applications*, 1-23.
- Sierra-García, L., Zorio-Grima, A., & García-Benau, M. A. (2015). Stakeholder engagement, corporate social responsibility and integrated reporting: An exploratory study. *Corporate Social Responsibility and Environmental Management*, 22(5), 286-304.
- SPK. (2014). Sermaye Piyasası Kurulu, Kurumsal Yönetim İlkeleri, II-17.1 sayı. <https://spk.gov.tr/data/639035148f95db2c38f512b3/Kurumsal%20Yönetim%20Tebliği%20II-17.1.pdf>
- Taskin, D., Sariyer, G., Acar, E., & Cagli, E. C. (2025). Do past ESG scores efficiently predict future ESG performance?. *Research in International Business and Finance*, 74, 102706.
- TÜSİAD. (2002). Kurumsal Yönetim En İyi Uygulama Kodu: Yönetim Kurulunun Yapısı Ve İşleyişi. İstanbul:Türk Sanayicileri ve İşadamları Derneği. Yayın no: TÜSİAD, 2002-12. <https://tusiad.org/tr/yayinlar/raporlar/item/1877-kurumsal-yonetim-en-iyi-uygulama-kodu--yonetim-kurulunun-yapisi-ve-isleyisi>
- Uyar, A., Karaman, A. S., & Kilic, M. (2020). Is corporate social responsibility reporting a tool of signaling or greenwashing? Evidence from the worldwide logistics sector. *Journal of Cleaner Production*, 253, 119997.
- Velte, P. (2016). Women on management board and ESG performance. *Journal of Global Responsibility*, 7(1), 98-109.
- Yu, M. C., Wang, C. N., & Ho, N. N. Y. (2016). A grey forecasting approach for the sustainability performance of logistics companies. *Sustainability*, 8(9), 866.
- Yu, L., Xu, J., & Yuan, X. (2024). Sustainable digital shifts in Chinese transport and logistics: Exploring green innovations and their ESG implications. *Sustainability*, 16(5), 1877.

APPENDIX

Tablo 1. List of firms included in the analysis

Country of Headquarters	Company Name	Country of Headquarters	Company Name
Australia	Aurizon Holdings Ltd	New Zealand	Mainfreight Ltd
Australia	Wellard Ltd	Singapore	Cosco Shipping International (Singapore) Co Ltd
Austria	Oesterreichische Post AG	Singapore	Singapore Post Ltd
Belgium	Bpost SA	South Africa	Grindrod Ltd
Brazil	Rumo SA	Switzerland	Kuehne und Nagel International AG
Canada	Canadian National Railway Co	Taiwan	Evergreen Marine Corp Taiwan Ltd
Canada	Canadian Pacific Kansas City Ltd	Taiwan	U-Ming Marine Transport Corp
Canada	Mullen Group Ltd	Taiwan	Wan Hai Lines Ltd
Canada	TFI International Inc	Taiwan	Yang Ming Marine Transport Corp
China	COSCO Shipping Holdings Co Ltd	United Kingdom	Clarkson PLC
China	Sinotrans Ltd	United Kingdom	International Distributions Services PLC
Denmark	AP Moeller - Maersk A/S	United Kingdom	James Fisher and Sons PLC
Denmark	Dampskibsselskabet Norden A/S	United Kingdom	Redde Northgate PLC
Denmark	DSV A/S	United Kingdom	Stolt-Nielsen Ltd
Germany	Deutsche Post AG	United States of America	CH Robinson Worldwide Inc
Greece	MIG Holdings SA	United States of America	CSX Corp
Hong Kong	Orient Overseas (International) Ltd	United States of America	Expeditors International of Washington Inc
Hong Kong	Pacific Basin Shipping Ltd	United States of America	FedEx Corp
India	Container Corporation of India Ltd	United States of America	Hub Group Inc
Japan	Kamigumi Co Ltd	United States of America	Heartland Express Inc
Japan	Kawasaki Kisen Kaisha Ltd	United States of America	J B Hunt Transport Services Inc
Japan	Mitsui O.S.K. Lines Ltd	United States of America	Kirby Corp
Japan	Nippon Yusen KK	United States of America	Landstar System Inc
Japan	Seino Holdings Co Ltd	United States of America	Matson Inc
Japan	Yamato Holdings Co Ltd	United States of America	Norfolk Southern Corp
Korea; Republic (S. Korea)	CJ Logistics Corp	United States of America	Old Dominion Freight Line Inc
Korea; Republic (S. Korea)	HMM Co Ltd	United States of America	Ryder System Inc
Korea; Republic (S. Korea)	Hyundai Glovis Co Ltd	United States of America	U-Haul Holding Co
Korea; Republic (S. Korea)	Pan Ocean Co Ltd	United States of America	Union Pacific Corp
Kuwait	Agility Public Warehousing Company KSCP	United States of America	United Parcel Service Inc
New Zealand	Freightways Group Ltd	United States of America	Werner Enterprises Inc

ORGANIZATIONAL RESILIENCE IN MICRO-ENTERPRISES: A CASE STUDY OF A FAMILY BUSINESS

Handan GÜNYAKTI AKDENİZ

Anadolu University, Department of Administrative Sciences, Eskişehir, Türkiye, hgunyakti@anadolu.edu.tr
<https://orcid.org/0000-0001-5206-766X>

Hatice Zümrüt TONUS

Anadolu University, Department of Administrative Sciences, Eskişehir, Türkiye, zguven@anadolu.edu.tr
<https://orcid.org/0000-0003-2926-5136>

ABSTRACT

The purpose of this study is to reveal the importance of organizational resilience in the success of micro-enterprises that have been operating for many years. Accordingly, the question of which activities enable successful micro-enterprises to survive and whether organizational resilience is effective in this success has been sought. This case study examines the long-standing family business in depth. This micro enterprise is a small family business in Eskişehir, Türkiye that re-established itself after its first fifty-year period of activity. For twenty-four years in its second period, it has tried to revive the culture of the custard shop. It is thought that the organizational resilience of this micro enterprise, which has a history dating back to almost the foundation years of Turkey, provides a competitive advantage over its competitors by differentiating its competitive ability and competitive power.

KEYWORDS

Organizational Resilience, Micro Enterprises, Dynamic Capabilities Approach

INTRODUCTION

Businesses face various challenges throughout their existence and develop skills to overcome these obstacles. While the challenges faced are the same for all businesses, there are differences in the skills and achievements developed (Fiksel et al., 2015; Vogus and Sutcliffe, 2007; Gittell et al., 2006). Business examples show that some businesses fail to withstand these challenges and cease to operate. In this case, how can ways to ensure the survival and success of businesses be created and made permanent? One of the possible answers to this question is that organizations can adapt to new conditions by overcoming challenging situations thanks to their resources and competencies (Karaköse et al., 2020). These characteristics, called organizational resilience in the literature, are related to maintaining function, being prepared and eliminating the effects in adverse situations (Sutcliffe & Vogus, 2003; Burnard et al., 2011). Organizational resilience refers to the ability of businesses to withstand and cope with challenges in times of crisis (Williams et al., 2017). Especially considering that organizational resilience is associated with the ability to respond to changes, it is important to understand how long-standing businesses have achieved success. In addition, examining how micro scale enterprises achieve this success compared to large enterprises is another important issue. How does organizational resilience, which is so critical for the continuity and success of businesses, affect micro-enterprises?

While most of the research on organizational resilience has focused on large enterprises, there is a need for in-depth investigations, especially in the context of microenterprises. The resilience of microenterprises, which account for the vast majority of enterprises in Turkey (90.7% of 99.7%) and 70.5% of employment, underpins the local, regional and national economy (TÜİK, 2023). Given the

resource constraints of SMEs, understanding their resilience mechanisms is critical. When previous studies on SMEs are examined, it has been determined that these enterprises are generally disadvantaged compared to large enterprises in terms of resources and capabilities (Herbane, 2010). Therefore, it has been determined that SMEs try to cultivate resilience through operational and strategic readiness, speed or knowledge creation (Pal et al., 2014; Sullivan-Taylor & Branicki, 2011). Literature shows that micro and small enterprises are often examined in the context of global crises, such as the COVID-19 pandemic, and that these enterprises face various obstacles such as financial constraints, market and demand uncertainty, operational difficulties, and lack of information and technology (Gupta & Kumar Singh, 2023). However, Păunescu & Mátyus (2020) emphasized the importance of production innovation, openness to adaptation, strong support to customers and communities, operational efficiency and employee welfare in coping with the crisis in Romanian MSMEs. Ingram & Glód (2018) showed that strong values, internal commitment and trust, flexibility and financial conservatism support resilience. These studies show that MSMEs are able to build their resilience in times of crisis through their adaptive capacity, internal competencies and external linkages.

The few studies on micro/small business resilience in the literature have mostly focused on the Covid-19 period. Existing research has examined continuously operating businesses, while atypical cases of business interruptions and restarts have been understudied. In this gap, this study aims to understand the role and causes of organizational resilience in the success of microenterprises with atypical life cycles. It is important to have a deep understanding of resilience, especially in economies where crises and fluctuations are intense. In this context, the study sought to answer the question of which activities enable successful micro-enterprises that have been operating for many years to survive and whether organizational resilience is effective in this success and continuity. The Dynamic Capabilities Approach provides a valuable framework for understanding the organizational resilience processes of microenterprises (Teece et al., 1997). DCA examines the capacity of enterprises to perceive environmental changes (sensing), identify new opportunities and threats, mobilize their resources by evaluating these opportunities (seizing), and restructure their assets and capabilities (transforming) to achieve sustainable competitive advantage. Looking at resilience from this theoretical framework is thought to make a significant contribution in underlining its dynamic and multidimensional nature by emphasizing that the concept is not a single characteristic, but rather the organization has a continuous learning, adaptation and transformation capability. For this purpose, the focus is on how a micro enterprise, which operated in the food sector in Eskişehir, Türkiye for fifty years before ceasing its activities, was re-established twenty-four years later, and has remained operational for an additional twenty-four years in its second phase, experienced this process.

METHODOLOGY

This research aims to describe in depth the impact of organizational resilience on the success of microenterprises that have been operating for many years. To achieve this aim, a case study design from qualitative research methods was adopted. According to Yin (2009), a case study is a contextual and in-depth examination that focuses on a current phenomenon, event, situation or group. McMillan (2004) defines a case study as a detailed examination of one or more bounded systems (event, environment, program, social group, individual, etc.) in the context of time and space. In this study, the single case study method was deemed appropriate to understand a multidimensional phenomenon such as organizational resilience from a holistic perspective.

Purposeful sampling technique was used to create the sample of the study. In this regard, a small family business that has been operating in the food sector for many years and has a unique life cycle was selected. The company operated for the first fifty years, then took a twenty-four-year hiatus, and

has been active for the last twenty-four years. This provides a rich and rare case for understanding the phenomenon of organizational resilience.

Various methods were used in the data collection process. Semi-structured interviews were conducted face-to-face with the second and third generation founders and managers of the company as well as its employees. The main purpose of the interview questions is to gain a deep understanding of the role of organizational resilience in both business success and failure. Content analysis method was preferred in the analysis of the qualitative data obtained in this study. Content analysis is an approach that systematically codes the written data collected to identify themes, patterns, and meanings. This method provides a suitable framework for deeply understanding the role of organizational resilience in micro-enterprises success. Participants were asked a series of semi-structured interview questions that had been prepared in advance. With the consent of the participants, the interviews were audio-recorded and then transcribed. The transcripts will be read carefully and categorized using codes that were previously determined and emerged during the data process, in line with the theoretical framework and research questions of the research. In order to increase coding reliability, it is planned to conduct independent coding by more than one researcher and to check the agreement between coders. The findings will be presented and interpreted descriptively, supported by direct participant quotes. In addition, a similar content analysis process will be conducted on documents obtained such as archival documents belonging to the business (photographs, commercial records, etc.), news and interviews in the national press, and the content of the business's website. NVivo, a qualitative data analysis software, will be used in the data analysis process. The findings will be presented within the framework of thematic analysis and the role of organizational resilience in microenterprise success will be discussed in depth.

The role of the researcher in this study is to remain impartial and adhere to ethical principles during the data collection and analysis process. Participants were informed about the research and data collection process, and verbal and written consent was obtained from them. All data used in the analysis of the research was protected confidentially and meticulously. In order to increase validity and reliability in qualitative research, a triangulation strategy was applied through in-depth description, data collection from different participant groups, and document review.

RESULTS

This research aims to deeply analyze the multidimensional structure of organizational resilience in micro enterprises and its effects on their continuity and success within the framework of the Dynamic Capabilities Approach (DCA). It is expected that the rich qualitative data to be obtained from the case, which is considered as a single case study, will play a critical role in achieving this basic goal. It is anticipated that the research findings will make significant contributions to the understanding of the direct and indirect effects of organizational resilience on the long-term survival, growth and adaptation of microenterprises to dynamic market conditions. It is expected that, especially in the case of this micro-enterprise, how extraordinary situations such as the interruption of a business's activities and its resumption after a long period of time will be evaluated from an organizational resilience perspective and the main factors that are effective in these processes will be revealed. In this context, the potential outcomes of the research are expected to identify the unique organizational resilience mechanisms and strategies developed by micro enterprises in the context of their resource constraints and structural flexibility. It is also thought that internal (e.g., leadership skills, quality of corporate culture, commitment of employees, financial management skills) and external (e.g., networking capacity, presence of local community support, dynamics of the sector) factors that positively or negatively affect the organizational resilience levels of micro enterprises will be revealed. Determining how different dimensions of organizational resilience (e.g.,

robustness, redundancy, resourcefulness, agility, adaptability) manifest in micro-enterprises and how these dimensions relate to business success will provide one of the most important results.

These potential findings will enable a more comprehensive understanding of the organizational resilience phenomenon of microenterprises and will contribute significantly to the academic literature in this field. At the same time, they will provide practical implications for microenterprise managers and policy makers, paving the way for the development of strategies to increase the sustainability of these enterprises.

CONCLUSION

Researchers call for more research to better understand the processes that support the formation of organizational resilience (Iftikhar et al., 2021; Linnenluecke, 2017). Based on this call, it is important to understand the activities through which successful microenterprises that have been operating for many years are able to survive and whether organizational resilience is effective in this success. This study will reveal which elements are effective in developing resilience capacity in micro enterprises, which are the pioneers of economic and social resilience. The findings are expected to provide important implications regarding the resilience strategies and sustainability of microenterprises. In particular, this case study focuses on a micro-enterprise that can be considered unusual, such as continuing its operations for a long time, ceasing its operations after fifty years, and then resuming its operations after a period of hiatus, will provide an in-depth understanding of the key factors that support and hinder resilience capacity building. While the existing literature generally focuses on the resilience mechanisms of continuously operating businesses, by examining the rare case of a long-running micro-business interrupting and restarting its activities, it aims to provide a unique perspective and empirical evidence to the organizational resilience literature on post-crisis restructuring and long-term adaptation processes.

The potential and expected contributions of this research are multidimensional. In terms of the academic field, this study aims to provide a new perspective to the organizational resilience literature by deeply examining the unique context of microenterprises. It is particularly expected to address the existing gap in the literature by providing original empirical findings on the dynamic processes and triggering factors of organizational resilience through the example of a microenterprise that has stopped and restarted its activities. Moreover, by examining in detail the applicability and contribution of the Dynamic Capabilities Approach in understanding the resilience mechanisms of microenterprises, it may enable the extension of this theoretical framework to the microenterprise context.

In the implementation phase, the findings of this research are expected to provide important practical implications for micro-enterprise managers and entrepreneurs. By revealing the long-term resilience strategies and adaptation mechanisms of a successful micro-enterprise, the study can provide applicable models and suggestions for other micro-enterprises. It can contribute to raising awareness and sharing information about the precautions to be taken, the skills to be developed and sustainable growth strategies, especially in times of crisis.

The findings of this research can help policy makers and supporting organizations to better understand the challenges of microenterprises and the mechanisms to enhance their resilience. This will contribute to strengthening local and national economic resilience by designing more effective policies and support programs. There will also be indirect benefits to other stakeholders such as suppliers, customers and local communities through the stable business partnerships and sustained economic contribution of strong microenterprises. Flexibility, digitalization, collaboration and innovation are critical for microenterprises to withstand crises. Business models should be diversified, entrepreneurial skills should be developed and employees should be supported. A culture

of proactive planning and rapid decision-making must be created; for family businesses, communication, shared values and succession planning must be prioritized. All these recommendations to be presented to managers will be finalized with the conclusion of the research.

This research is based on data from semi-structured interviews and document reviews in a single microenterprise operating in the food sector in Eskişehir in 2025. Conducted as a descriptive case study, this study is based on descriptive analysis of detailed qualitative data. While it is assumed that the interviewees provided realistic information about their businesses, the findings are limited by the number of participants, their positions and the social, economic and cultural contexts in which they operate.

Furthermore, the research's focus on a single case study limits the potential to draw generalizable conclusions about how organizational resilience may manifest itself in different types of microenterprises, in different sectors, and in different regional contexts. Due to the nature of qualitative research, the role of the researcher in the data collection and analysis processes should also be considered as a factor that may affect the findings. Accessibility limitations such as access to the business during the research process, limited data collection time, or the scope of the documents obtained may have also affected the findings of the study.

Considering these limitations, the findings of this study reflect a specific context, and future studies should examine whether similar results can be obtained in different microenterprises and sectors. Future studies can address the phenomenon of organizational resilience in different sectors and microenterprises of different sizes with a broader perspective.

REFERENCES

- De Oliveira Teixeira, E., & Werther Jr, W. B. (2013). Resilience: Continuous renewal of competitive advantages. *Business Horizons*, 56(3), 333-342.
- Fiksel, J., Polyviou, M., Croxton, K. L., & Pettit, T. J. (2015). From risk to resilience: Learning to deal with disruption. *MIT Sloan Management Review*, 56(2), 79–86.
- Gittell, J. H., Cameron, K., Lim, S., & Rivas, V. (2006). Relationships, layoffs, and organizational resilience: Airline industry responses to September 11. *The Journal of applied behavioral science*, 42(3), 300-329.
- Gupta, A., & Kumar Singh, R. (2023). Managing resilience of micro, small and medium enterprises (MSMEs) during COVID-19: analysis of barriers. *Benchmarking: An International Journal*, 30(6), 2062-2084
- Herbane, B. (2010). Small business research: Time for a crisis-based view. *International small business journal*, 28(1), 43-64.
- Iftikhar, A., Purvis, L., & Giannoccaro, I. (2021). A meta-analytical review of antecedents and outcomes of firm resilience. *Journal of Business Research*, 135, 408-425.
- Ingram, T., & Głód, G. (2018). Organizational resilience of family business: case study. *Ekonomia i Prawo. Economics and Law*, 17(1), 57-69.
- Karaköse, M. A., İmamoğlu, S. Z., & İnce, H. (2020). Dönüşümcü ve adaptif liderlik tarzlarının örgütsel dayanıklılık kapasitesinin geliştirilmesindeki rolü: Kavramsal bir model önerisi. *Doğu Üniversitesi Dergisi*, 21(1), 153-169.
- Linnenluecke, M. K. (2017). Resilience in business and management research: A review of influential publications and a research agenda. *International journal of management reviews*, 19(1), 4-30.
- McMillan, J. H. (2004). *Educational research: Fundamentals for the consumer*. (Fourth Edition). USA: Pearson Education, Inc
- Ortiz-de-Mandojana, N., & Bansal, P. (2016). The long-term benefits of organizational resilience through sustainable business practices. *Strategic management journal*, 37(8), 1615-1631.

- Pal, R., Torstensson, H., & Mattila, H. (2014). Antecedents of organizational resilience in economic crises —an empirical study of Swedish textile and clothing SMEs. *International Journal of Production Economics*, 147, 410-428.
- Păunescu, C., & Mátyus, E. (2020). Resilience measures to dealing with the COVID-19 pandemic. Evidence from Romanian micro and small enterprises. *Management & Marketing*, 15.
- Seville, E., Van Opstal, D., & Vargo, J. (2015). A primer in resiliency: seven principles for managing the unexpected. *Global Business and Organizational Excellence*, 34(3), 6-18.
- Sullivan-Taylor, B., & Branicki, L. (2011). Creating resilient SMEs: why one size might not fit all. *International Journal of Production Research*, 49(18), 5565-5579.
- Sutcliffe, K. M. (2003). Organizing for resilience. *Positive organizational scholarship: Foundations of a new discipline*.
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic management journal*, 18(7), 509-533.
- TÜİK. Türkiye İstatistik Kurumu (2023). Küçük ve Orta Büyüklükteki Girişim İstatistikleri, 2023. <https://data.tuik.gov.tr/Bulten/Index?p=Kucuk-ve-Orta-Buyuklukteki-Girisim-Istatistikleri-2023-53543>
- Vogus, T. J., & Sutcliffe, K. M. (2007, October). Organizational resilience: Towards a theory and research agenda. In 2007 IEEE international conference on systems, man and cybernetics (pp. 3418-3422). IEEE.
- Yin, R. K. (2009). *Case study research: Design and methods* (Vol. 5). SAGE.

A BIBLIOMETRIC REVIEW OF GREEN INNOVATION AND ENVIRONMENTAL PERFORMANCE

Lazgeen Mohammed Halo

*Yıldız Technical University, Faculty of Economics and Administrative Sciences, Türkiye
University of Zakho, College of Administration & Economics, Iraq, lazgeen.halo@std.yildiz.edu.tr
<https://orcid.org/0000-0003-4489-9938>*

Esin CAN

*Yıldız Technical University, Faculty of Economics and Administrative Sciences, Türkiye, eesincan@gmail.com
<https://orcid.org/0000-0003-1754-4867>*

ABSTRACT

This study conducts a bibliometric analysis to examine the evolution and structure of research on green innovation and environmental performance. Using the Web of Science (WoS) database, 114 articles published between 2015 and 2025 were analyzed with VOSviewer and Biblioshiny software. The analysis explores annual publication trends, influential authors, journals, countries, and institutions, keyword patterns, collaboration networks, and future research directions. Findings reveal a steady growth in the field since 2022, with notable contributions from scholars like Sanjay Kumar Singh. Business Strategy and the Environment is the leading journal, China is the most active country, and Zhejiang Gongshang University ranks as the top institution. Thematic clusters such as green transformational leadership, green human resources, business performance, and technological innovation are emerging as key areas. This bibliometric mapping highlights both well-established research domains and underexplored topics, offering practical insights and identifying gaps for future investigation. The study also emphasizes the interdisciplinary and expanding nature of the field, reflecting its growing importance in organizational and policy contexts. The originality of this research lies in its integrated focus on green innovation and environmental performance—fields often studied separately. By visualizing knowledge structures and evolutionary trends, the study contributes multidimensional insights and lays the groundwork for future academic exploration. It is among the first to comprehensively examine these two concepts together, providing a valuable foundation for future research and policy development.

KEY WORDS

green innovation, environmental performance; bibliometric analysis; Biblioshiny; VOSviewer.

INTRODUCTION

Green innovation has emerged as a critical strategic approach in response to increasing environmental pressures and evolving regulatory frameworks (Sun et al., 2019; Chang, 2011; Chen et al., 2012). Environmental concerns, once considered secondary, have now become central to corporate strategy, with green innovation increasingly viewed as essential for achieving sustainable development and maintaining competitive advantage (Weng et al., 2015). Rising consumer awareness and growing demand for sustainability have prompted firms to adopt green-oriented business models that align environmental goals with market expectations (Henriksen, 2012; Tang et al., 2018; Borsatto & Bazani, 2021).

Scholars conceptualise green innovation either as a set of organisational capabilities or as a collection of environmental practices (Chen, 2008; Qi et al., 2010). In practice, green innovation encompasses both hardware and software innovations—applied to products and processes—that enhance

environmental performance and improve competitive positioning (Huang et al., 2009; Chen et al., 2012; Rennings, 2000). It may also include new or modified processes, systems, and services that contribute to environmental sustainability (Bernaur et al., 2006; Oltra & Saint Jean, 2009). Moreover, green innovation facilitates low-carbon development and offers strategic advantages such as resource efficiency and cost reduction by transforming waste into revenue-generating outputs (Zhang et al., 2020; Bassetti et al., 2021; Li & Ibrahimi, 2024). Through technological and administrative advancements, green practices enhance firms' environmental reputation and overall performance, establishing green innovation as a valuable corporate asset (Ketata et al., 2015; Lee & Min, 2015; Weng & Lin, 2011).

Despite its significance, the concept of environmental performance remains vaguely defined in the literature, with many empirical studies neglecting to provide a clear definition (Schultze & Trommer, 2012; Salamé et al., 2021). Wagner (2005) defines environmental performance as an organization's ability to meet stakeholders' environmental expectations. While traditionally addressed from an economic perspective and linked to profitability, the concept has increasingly expanded to incorporate environmental dimensions due to growing ecological concerns and stakeholder pressure (Wang et al., 2020). Klassen and McLaughlin (1996) define environmental performance as the extent to which a company reduces its environmental impact relative to industry standards. Milgrom and Roberts further emphasize the achievement of managerial goals, supporting a stakeholder-oriented view of environmental performance (as cited in Schultze & Trommer, 2012). Recent perspectives suggest that environmental performance should be seen not only as regulatory compliance but also as a value-added component of socioeconomic evaluation, thus enhancing legitimacy and promoting green innovation (Salamé et al., 2021). Innovation, in this context, is essential to minimizing environmental harm while improving organizational outcomes (Madaleno et al., 2020; Bach et al., 2019). A comprehensive understanding of environmental performance should therefore consider the role of human resources and green innovation in aligning leadership strategies with environmental objectives.

Despite the growing interest in this topic, the absence of comprehensive bibliometric research has limited the academic community's understanding of how the field of green innovation and environmental performance has evolved, who the key contributors are, and what emerging themes characterise current discourse. To address this gap, the following research questions are posed:

RQ1: How has the annual number of publications on green innovation and environmental performance evolved over time?

RQ2: Who are the most influential contributors (authors, journals, countries, and organizations) conducting advanced research in the field?

RQ3: What are the main thematic clusters and emerging topics identified through keyword analysis?

RQ4: What are the collaboration networks among authors and countries, and what is the citation impact of key articles?

RQ5: What potential future research directions can be suggested for this field?

METHODOLOGY

Bibliometric methods (e.g., co-citation analysis, bibliographic coupling, keyword co-occurrence) use bibliographic data from publication databases to construct structural representations of scientific fields. These methods introduce objectivity into the evaluation of scientific literature (Zupic & Čater, 2015) and are recognized as both rigorous and effective for analyzing large volumes of scholarly output. Originating from research in library and information sciences, bibliometric analysis enables

the systematic classification and summary of existing literature. Prior studies have employed these techniques to examine journals, institutions, countries, and research topics (Donthu et al., 2020).

Bibliometric analysis allows researchers to uncover the developmental patterns of a field and to identify research gaps and emerging themes. While widely used in fields such as engineering and health sciences, its application in business research remains relatively recent and, in many cases, underdeveloped (Donthu et al., 2021).

In this study, two key tools were employed: VOSviewer and Biblioshiny (an R interface to the Bibliometrix package).

VOSviewer uses the Visualization of Similarities (VOS) mapping technique to create bibliometric maps. It can also display maps generated using other methods such as multidimensional scaling. VOSviewer is compatible with various operating systems and can be run directly from the internet. It is especially effective for visualizing maps with a large number of items (e.g., 100+), which many other bibliometric software tools struggle to render clearly (Van Eck & Waltman, 2010).

Biblioshiny, via the Bibliometrix package in R, enables both descriptive and advanced bibliometric analyses. Common outputs include statistics on the most productive authors, countries, journals, co-authorship networks, keyword co-occurrence, thematic evolution, and trend detection (Aria & Cuccurullo, 2017). Donthu et al. (2021) recommend a minimum of 100 documents for meaningful bibliometric analysis. Given that this study includes 114 articles retrieved from the Web of Science (WoS) database, these tools were deemed appropriate.

Figure 1 illustrates the methodological steps used in evaluating the collected documents. The procedure consists of three main stages:

Data Collection: Relevant keywords were selected to extract the literature from the WoS database. Results were filtered based on predetermined criteria such as English language and document type (e.g., journal articles), excluding non-peer-reviewed sources like editorials or book chapters.

Data Visualization: The filtered dataset was imported into Biblioshiny and VOSviewer within R Studio to conduct bibliometric analysis and generate visual representations.

Data Analysis: This stage involved identifying core themes and emerging topics in the field of green innovation and environmental performance.

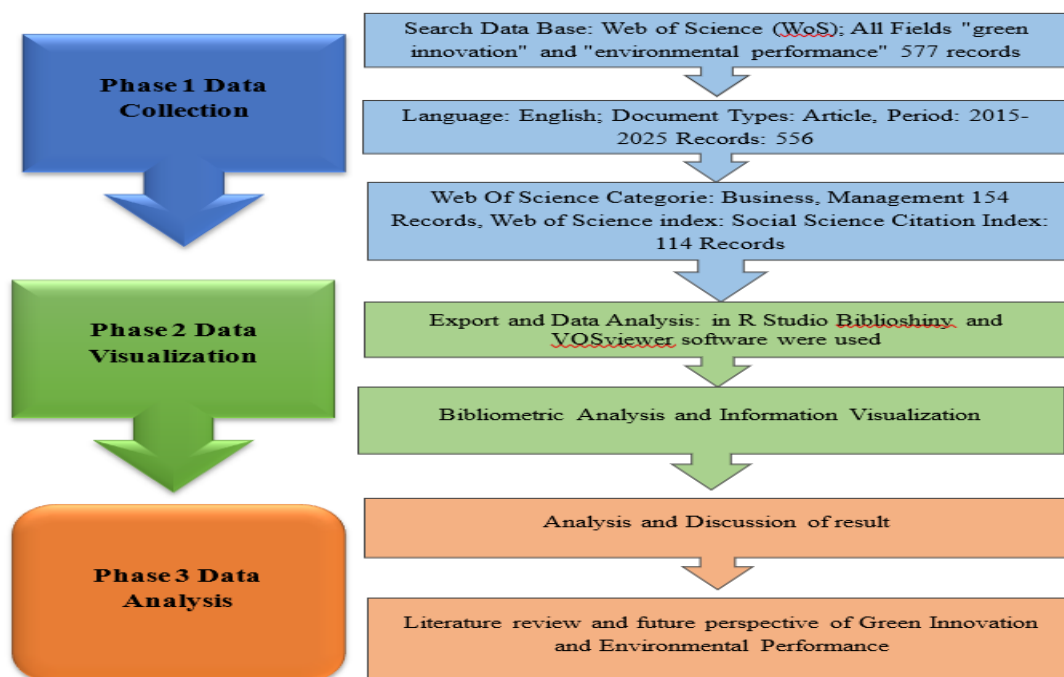


Figure 1. Methodological Stages of Bibliometric Analysis

In the Web of Science (WoS) database, a total of 577 publications were retrieved using the keywords “green innovation” and “environmental performance” in June 2025. This number was reduced to 556 by filtering for document type (articles), language (English), and the publication period (2015–2025). In the first screening stage, the selection was further refined to 154 publications categorized under Business and Management in the WoS subject area. Finally, the dataset was limited to 114 articles indexed in the Social Sciences Citation Index (SSCI) within the WoS Core Collection.

In the second stage, the collected data were exported in formats compatible with VOSviewer and Biblioshiny (R Studio). These tools were used to conduct bibliometric analyses and generate visualizations to answer the study's research questions.

In the third stage, the analysis results and discussions were presented. This stage also included a comprehensive literature review on green innovation and environmental performance, along with insights for future research directions.

RESULTS

The annual publication trends in the field of green innovation and environmental performance between 2015 and 2025 can be divided into two distinct periods. The first period (2015–2021) experienced slow and conservative growth, with just 23 articles published—an annual average of 3.83. This trend reflects the field’s early, exploratory phase, where academic engagement was still emerging.

The second period (2022–2025) shows a significant increase, with 82 published articles and an annual average of 20.5. This growth highlights the rising academic interest in the topic, driven by increasing environmental awareness among stakeholders and organizations. The expansion of research signals that green innovation and environmental performance have become strategic priorities for institutions. Accordingly, future research is encouraged to explore these themes across different sectors and geographic regions.

Among the most influential contributors, Sanjay Kumar Singh stands out as the leading author, while *Business Strategy and the Environment* ranks as the most prominent journal with 32 publications. At the national level, China has made the most impactful contributions. Institutions such as Zhejiang Gongshang University, Wuhan University, and Xi'an Jiaotong University, affiliated with China, are key contributors to the field.

China's leadership can be attributed to major policy initiatives, including the Air Pollution Prevention and Control Action Plan (2013) and the Environmental Protection Law enacted in 2015 (Zhao & Zhao, 2025). These reforms have promoted green practices in both public and private sectors. As one of the world's most populous countries with a manufacturing-heavy economy—often associated with environmental harm—China has taken significant steps to address pollution. The launch of the national carbon emissions trading system in 2021, now the world's largest, further solidifies this commitment (Liu & Li, 2022). Increased public awareness of environmental and social concerns has also encouraged firms to adopt more sustainable practices. In contrast, countries focused solely on profit, without prioritizing environmental quality or social welfare, are falling behind in global competitiveness (Zhao & Huang, 2022).

Identifying the geographical distribution of key authors, journals, and institutions helps highlight research gaps and fosters opportunities for future collaboration—particularly in underrepresented regions.

Key thematic areas emerging from the literature include green culture, sustainable performance, green intellectual capital, job satisfaction, green technological innovation, and human resource management. These topics indicate that research has moved beyond theoretical discussions and now addresses practical applications that influence environmental performance alongside green innovation.

Collaboration networks are especially prominent in China, both domestically and internationally, confirming its leadership across all analytical dimensions. In terms of citation impact, the most influential article is a 2020 publication by Singh and colleagues in *Technological Forecasting & Social Change*, which ranks highest in total citations.

Current trends and thematic analyses reveal several underexplored areas in the field, pointing to strong potential for future research. These include expanding the study of green leadership, innovation strategies, and human capital in achieving organizational sustainability.

CONCLUSION

This analysis visualizes research trends, annual publication counts, leading researchers, journals, countries, and institutions, as well as keyword patterns, collaboration networks, and future directions using VOSviewer and Biblioshiny in R Studio. It maps the core structure of the green innovation and environmental performance field. For this purpose, 114 articles published between 2015 and 2025 (to date) were analyzed using bibliometric methods to assess the field's growth trajectory.

The findings reveal steady growth in this field since 2022. Scholars such as Sanjay Kumar Singh have made notable contributions. *Business Strategy and the Environment* leads among journals, while the People's Republic of China stands out as the dominant country. Zhejiang Gongshang University, affiliated with China, ranks as the most prominent institution. Key thematic areas such as green culture, sustainable performance, green intellectual capital, job satisfaction, green technology innovation, and human resource management reflect the expanding scope of research.

Green innovation and environmental performance have evolved beyond theoretical discussions toward practical application. This overview offers valuable insights for academics and practitioners by presenting the current state of research and highlighting potential future developments.

This bibliometric analysis uniquely illustrates how green innovation and environmental performance research has developed over time, in contrast to classical innovation and performance studies. Unlike earlier works that focused on conceptual or case-based discussions, the bibliometric method provides a systematic perspective, revealing how institutional outcomes and field-specific requirements intersect.

The visualized results show that as the number of publications increases, the complexity and interdisciplinarity of the field are also growing. It is increasingly aligned with institutional and societal objectives. Based on the findings, these issues are becoming essential for both managerial and non-managerial staff and are being incorporated into the strategic vision and mission of organizations.

To support sustainability, organizations must implement training programs in green innovation and environmental performance. This is crucial, as environmental awareness and regulatory mindsets can only be cultivated through education and incentive systems. Policymakers also play a key role in mitigating climate change and environmental degradation through the promotion of green practices. To achieve these goals, organizations are increasingly integrating green transformational leadership and green human resource management into their operations, thereby fostering long-term sustainability cultures, ecological responsibility, and institutional resilience.

However, this study has limitations. It is based solely on the Web of Science (WoS) database and used only the keywords “green innovation” and “environmental performance.” As a result, relevant studies indexed in other databases, such as Scopus or Google Scholar, or published in languages other than English, may have been excluded. Future research should broaden its database sources and keyword range to ensure more comprehensive bibliometric analyses and deeper insights into the field.

Finally, this study demonstrates the growing relevance of green innovation and environmental performance in addressing ecological, organizational, and societal challenges. Future research should adopt interdisciplinary approaches, drawing on fields such as politics, policy, engineering, the natural sciences, organizational behavior, psychology, and digital transformation, to explore the field from multiple dimensions. Visualized publication trends, keyword clustering, and empirical gaps highlight promising topics, including green transformational leadership, human resource practices, business performance, green management types, upper echelons leadership, accountability, entrepreneurship, corporate reputation, and technological innovation. Aligning these themes with green innovation and environmental performance opens new theoretical and practical pathways for future research. Scholars may also adopt a multidisciplinary lens by exploring relationships among variables like green organizational citizenship and green intellectual capital across different sectors and regions.

REFERENCES

- Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, 11(4), 959-975. <https://doi.org/10.1016/j.joi.2017.08.007>
- Bach, T. M., Dalazen, L. L., da Silva, W. V., Ferraresi, A. A., and da Veiga, C. P. (2019), “Relationship Between Innovation and Performance in Private Companies: Systematic Literature Review”, *SAGE Open*, Vol. 9, No. 2, pp. 1-17. <https://doi.org/10.1177/2158244019855847>.
- Bassetti, T., Blasi, S., & Sedita, S. R. (2021). The management of sustainable development: A longitudinal analysis of the effects of environmental performance on economic performance. *Business Strategy and*

- the Environment, 30(1), 21-37. <https://doi.org/10.1002/bse.2607>
- Bernauer, T., Engels, S., Kammerer, D., & Seijas, J. (2006). Explaining green innovation: ten years after Porter's win-win proposition: how to study the effects of regulation on corporate environmental innovation?. CIS working paper, 17(2006).
- Borsatto, J. M. L. S., & Bazani, C. L. (2021). Green innovation and environmental regulations: A systematic review of international academic works. *Environmental science and pollution research*, 1-18. <https://doi.org/10.1007/s11356-020-11379-7>
- Chang, C. H. (2011). The influence of corporate environmental ethics on competitive advantage: The mediation role of green innovation. *Journal of Business Ethics*, 104, 361-370. <https://doi.org/10.1007/s10551-011-0914-x>
- Chen, Y. S. (2008). The driver of green innovation and green image–green core competence. *Journal of Business Ethics*, 81, 531-543. <https://doi.org/10.1007/s10551-007-9522-1>
- Chen, Y. S., Chang, C. H., & Wu, F. S. (2012). Origins of green innovations: the differences between proactive and reactive green innovations. *Management Decision*, 50(3), 368-398. <https://doi.org/10.1108/00251741211216197>
- Donthu, N., Kumar, S., & Pattnaik, D. (2020). Forty-five years of *Journal of Business Research*: A bibliometric analysis. *Journal of Business Research*, 109, 1-14. <https://doi.org/10.1016/j.jbusres.2019.10.039>
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133, 285-296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- El-Kassar, A. N., & Singh, S. K. (2019). Green innovation and organizational performance: The influence of big data and the moderating role of management commitment and HR practices. *Technological forecasting and social change*, 144, 483-498. <https://doi.org/10.1016/j.techfore.2017.12.016>
- Henriksen, K., Bjerre, M., Øster, J., & Bisgaard, T. (2012). Green business model innovation-policy report. Nordic Council of Ministers.
- Huang, Y. C., Ding, H. B. ve Kao, M. R. (2009). Salient Stakeholder Voices: Family Business and Green Innovation Adoption. *Journal of Management & Organization*, 15(3), 309-326. <https://doi.org/10.5172/jmo.2009.15.3.309>
- Ketata, I., Sofka, W., & Grimpe, C. (2015). The role of internal capabilities and firms' environment for sustainable innovation: evidence for Germany. *R&d Management*, 45(1), 60-75. <https://doi.org/10.1111/radm.12052>
- Klassen, R. D., & McLaughlin, C. P. (1996). The impact of environmental management on firm performance. *Management Science*, 42(8), 1199-1214. <https://doi.org/10.1287/mnsc.42.8.1199>
- Kraus, S., Rehman, S. U., & García, F. J. S. (2020). Corporate social responsibility and environmental performance: The mediating role of environmental strategy and green innovation. *Technological forecasting and social change*, 160, 120262. <https://doi.org/10.1016/j.techfore.2020.120262>
- Lee, K. H., & Min, B. (2015). Green R&D for eco-innovation and its impact on carbon emissions and firm performance. *Journal of Cleaner Production*, 108, 534-542. <https://doi.org/10.1016/j.jclepro.2015.05.114>
- Li, J., & Ibrahim, H. (2024). Executive Green Perception and Green Innovation Improve New Quality Productivity in Chinese Listed Firms. *International Journal of Financial Studies*, 12(4), 102. <https://doi.org/10.3390/ijfs12040102>
- Liu, M., & Li, Y. (2022). Environmental regulation and green innovation: Evidence from China's carbon emissions trading policy. *Finance Research Letters*, 48, 103051. <https://doi.org/10.1016/j.frl.2022.103051>
- Madaleno, M., Robaina, M., Dias, M. F., and Meireles, M. (2020). Dimension effects in the relationship between eco-innovation and firm performance: A European comparison. *Energy Reports*, Vol. 6, pp. 631– 637.

<https://doi.org/10.1016/j.egy.2019.09.038>

- Oltra, V., & Saint Jean, M. (2009). Sectoral systems of environmental innovation: an application to the French automotive industry. *Technological Forecasting and Social Change*, 76(4), 567-583. <https://doi.org/10.1016/j.techfore.2008.03.025>
- Qi, G. Y., Shen, L. Y., Zeng, S. X. ve Jorge, O. J. (2010). The Drivers for Contractors' Green Innovation: An Industry Perspective. *Journal of Cleaner Production*, 18(14), 1358-1365. <https://doi.org/10.1016/j.jclepro.2010.04.017>
- Rehman, S. U., Kraus, S., Shah, S. A., Khanin, D., & Mahto, R. V. (2021). Analyzing the relationship between green innovation and environmental performance in large manufacturing firms. *Technological forecasting and social change*, 163, 120481. <https://doi.org/10.1016/j.techfore.2020.120481>
- Rennings, K. (2000). Redefining innovation—eco-innovation research and the contribution from ecological economics. *Ecological economics*, 32(2), 319-332. [https://doi.org/10.1016/S0921-8009\(99\)00112-3](https://doi.org/10.1016/S0921-8009(99)00112-3)
- Salamé, J. M., Leroy, Y., Saidani, M., & Nicolai, I. (2021). Understanding and monitoring environmental performance of infrastructure design projects. *Proceedings of the Design Society*, 1, 3269-3278. <https://doi.org/10.1017/pds.2021.588>
- Schultze, W., & Trommer, R. (2012). The concept of environmental performance and its measurement in empirical studies. *Journal of Management Control*, 22, 375-412. <https://doi.org/10.1007/s00187-011-0146-3>
- Singh, S. K., Del Giudice, M., Chiappetta Jabbour, C. J., Latan, H., & Sohal, A. S. (2022). Stakeholder pressure, green innovation, and performance in small and medium-sized enterprises: The role of green dynamic capabilities. *Business Strategy and the Environment*, 31(1), 500-514. <https://doi.org/10.1002/bse.2906>
- Singh, S. K., Del Giudice, M., Chierici, R., & Graziano, D. (2020). Green innovation and environmental performance: The role of green transformational leadership and green human resource management. *Technological forecasting and social change*, 150, 119762. <https://doi.org/10.1016/j.techfore.2019.119762>
- Sun, H., Edziah, B. K., Sun, C., & Kporsu, A. K. (2019). Institutional quality, green innovation and energy efficiency. *Energy policy*, 135, 111002. <https://doi.org/10.1016/j.enpol.2019.111002>
- Tang, M., Walsh, G., Lerner, D., Fitza, M. A., & Li, Q. (2018). Green innovation, managerial concern and firm performance: An empirical study. *Business strategy and the Environment*, 27(1), 39-51.
- Van Eck, N., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523-538. <https://doi.org/10.1002/bse.1981>
- Wagner, M. (2005). Consistency and credibility? Environmental reporting, environmental performance indicators and economic performance. Marburg: Tectum.
- Wang, S., Wang, H., Wang, J., and Yang, F. (2020). Does environmental information disclosure contribute to improve firm financial performance? An examination of the underlying mechanism. *Science of the Total Environment*, Vol. 714, No.96. <https://doi.org/10.1016/j.scitotenv.2020.136855>
- Weng, H. H., Chen, J. S., & Chen, P. C. (2015). Effects of green innovation on environmental and corporate performance: A stakeholder perspective. *Sustainability*, 7(5), 4997-5026. <https://doi.org/10.3390/su7054997>
- Weng, M. H., & Lin, C. Y. (2011). Determinants of green innovation adoption for small and medium-size enterprises (SMES). *African journal of business management*, 5(22), 9154.
- Zang, Y., Liu, Y., Yang, Y., Woods, M., & Fois, F. (2020). Rural decline or restructuring? Implications for sustainability transitions in rural China. *Land Use Policy*, 94, 104531. <https://doi.org/10.1016/j.landusepol.2020.104531>
- Zhang, J., Liang, G., Feng, T., Yuan, C., & Jiang, W. (2020). Green innovation to respond to environmental

regulation: How external knowledge adoption and green absorptive capacity matter? *Business Strategy and the Environment*, 29(1), 39-53. <https://doi.org/10.1002/bse.2349>

Zhao, L., & Zhao, R. (2025). Ecological rule of law and enterprise green innovation—Evidence from China's environmental courts. *Journal of Environmental Management*, 374, 124081. <https://doi.org/10.1016/j.jenvman.2025.124081>

Zhao, W., & Huang, L. (2022). The impact of green transformational leadership, green HRM, green innovation and organizational support on the sustainable business performance: Evidence from China. *Economic research-Ekonomska istraživanja*, 35(1), 6121-6141. <https://doi.org/10.1080/1331677X.2022.2047086>

Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational research methods*, 18(3), 429-472. <https://doi.org/10.1177/1094428114562629>

BIG DATA IN SMART CITIES TO ACHIEVE SUSTAINABLE DEVELOPMENT GOAL (SDG) 11: A SYSTEMATIC REVIEW

Caterina Aura

Department of Business and Legal Sciences, University of Calabria, Italy, caterina.aura@unical.it

<https://orcid.org/0000-0002-2098-548X>

ABSTRACT

The aim of this study is to describe the role of big data in the implementation of the Sustainable Development Goals (SDGs) within smart cities. The article focuses on the implementation of SDG 11, which concerns sustainable cities and communities. When smart cities are managed with the help of big data, they optimize the management of urban resources, improve public services, and improve the quality of life of citizens. This contributes to more sustainable and inclusive urban development. The first part of the study discusses the advantages and future prospects of applying big data to smart city monitoring. The economic, social, and environmental impacts are described. The second part conducts a systematic review of the relevant literature. A framework is then constructed that highlights the potential of big data to facilitate the transition towards cities that are simultaneously sustainable, inclusive, intelligent, and socially equitable. Finally, the case of the smart city of Zurich is explored.

KEYWORDS

Sustainability, SDG, Smart City, Big Data, Digitalization

INTRODUCTION

The emergence and spread of a smart city are based on various technological applications and digital solutions that improve the quality of life (Garau et al., 2020), such as the Internet of Things (IoT) (Subhashini and Khang, 2023; Nguyen et al., 2024; Nassereddine and Khang, 2024), artificial intelligence (AI), big data, and digital twins (Weil et al., 2023). Smart cities require the implementation of digitalization solutions that necessarily include digital twin models as the basis for decision support systems (Nesi, 2023). The technological aspect is crucial for several reasons: promoting energy efficiency and reducing consumption, reducing air pollution in cities, and protecting the environment and human health. Another key element in promoting the development of these smart cities is the presence of an adequate infrastructure, and therefore enabling networks that allow the connected objects of the cities of the future to operate and communicate. Finally, the vision of a smart city is based on people, whose knowledge and culture make a difference. This study is useful to both researchers and practitioners, as it provides theoretical contributions and practical insights in the field of smart cities and big data. Thanks to the benefits of big data, smart cities will become increasingly sustainable (Bibri et al., 2023) and efficient (Xue et al., 2025); they will improve citizens' quality of life by optimizing services and infrastructure (Hammoumi et al., 2024). Information managed by big data will be increasingly faster and will enable rapid decision-making; this speed and precision will allow for the personalization of services and infrastructure across the territory (Li et al., 2024). Big data is crucial for achieving the SDGs within cities, so much so that they have earned the title of smart city. The term “smart city” should not be understood merely as a “digital city”. The “smart city” perspective encompasses many visions that are expressed in various ways, such as smart mobility, energy, governance, living, environment, health, people, economy, social innovation, and many others. Discussing the importance of big data, this research explores its

effects on the development of sustainable, inclusive, safe, and resilient smart cities (Yedalla et al., 2025). The strategic value of big data in achieving the SDGs within smart cities is demonstrated. The study aims to demonstrate how the use of big data and smart technologies can foster the emergence of smart cities that achieve some of the most important SDGs. It provides a comprehensive overview of how big data is being used to promote sustainable urban infrastructure (Ogunkan & Ogunkan, 2025). By leveraging precise data provided by smart devices, cities will be able to optimize their operations and manage change effectively and efficiently. A review of the relevant literature confirms the importance of concepts such as big data in the development of sustainable smart cities (Wang et al., 2022; Yigitcanlar et al., 2024). A recent study in the literature attempted to link smart city development and the SDGs (Kaiser & Deb, 2025). Other scholars have demonstrated that big data supports the Sustainable Development Goals and is useful for monitoring the progress of smart cities (Barbieri et al., 2025); integrating and leveraging digital technologies can create innovative and sustainable smart cities (Bibri, 2020). The development and implementation of ICT in smart urban planning has yielded excellent results in terms of innovation and sustainability (Höjer & Wang, 2015). Technocratic theory already believed in a notion of an efficient smart city, which considered intelligent technologies as a powerful means to foster the process of urban transformation (Ahad et al., 2020; Konbr & Abdelaal, 2022). In the literature on technologies and big data applied to the development of smart cities, several issues remain unresolved or underexplored for practical purposes. Economic and business studies in recent years have analyzed the multidimensional nature of smart cities: they are undisputed tools for sustainability and territorial digitalization (Biancone et al., 2022); they represent fundamental instruments in the fight against inequality and poverty (Gerli et al., 2024) and are becoming tools for combating unemployment and safeguarding the environment (Viggiani, 2024). Recent studies show that smart cities represent the solution to the effects of climate change (Losasso & Rigillo, 2024). Creating sustainable cities and environments will require the services of various expert professionals, including smart city experts (Percoco, 2024). Barbieri et al.'s recent study (2025) recommends focusing future studies on the analysis of specific SDGs, which unfortunately have not yet been explored, while also taking into account the geographic context. The article's contribution to the study of smart cities is evident in the section exploring the relationship between big data and SDG 11. The results of the bibliometric analysis revealed that artificial intelligence (AI), big data, machine learning, and deep learning are emerging fields of research in the field of smart cities, especially when addressing issues related to the Sustainable Development Goals (SDGs) (Kaiser & Deb, 2025). The final section presents the case of the “smart city” of Zurich, the world capital of smart cities, which has been ranked first in the world for four consecutive years. This ranking was drawn up based on the “Smart City Index”, an indicator that uses several parameters to define a scale of smart cities.

METHODOLOGY

The analysis was conducted through a systematic literature review. The first part formulated several research questions to define the scope of the study and guide the review process. The research questions were as follows:

- RQ1: How many studies have analyzed the “big data” dimension in the definition of “smart cities” in the last 10 years?
- RQ2: How many studies have analyzed the “big data” dimension in the definition of “smart cities” by adding the word “SDG” in the last 10 years?
- RQ3: How many studies have analyzed the “big data” dimension in the definition of “smart cities” by adding the word “SDG 11” in the last 10 years?

The literature review allowed us to determine how many scientific research articles on smart cities analyzed the impact of big data on the development of SDG 11. The analysis was conducted over a

10-year time span. The reference period was from 2015 to early 2025. 2015 was chosen as the starting year, as it was the year the SDGs were first announced by the UN General Assembly. The article search was based on keywords (“big data” and “smart cities” and “SDG” and “SDG 11”). The database used to review the articles and scientific publications is Web of Science (WOS). WOS was chosen because it is considered more reliable, as it includes only peer-reviewed scientific publications and allows for detailed citation analysis and H-index calculation. The second part of the study delves deeper into the subject matter by defining the characteristics of smart cities based on a set of articles remaining after an initial screening of the articles produced by the review. Content analysis is used to identify current trends and future research directions. Conclusions are then drawn. The research concludes with a case study analysis. A qualitative approach widely used in business studies, case studies, due to their unique characteristics, are essential when exploring the dynamics underlying a specific experience. Case studies are a research methodology that allows for observation of a phenomenon through analysis of its context, thus providing a high level of understanding of the observed phenomenon and helping to bridge the gap between theory and practice often highlighted in business studies literature (Chicchi, 2014). Case studies, with their ability to reconcile theory and context (Welch et al., 2022), therefore prove to be an effective strategy for design and data quality control.

RESULTS

This study examined the impact of big data on the development of sustainable smart cities and its relationship with SDG 11. The results identified several characteristics that big data must possess for smart city development, which play a significant role in the implementation of SDG 11. The benefits of big data are particularly evident in the data provision, control, and monitoring phases within decision-making processes. They are crucial in influencing the development of smart cities, attracting increasing research attention in the last year. The results show that there is considerable interest in the literature in this emerging trend, especially in the study of SDG 11; there are few references in the literature to other sustainable development goals, such as those related to poverty reduction and gender equality. The results of the review are shown in Table 1.

Table 1. Decision-making flow. Source: Own elaboration.

Review decision flow	
Papers selected in WOS on “big data” and “smart cities”	3802
Papers selected in WOS on “big data” and “smart cities” and “SDG”	19
Selected Science Direct papers on “big data” and “smart cities” and “sdg” and “sdg 11”	10

Using the terms “big data” and “smart cities” on WoS, 3,802 articles were initially identified for the years 2015-2025. The search was subsequently refined by including the topic “SDG,” resulting in 19 articles from the last 10 years. Finally, the keyword “SDG 11” was entered, yielding only 10 results. In total, only 5 articles were analyzed because they best met the previously established criteria, as they contained the key topics for the literature review. The document analysis conducted on articles from the last 10 years highlighted the lack of attention to SDG 11.

Now let’s briefly answer the research questions posed at the beginning:

- RQ1: How many studies have analyzed the “big data” dimension in the definition of “smart cities” in the last 10 years?

AQ1: 3802 studies have analyzed the “big data” dimension in the definition of “smart cities” in the last 10 years. These studies focus on many aspects that concern the development of smart cities such as dimensions (Albino et al., 2015 ; and Gil-Garcia et al., 2016) or strategic principles for the development of a smart city (Martin et al., 2018) . Since 2021, deep learning, machine learning, and artificial intelligence have emerged as fields of primary interest among scholars (Kaiser & Deb, 2025).

- RQ2: How many studies have analyzed the “big data” dimension in the definition of “smart cities” by adding the word “SDG” in the last 10 years?

AQ2: Nineteen studies have analyzed the "big data" dimension in the definition of "smart cities" by adding the word "SDG" in the last 10 years. These studies explore the fundamental role of technology in achieving the Sustainable Development Goals (SDGs) in various sectors, including the food-water-energy nexus, business, public health, global warming mitigation, and biodiversity conservation (Ma et al., 2024). These studies focus on how digitalization methods can directly benefit specific sectors in achieving the SDGs. Some address the issue of the metaverse.

which, as a virtual form of smart cities, aligns with the SDGs. It focuses on identifying potential co-benefits and trade-offs between the Metaverse and the SDGs. Findings indicate that research primarily focuses on the SDGs related to health, education, innovation, sustainable cities, and responsible consumption and production (Sharifi et al., 2025). Others address the SDGs and big data by assessing the importance of geospatial data (Costa et al., 2024).

- RQ3 How many studies have analyzed the “big data” dimension in the definition of “smart cities” by adding the word “SDG 11” in the last 10 years?

AQ3: The results from the analysis using all search terms are 10. The most relevant ones showed us that the literature on the study of our analysis is very scarce as it mainly focuses on the SDGs in general. The literature regarding big data and its impact on the development of SDG 11 in smart cities is oriented towards generic aspects of artificial intelligence; the article by Filho et al., (2024) presents a study that evaluates how AI can facilitate the achievement of SDG 11 within smart cities. Some case studies are illustrated that demonstrate that AI improves urban sustainability; By promoting collaboration between urban planners, policy makers, and AI experts, the full potential of AI can be exploited to shape sustainable urban environments and achieve Sustainable Development Goal 11 (Filho et al., 2024). The same consideration is expressed in the article by Zhang et al., (2022), who show that smart cities improve the efficiency and effectiveness of urban management, including public services, public safety and environmental protection, and that they ultimately achieve Sustainable Development Goal (SDG) 11: making cities inclusive, safe, resilient and sustainable. There are other important works that highlight the role of smart cities in promoting economic growth, sustainable mobility, environmental sustainability and good governance among cities. These benefits can support cities in achieving the objectives of SDG 11. (Jain et al, 2023). The study by Zyoud & Zyoud, (2025) instead refers to the impact of the Internet of Things (IoT) in the development of SDG 11 within smart cities. It is not limited to the sole reference of big data. A review is conducted on the more general topic of IoT. In the article by Allam et al., (2019) IoT and big data are analysed together as two related elements for the development of intelligent smart cities as required by SDG 11. Five of the articles resulting from the research on WOS were discarded because they did not meet the research standards, while one, being a simple proceeding, was not counted.

THE SMART CITY OF ZURICH

Globally, many cities have already begun their journey toward becoming smart cities. While there are no univocal criteria for identifying those already at an advanced stage, international rankings published annually can be used. The most important ranking is the “Smart City Index”, created

annually by the Smart City Observatory. It is based on the work of the Swiss School of Management (IMD) and the Singapore University of Technology and Design (SUTD). In calculating the ranking, the IMD analyzed 142 cities worldwide, evaluating them based on the services they offer and citizens' perceptions of their technological components. Based on this ranking, a smart city is defined as “an urban context that applies technology to enhance the benefits and reduce the shortcomings of urbanization for its citizens”, offering a balanced focus on technology and economics on the one hand, and the “human dimensions” of smart cities (quality of life, environment, and inclusiveness) on the other. The ranking was drawn up based on parameters combined with the results of surveys conducted with targeted questionnaires among citizens of the respective smart cities. The objective of the surveys is to evaluate the impact technology has on everyday life based on two pillars: the city's infrastructure and the technological applications available to citizens. The responses are correlated and evaluated based on five key characteristics: a) health and safety, b) urban mobility, c) activities carried out, d) opportunities, and e) governance. Each characteristic is assigned a rating scale that generates the ranking.

In the 2025 ranking of the world's smartest cities, Zurich tops the list; other European cities follow, with only Canberra representing Oceania. Table 2 shows the top ten cities in the IMD ranking.

Table 2. Top 10 smart city ranking based on the “Smart City Index” (Source: Own calculation)

Smart City Index Ranking	Smart City
1	Zurich
2	Oslo
3	Geneva
4	Dubai
5	Abu Dhabi
6	London
7	Copenhagen
8	Canberra
9	Singapore
10	Lausanne

Smart cities are developing in a wide variety of contexts, adapting technologies to local needs. Real-world examples include those in Asia, Latin America, Africa, and North America. Looking at the features and services offered by these smart cities, the most notable include digital data access and management, sustainable mobility, and social inclusion. Some of these are priorities in smart city development and are often part of innovative programs and projects developed based on geographic areas and their specific characteristics. Specifically, Zurich has held the top spot in the “Smart City Index” rankings for four consecutive years. According to residents, Zurich is the smartest city in the world. The Swiss city stands out for its use of innovative technologies such as big data, AI, the Internet of Things, and sustainable urban planning, placing great emphasis on digitalization and the quality of life of its residents. Zurich is a constantly growing city, home to more than 400,000 people. The administration is composed of nine departments and their associated service divisions. It has been considered a “smart city” since 2019, the year the “Smart City Index” ranking was introduced. Since then, Zurich has consistently maintained its top spot by implementing strategies to earn Smart City status; it is considered a center and driver of innovation in city administration. Zurich is not only one of the most sustainable cities in the world, but also the smartest. Zurich does not excel in just

one aspect, but presents a holistic approach to the smart city, combining sustainability, efficiency, technology, and quality of life to create a livable, inclusive, and above all, innovative urban environment. It has successfully promoted numerous innovative projects, leveraging digital transformation as an opportunity for the city and its residents. The “Smart City Index” ranking is based on a number of important parameters; Table 3 outlines the main parameters underlying the analysis. Specifically, it illustrates the main actions taken to make Zurich a smart city and their implications.

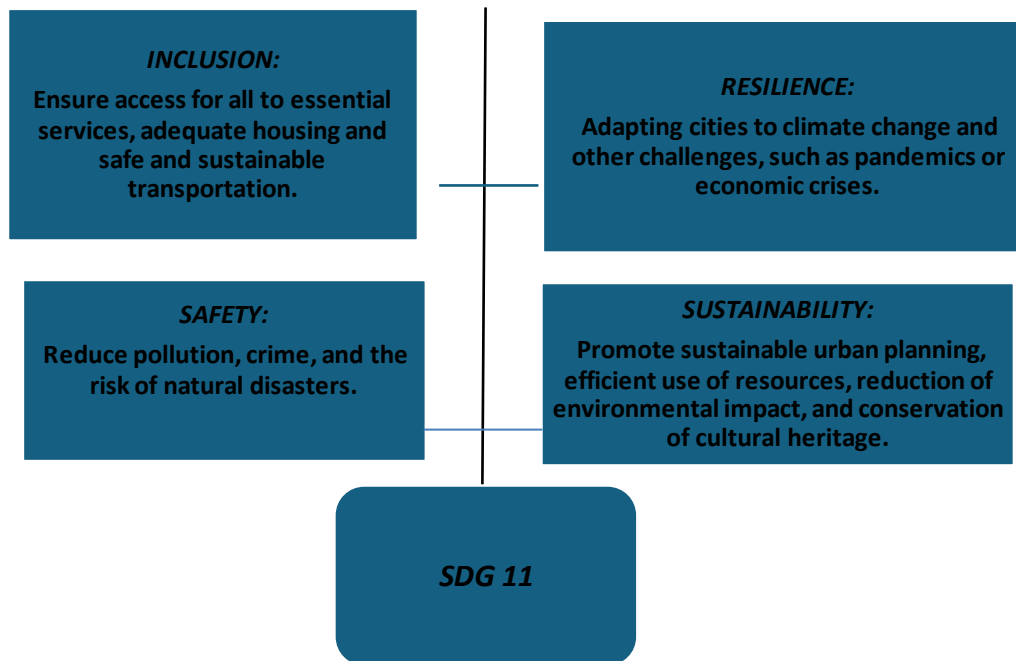
Table 3 .Main environmental, social, and economic aspects of the Zurich “Smart City Index”
(Source: Own calculation)

Smart City Index Parameter	Actions	What does it entail?
<i>Environmental and energy promotion and awareness</i>	<ul style="list-style-type: none"> - Project for the promotion of renewable energy; - organizing events to educate citizens about their energy impact and to promote conscious consumption; - Free advice on: sustainable construction, investments in renewable energy such as wind and geothermal; - incentives for the installation of solar panels and smart appliances; - environmental promotion and awareness events; - use of renewable sources. 	<ul style="list-style-type: none"> - reduction of greenhouse gas emissions and minimization of environmental impact; - reduction of energy consumption per inhabitant; - maximizing energy efficiency; - awareness of cost and CO2 savings; - increased awareness of renewable energy.
<i>Efficient and sustainable structures</i>	<ul style="list-style-type: none"> - Urban redevelopment projects in the city centre; - new area of Langstrasse, entirely connected to the Hauptbahnhof (main station); - the Sorell Hotel chain or the Mövenpick Hotel Zürich-Regensdorf use energy-saving light bulbs ; 	<ul style="list-style-type: none"> - dynamic balance between strategic infrastructures and citizens' needs , essential for connecting to the world; - catering facilities and elegant homes with high energy performance.
<i>Quality of life</i>	<ul style="list-style-type: none"> - Projects on school education; - projects for the creation and development of new educational and employment opportunities, making it attractive for residents; 	<ul style="list-style-type: none"> - Schooling; - low level of pollution; - good health services;
<i>Accessible and intelligent mobility</i>	<ul style="list-style-type: none"> - Initiatives and projects for efficient public transport, powered by renewable energy; 	<ul style="list-style-type: none"> - improving the quality of life of citizens. - accessible, sustainable and

	<ul style="list-style-type: none"> - optimizing traffic control with intelligent technologies; - 	<ul style="list-style-type: none"> intelligent mobility; - minimization of energy consumption; - comfort in transporting tourists. -
<i>Technology Integration</i>	<ul style="list-style-type: none"> - Ability to calculate energy consumed; - sharing personal data to ease road congestion; - use of facial recognition technology to ensure public safety; - digitization of documents and information; - 	<ul style="list-style-type: none"> - Greater awareness of consumption; - increased trust in institutions and reduced processing times for administrative and bureaucratic procedures;
<i>Reduced environmental impact</i>	<ul style="list-style-type: none"> - hotels that boast sustainability certifications and practices for reducing food waste; - Waste management initiatives; - Initiatives for waste separation and the fight against food waste (such as collaborating with bakeries to sell unsold products); 	<ul style="list-style-type: none"> - Reduced use of water resources; - waste and chemical product separation; - encouraging employees to adopt a sustainable lifestyle even in their private lives.

All the parameters listed in Table 3 serve to make Zurich the smartest city in the world. A city that is progressively evolving by embracing innovation, thanks to the use of artificial intelligence tools. The city is not only a reflection of innovation; it is also a city of tradition that is open to new developments, making it the world's most vibrant and intelligent city. Based on what has been explained above, we are aware that the role of smart cities is also widely recognized in SDG 11 of the United Nations 2030 Agenda for Sustainable Development, which, with the objective "Sustainable Cities and Communities", aims to make urban areas and human settlements "inclusive, safe, resilient, and sustainable". This goal is particularly relevant for Zurich, today considered a highly developed and rapidly growing urban area. A smart city experiencing strong economic and social growth, it faces environmental and social challenges. Specifically, Zurich achieves four of the goals promoted in SDG 11: inclusion, resilience, safety, and sustainability (Chart 1).

Chart 1. Main SDG 11 targets promoted in the smart city of Zurich (Source: Own calculation)



SDG 11 is present in all its forms within the city of Zurich; it has been a fundamental objective in transforming the city into a livable, equitable, inclusive, and sustainable place for all. With its care and attention to quality of life, innovation, and environmental and energy promotion and awareness, the city of Zurich has the potential to be a positive example on this path. In line with SDG 11, Zurich's smart city guarantees everyone access to adequate housing, basic services, and sustainable infrastructure. It also promotes electric and eco-sustainable mobility, reducing pollution. It also creates green spaces, offering access to smart housing and services. Thanks to strategies implemented to protect vulnerable neighborhoods, it also manages to be a smart and inclusive city.

CONCLUSION

The following study, through the analysis of the technological dimension (big data) in the smart city context, has explored and deepened understanding of the multifunctional role of this particular urban model, turning it into a virtuous model for the development and implementation of one of the most important SDGs, SDG 11. The case of the smart city of Zurich is the strongest example of an inclusive and intelligent city. While this phenomenon has contributed to promoting progress, it has also highlighted challenges related primarily to the environment and the social well-being of citizens. It is at this juncture that the concept of the smart city comes into play, which aims to improve the quality of life of its citizens by making the city a more efficient and innovative place through the use of new technologies. This exploratory study of the literature has initially allowed for the integration of previous studies on smart cities, reinforcing the importance of technology, the SDGs, and their function as an innovative model for the surrounding environment. This relationship allows for the achievement of not only SDG 11 but also other types of SDGs. The analysis demonstrated how the use of digital technologies is not limited to enhancing the social aspects of cities, but is also of significant importance in the development and implementation of smart cities. The research objective clearly highlighted the reciprocal relationship between big data and smart cities and the resulting benefits that can be derived in terms of achieving the SDGs, thus validating smart cities'

ability to create shared value and explaining, at least theoretically, the ever-increasing use of these tools by cities.

REFERENCES

- Ahad, M. A., Paiva, S., Tripathi, G., & Feroz, N. (2020). Enabling technologies and sustainable smart cities. *Sustainable cities and society*, 61, 102301.
- Albino, V., Berardi, U., & Dangelico, R. M. (2015). Smart cities: Definitions, dimensions, performance, and initiatives. *Journal of urban technology*, 22 (1), 3-21.
- Allam, Z., Tegally, H., & Thondoo, M. (2019). Redefining the use of big data in urban health for increased liveability in smart cities. *Smart Cities*, 2 (2), 259-268.
- Barbieri, R., Coluccia, B., & Natale, F. (2025). How are smart city policies progressing in Italy? Insights from SDG indicators. *Land Use Policy*, 148, 107386.
- Biancone, P., Brescia, V., Chmet, F., & Lanzalonga, F. (2022). The relaunch of Smart Cities in Italy through the PNRR: challenges, opportunities, and limitations of digitalization policies. *Azienda pubblica*, 3, 1-19.
- Bibri, S. E. (2020). Compact urbanism and the synergic potential of its integration with data-driven smart urbanism: An extensive interdisciplinary literature review. *Land Use Policy*, 97, 104703.
- Bibri, S. E., Alexandre, A., Sharifi, A., & Krogstie, J. (2023). Environmentally sustainable smart cities and their converging AI, IoT, and big data technologies and solutions: An integrated approach to an extensive literature review. *Energy Informatics*, 6 (1), 9.
- Costa, D. G., Bittencourt, J. C. N., Oliveira, F., Peixoto, J. P. J., and Jesus, T. C. (2024). Achieving Sustainable Smart Cities Through Geospatial Data-Driven Approaches. *Sustainability*, 16 (2), 640.
- Leal Filho, W., Mbah, M. F., Dinis, M. A. P., Trevisan, L. V., de Lange, D., Mishra, A., ... & Aina, Y. A. (2024). The role of artificial intelligence in the implementation of the UN Sustainable Development Goal 11: Fostering sustainable cities and communities. *Cities*, 150, 105021.
- Gerli, P., Ferreri, M., Lauri, C., Regalia, M., & Williams, A. (2024). Addressing inequalities in smart places: a guide for public administrations and third sector organizations.
- Gil-Garcia, J. R., Zhang, J., & Puron-Cid, G. (2016). Conceptualizing smartness in government: An integrative and multi-dimensional view. *Government Information Quarterly*, 33 (3), 524-534.
- Hammoumi, L., Maanan, M., & Rhinane, H. (2024). Characterizing smart cities based on artificial intelligence. *Smart Cities*, 7 (3), 1330-1345.
- Höjer, M., & Wangel, J. (2015). Smart sustainable cities: definitions and challenges. In *ICT innovations for sustainability* (pp. 333-349). Springer International Publishing.
- Jain, A., Gue, I. H., & Jain, P. (2023). Research trends, themes, and insights on artificial neural networks for smart cities towards SDG-11. *Journal of Cleaner Production*, 412, 137300.
- Kaiser, Z. A., & Deb, A. (2025). Sustainable smart cities and Sustainable Development Goals (SDGs): a review. *Regional Sustainability*, 6(1), 100193.
- Konbr, U., & Abdelaal, M. (2022). Utilizing smart systems to enhance the sustainability of Egyptian administrative buildings. *Civil Engineering and Architecture*, 10(7), 2779-2808.
- Li, X., Wang, Q., & Tang, Y. (2024). The impact of artificial intelligence development on urban energy efficiency—based on the perspective of Smart City policy. *Sustainability*, 16 (8), 3200.
- Losasso, M., & Rigillo, M. (2024). Climate adaptation at the territorial and urban scale: water, soil, and vegetation. *ENVIRONMENT RISK COMMUNICATION*, 19(Water. Is it a problem?), 76-79.
- Ma, X., Li, J., Guo, Z., & Wan, Z. (2024). Role of big data and technological advancements in monitoring and development of smart cities. *Heliyon*, 10 (15).

- Martin, C. J., Evans, J., & Karvonen, A. (2018). Smart and sustainable? Five tensions in the visions and practices of the smart-sustainable city in Europe and North America. *Technological Forecasting and Social Change* , 133 , 269-278.
- Ogunkan, D. V., & Ogunkan, S. K. (2025). Exploring Big Data Applications in Sustainable Urban Infrastructure: A Review. *Urban Governance* .
- Percoco, A., New Skills and Opportunities for Young People: The Challenge of Basilicata (April 2, 2024). FEEM Policy Brief No. 01, Available at SSRN: <https://ssrn.com/abstract=4782479> .
- Sharifi, A., Amirzadeh, M., & Khavarian-Garmsir, A. R. (2025). The metaverse as a future form of smart cities: A systematic literature review of co-benefits and trade-offs for sustainable development goals. *Cities* , 161 , 105879.
- Viggiani, S. (2024). Urban Intelligence: Privacy-Proof Smart Cities. *Cyberspace and Law: International Journal of Legal Informatics*, 25, 1, 2024, 43–58.
- Wang, B., Loo, B. P., & Huang, G. (2022). Becoming smarter through smart city pilot projects: Experiences and lessons from China since 2013. *Journal of Urban Technology*, 29(4), 3-24.
- Xue, H., Cai, M., Liu, B., Di, K., & Hu, J. (2025). Sustainable development through digital innovation: Unveiling the impact of big data comprehensive experimental zones on energy utilization efficiency. *Sustainable Development* , 33 (1), 177-189.
- Yedalla, J. (2025). Building cyber-Resilient Smart Cities: The role of AI and big data in urban security. *International Journal of Science and Research (IJSR)* , 14 (2), 648-652.
- Yigitcanlar, T., Kamruzzaman, M., Buys, L., Ioppolo, G., Sabatini-Marques, J., da Costa, E. M., & Yun, J. J. (2018). Understanding 'smart cities': Intertwining development drivers with desired outcomes in a multidimensional framework. *Cities*, 81, 145-160.
- Zhang, D., Pee, L. G., Pan, S. L., & Cui, L. (2022). Big data analytics, resource orchestration, and digital sustainability: A case study of smart city development. *Government information quarterly* , 39 (1), 101626.
- Zyoud, S., & Zyoud, A. H. (2025). Advancing sustainable cities and communities with internet of things: Global insights, trends, and research priorities for SDG 11. *Results in Engineering* , 104917.
- <https://www.intesasanpaoloinnovationcenter.com/it/news-ed-eventi/news/2023/06/smart-city-a-che-punto-siamo-in-italia/>

***HUMAN-CENTRIC
DIGITAL
TRANSFORMATION***

WORK-LIFE BALANCE IN THE AGE OF AI: OPPORTUNITIES AND CHALLENGES FOR WOMEN

Jelena Krstić

Institute of Economic Sciences, Belgrade, Serbia, jelena.krstic@ien.bg.ac.rs

<https://orcid.org/0000-0001-8876-8513>

Ivana Domazet

Institute of Economic Sciences, Belgrade, Serbia, ivana.domazet@ien.bg.ac.rs

<https://orcid.org/0000-0002-3493-4616>

ABSTRACT

The benefits brought by the application of tools based on artificial intelligence have become one of the hot topics in research related to the well-being of employees. Taking into account that women are traditionally the ones who, in addition to work duties, still carry a greater proportion of responsibilities related to family and home in relation to men, this topic requires a gender-oriented perspective. In spite of the rising research interest for this topic, the contribution of AI tools to the achievement a better work-life balance for employed and self-employed women still remains an area which is insufficiently researched. Aiming to contribute to the knowledge in this field, this paper provides a comprehensive insight into existing theoretical and empirical findings about how and to what extent AI tools can contribute to the improvement of work-life balance for women, especially in the context of changing working conditions and digital transformation. The results are systematized in a way which indicates the key benefits of applying these tools for achieving work-life balance, but also the challenges and barriers that exist in this regard.

KEYWORDS

Women, Work-life balance, AI tools

INTRODUCTION

Work-life balance (WLB) represents one of the major issues in the literature related to employees' wellbeing. The concept of work-life balance is deeply rooted in several classic theories that help explain how individuals manage the boundaries between their work and non-work roles. Boundary Theory (Ashforth, Kreiner, & Fugate, 2000) highlights how people create, maintain, and negotiate boundaries to segment or integrate their professional and private lives. Similarly, Role Strain Theory (Goode, 1960) and Role Conflict Theory (Kahn et al., 1964) explain the tension that arises when multiple roles place competing demands on limited personal resources, such as time and energy. These theoretical perspectives illustrate how structural, social, and individual factors contribute to role conflict and the strategies individuals use to mitigate it (Greenhaus & Beutell, 1985). This concept is considered to be essential for the preservation of physical and mental health of employees, as well as for achieving long-term employee satisfaction. Even though both men and women attach great significance to WLB, the achievement of such balance represents a particular challenge for women (Agarwal & Lenka, 2015; De Clercq et al., 2021; Nagy, 2020), who continue to carry a disproportionately greater share of home, family and caregiving responsibilities compared to men. This represents huge problem for employed women, especially those who are self-employed, and it has a pronounced negative impact on both the income they generate from their business and

limits their ability and motivation to focus on business growth (Pareek & Bagrecha, 2017; Adom et al., 2018; Neneh, 2021). Long-term imbalance often leads to higher stress, burnout, and difficult career advancement, especially in today's fast-paced work environment. Such inequality arises from gender discrimination and gender related stereotypes and biases, which are presented globally but more pronounced in developing countries (Panda, 2018; Poggesi et al., 2019; Kumar & Choudhury, 2022). On the other hand, it is noted that achieved work-life balance has a positive effect on women work performances and productivity (Neneh, 2021).

In the modern digital age, artificial intelligence (AI) is becoming more and more present in the work environment, opening up new opportunities for improving the quality of life of employees. The higher intensity of digital tools use is seen as a valuable solution for managing both work- and family-related communication and work and non-work-related demands (Rajahonka & Villman, 2019; Lyons & Zhang, 2023). The introduction of AI tools into the workplace represents a significant technological development that can reshape work-life boundaries by automating tasks, enabling flexible work arrangements, and influencing role demands. To understand the adoption and impact of AI tools in different contexts, studies are often built up on established theories, such as the Technology Acceptance Model (TAM) (Davis, 1989) and its extensions (Venkatesh & Davis, 2000). However, the importance of incorporating gender perspectives into technology adoption has been increasingly recognized, so frameworks such as Gendered TAM (Gefen & Straub, 1997), which emphasize how gender norms, expectations, and workplace cultures shape both the access to and impact of digital tools. AI technologies make an impact on women around the world, in all phases of their career cycle, from the initial employment through the entire path of professional development, bringing multiple opportunities, as well as challenges in the gender equality context (UNESCO/OECD/IDB, 2022). There is empirical evidence that AI tools can support women in balancing various responsibilities, thus supporting them to complete business activities more efficiently. The effectiveness of AI tools in improving WLB is proven for women in various occupations, such as nurses (Rony et al., 2024), surgeons (Capelli et al., 2023), university members (Swamy et al., 2023; Meharunisa et al., 2024), entrepreneurs (De Clercq et al., 2021), etc. Despite the growing interest of scientists and professionals for this topic, the contribution of AI tools to the achievement a better work-life balance for women, who still face the greater burden of professional and family roles, still remains under researched area. Aiming to contribute to the knowledge in this field, this paper provides a comprehensive insight into existing theoretical and empirical findings about how and to what extent AI tools can contribute to the improvement of work-life balance for women, especially in the context of changing working conditions and digital transformation.

METHODOLOGY

This paper has a theoretical character and is based on a systematic review of relevant literature with the aim of analyzing the role of AI tools in improving the balance between work and private life of employed and self-employed women. As noted by van Wee and Banister (2023), literature review papers significantly contribute to the output of scientific research as “they introduce readers efficiently into a specific research area by providing an overview of the state of knowledge”. Papers based on the review of the existing body of literature are becoming more prevalent in the area of AI-related literature (e.g. Sestino & De Mauro, 2021; Enholm et al., 2022; Perifanis & Kitsios, 2023) as well as work-life balance literature (e.g. Sirgy & Lee, 2018; Wood et al., 2020; Rashmi & Kataria, 2022).

The starting point of the research is the identification of key topics that are at the intersection of digital transformation, gender equality and contemporary challenges in the labor market. As a segment of the methodological approach, a qualitative analysis will be applied, which implies the

selection, analysis and synthesis of existing sources of literature. To ensure methodological transparency and replicability, the systematic review follows the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. In accordance with that, the research consists of the following four major phases: identification, screening, eligibility and inclusion. In the first phase, by using databases such as Google Scholar, Scopus and Web of Science, sources dealing with topics of interest are identified. Keywords used in the search include: women, work-life balance, digital technologies, AI based tools, gender and technology, and other related terms. After the identification, a screening of the obtained results is applied in the second phase. It contains the removal of duplicates and records and removal of records on the basis of title and abstract irrelevance. After filtering of databases on the basis of defined keywords, further eligibility criteria were applied. The inclusion criteria required studies to: (1) explicitly examine the relationship between contemporary technologies and work-life balance among employed or self-employed women, (2) be published in peer-reviewed journals or reputable conference proceedings, and (3) be published in English within the last 5–7 years. Since this is a novel topic, a majority of articles meet the criteria of temporal relevance. Only articles which met all the mentioned criteria are taken into further consideration. On the other hand, exclusion criteria involved studies that: (1) focused solely on technological adoption and use without gender-specific insights, (2) lacked empirical or theoretical grounding, or (3) were opinion pieces without methodological rigor.

In the fourth phase, all sources that are considered eligible in the previous phase were additionally reviewed by authors and a set of selected ones was included in the further analysis. Based on the analysis of the content of those selected articles, dominant theoretical perspectives, methodology frameworks and key findings are identified. On the basis of the obtained results, one can see how much this topic is represented in the literature so far, in which countries studies in this area were conducted, which methodological approaches were most often applied and what findings were generally reached. Finally, the results were systematized according to thematic areas related to the topic.

RESULTS

Based on a systematic review of the literature, the identification of the benefits and challenges of applying AI tools for women's work performances and private life is obtained. On the one hand, results highlight how different AI tools can contribute to more flexible work arrangements and reduced workload, but also potential negative consequences such as demand for higher level of digital skills, increased work intensity and even further erosion of boundaries between work and private life.

There is a growing body of evidence that AI tools contribute women's empowerment and their ability to achieve and maintain a work-life balance (Meharunisa et al., 2024). Some of the main benefits that using artificial intelligence-based tools brings to female employees and entrepreneurs, include: better time and priority management, reduction of cognitive load, data-driven decision making, increased productivity and efficiency, flexibility and perspectives for remote work, support in learning and skills development, more equal access to information and resources, improving team communication and cooperation, etc. AI planning and organization tools help women more efficiently schedule work tasks and balance them with family responsibilities (UNESCO/OECD/IDB, 2022; Swamy et al., 2023). By enabling automation, AI can greatly lessen administrative and operational tasks, which leads to lesser workloads and better work organization (Rony et al., 2024; Khan & Sreenivasan, 2024). Automation of routine and repetitive tasks allows working women to focus on more creative and complex tasks, reducing stress and fatigue. AI tools contribute to making more informed and effective business decision-making (Rony et al., 2024; WEDO, 2025). Also, it

provides opportunities for remote work, which is proven to ultimately supports women in achieving a more balanced work-life dynamic (Alsulami, Mabrouk, & Bousrih, 2023; Tan, Lim-Soh, & Tan 2024; Rony et al., 2024). AI-powered team and project management systems enable working from home or flexible working hours, which contributes to a better work-life balance. Additionally, AI-based tools improve internal communication, enable faster information sharing and facilitate collaboration in hybrid and dispersed teams.

One of the benefits of the application of AI is providing more equal access to information and resources and personalized learning (Nedungadi, Tang, & Raman, 2024). Such way, AI can contribute to reducing gender gaps in access to knowledge, training and opportunities for professional development through digital and accessible platforms. Technology represents great support in learning and skills development, as personalized AI learning platforms allow working women to improve their knowledge and skills at their own pace and schedule (Patil, Husainy, & Hatte, 2024). Eventually, by using AI solutions for work organization, project management and communication, women can manage work tasks better and faster, which increases their overall efficiency and effectiveness (Meharunisa et al., 2024).

On the other hand, AI based solutions bring certain challenges to the work environment. One of such challenges is related to the increased fear of job replacements (Alkhalifah et al., 2024; Dahlin, 2024). Ethical issues attached to AI application are also commonly discussed in the available literature (Adewale, 2025). Such concerns surrounding AI encompass gender bias in AI systems, underrepresentation of women in AI development, and the reinforcement of harmful stereotypes which can eventually lead to even greater digital gender divide (Shrestha, & Das, 2022). Additionally, the effective application of AI underscores the necessity for women to engage in reskilling and upskilling initiatives to meet the evolving workplace demands (UNESCO/OECD/IDB, 2022), which represents one more challenge in this area.

CONCLUSION

Obtained results of this theoretical research contribute to a deeper understanding of the ways in which tools based on AI can influence the realization of a better balance between work and private life for women. By analyzing relevant literature, this paper provides a gender-sensitive perspective on how digital technologies, particularly AI-based tools, affect daily work arrangements, caregiving responsibilities, and role management. The findings indicate that women often perceive and use AI tools as a means to increase work flexibility and productivity, yet existing studies also highlight persistent gender gaps in access, digital skills, and the fair distribution of benefits and risks.

The contribution of this paper is reflected in the comprehensive systematization of the results of previous theoretical and empirical studies on this topic, which provides a significant basis for further studies in this area. Notably, this review identifies a lack of empirical research that combines gender perspectives with the analysis of specific AI applications and real workplace conditions. Also, it contributes by pointing out gaps in empirical research so far, especially in terms of a combined approach to gender perspectives, technology application and working conditions, thus opening up space for further interdisciplinary research. Future research should build on this review by conducting cross-country empirical studies to explore how different workplace cultures and policy contexts affect the adoption and outcomes of AI tools for women's WLB. Additionally, longitudinal studies and mixed-method research designs are particularly encouraged to capture the dynamic impacts of AI over time, including unintended effects on women's workload, well-being, and career progression.

Finally, based on the findings of this literature review, specific recommendations for organizations and decision makers are formulated; with the aim of promoting a more inclusive digital transformation that takes into account the needs and specificities of women in the contemporary work environment. Based on the findings, this paper recommends that organizations actively invest in gender-responsive AI training and digital upskilling programs to ensure that women can fully benefit from AI-driven work processes. For policymakers, the review highlights the need to design national or sectoral strategies that address structural barriers to women's access to advanced technologies, including initiatives that reduce the gender digital divide and encourage inclusive technology development.

REFERENCES

- Adewale, S. (2025). Exploring ChatGPT usage amongst female academics and researchers in the academia. *International Journal of Information and Learning Technology*, 42(1), 49-66. <https://doi.org/10.1108/IJILT-01-2024-0012>
- Adom, K., Asare-Yeboah, I.T., Quaye, D.M., & Ampomah, A.O. (2018). A critical assessment of work and family life of female entrepreneurs in Sub-Saharan Africa: Some fresh evidence from Ghana. *Journal of Small Business and Enterprise Development*, 25(3), 405-427. <https://doi.org/10.1108/JSBED-02-2017-0063>
- Agarwal, S., & Lenka, U. (2015). Study on work-life balance of women entrepreneurs – review and research agenda. *Industrial and Commercial Training*, 47(7), 356–362. <https://doi.org/10.1108/ict-01-2015-0006>
- Alkhalifah, J.M., Bedaiwi, A.M., Shaikh, N., Seddiq, W., Meo, S.A. (2024). Existential anxiety about artificial intelligence (AI)- is it the end of humanity era or a new chapter in the human revolution: questionnaire-based observational study. *Frontiers in Psychiatry*, 15:1368122. <https://doi.org/10.3389/fpsyt.2024.1368122>.
- Alsulami, A., Mabrouk, F., & Bousrih, J. (2023). Flexible working arrangements and social sustainability: Study on women academics post-COVID-19. *Sustainability*, 15(1), 544. <https://doi.org/10.3390/su15010544>
- Ashforth, B. E., Kreiner, G. E., & Fugate, M. (2000). All in a day's work: Boundaries and micro role transitions. *Academy of Management Review*, 25(3), 472–491. <https://doi.org/10.2307/259305>
- Capelli, G., Glavas, D., Ferrari, L., Verdi, D., & Spolverato, G. (2023). Women surgeons fighting for work-life balance: how technology might help close the gender gap. *Artificial Intelligence Surgery*, 3(2), 80–89. <https://doi.org/10.20517/ais.2022.40>
- Dahlin, E. (2024). Who says artificial intelligence is stealing our jobs? *Socius*, 10. <https://doi.org/10.1177/23780231241259672>
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
- De Clercq, D., Brieger, S. A., & Welzel, C. (2019). Leveraging the macro-level environment to balance work and life: an analysis of female entrepreneurs' job satisfaction. *Small Business Economics*, 56(4), 1361–1384. <https://doi.org/10.1007/s11187-019-00287-x>
- Enholm, I.M., Papagiannidis, E., Mikalef, P., Krogstie, J. (2022). Artificial intelligence and business value: a literature review. *Information Systems Frontiers*, 24, 1709–1734. <https://doi.org/10.1007/s10796-021-10186-w>
- Gefen, D., & Straub, D. W. (1997). Gender differences in the perception and use of e-mail: An extension to the Technology Acceptance Model. *MIS Quarterly*, 21(4), 389–400. [10.2307/249720](https://doi.org/10.2307/249720)
- Goode, W. J. (1960). A theory of role strain. *American Sociological Review*, 25(4), 483–496.
- Greenhaus, J. H., & Beutell, N. J. (1985). Sources of conflict between work and family roles. *Academy of Management Review*, 10(1), 76–88. <https://doi.org/10.2307/258214>

- Khan, S., & Sreenivasan, D. (2024). Impact of AI on work life balance of working women in hotel industry. *International Journal of Scientific Research in Engineering And Management*, 8(10), 1–5. <https://doi.org/10.55041/ijsrem38120>
- Kahn, R. L., Wolfe, D. M., Quinn, R. P., Snoek, J. D., & Rosenthal, R. A. (1964). *Organizational stress: Studies in role conflict and ambiguity*. Wiley, New York.
- Kumar, S., & Choudhury, S. (2022). Gender and feminist considerations in artificial intelligence from a developing-world perspective, with India as a case study. *Humanities and Social Sciences Communication*, 9:31 (2022). <https://doi.org/10.1057/s41599-022-01043-5>
- Lyons, E., & Zhang, L. (2023). Female Entrepreneurs, Digital Tools, and Work-Life Balance: Evidence from Small Businesses around the World. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4536460>
- Meharunisa, S., Almugren, H., Sarabdeen, M., Mabrouk, F., & Kijas, A. C. M. (2024). The impact of artificial intelligence on women's empowerment, and work-life balance in Saudi educational institutions. *Frontiers in Psychology*, 15. <https://doi.org/10.3389/fpsyg.2024.1432541>
- Nagy, B. (2020). "Mummy is in a call": digital technology and executive women's work-life balance. *Social Inclusion*, 8(4), 72-80. <https://doi.org/10.17645/si.v8i4.2971>
- Nedungadi, P., Tang, K.-Y., & Raman, R. (2024). The Transformative Power of Generative Artificial Intelligence for Achieving the Sustainable Development Goal of Quality Education. *Sustainability*, 16(22), 9779. <https://doi.org/10.3390/su16229779>
- Neneh, B. N. (2021). Role salience and the growth intention of women entrepreneurs: Does work-life balance make a difference? *The Spanish Journal of Psychology*, 24, e4. <https://doi.org/10.1017/SJP.2021.9>
- Panda, S. (2018). Constraints faced by women entrepreneurs in developing countries: review and ranking. *Gender in Management*, 33(4), 315-331. <https://doi.org/10.1108/GM-01-2017-0003>
- Pareek, P., & Bagrecha, C. (2017). A Thematic Analysis of the Challenges and Work-Life Balance of Women Entrepreneurs Working in Small-Scale Industries. *Vision*, 21(4), 461-472. <https://doi.org/10.1177/0972262917739181>
- Patil, S. D., Husainy, A., & Hatte, P. R. (2024). Empowerment of women through education and training in Artificial Intelligence. In S. Ponnusamy, V. Bora, P. Daigavane, & S. Wazalwar (Eds.), *AI Tools and Applications for Women's Safety* (pp. 132-149). IGI Global Scientific Publishing. <https://doi.org/10.4018/979-8-3693-1435-7.ch008>
- Perifanis, N.-A., & Kitsios, F. (2023). Investigating the influence of artificial intelligence on business value in the digital era of strategy: A literature review. *Information*, 14(2), 85. <https://doi.org/10.3390/info14020085>
- Poggesi, S., Mari, M. & De Vita, L. (2019). Women entrepreneurs and work-family conflict: an analysis of the antecedents. *International Entrepreneurship and Management Journal*, 15, 431–454. <https://doi.org/10.1007/s11365-017-0484-1>
- Rajahonka, M., & Villman, K. (2019). Women managers and entrepreneurs and digitalization: on the verge of a new era or a nervous breakdown? *Technology Innovation Management Review*, 9(6), 14–24. <https://doi.org/10.22215/timreview/1246>
- Rashmi, K., & Kataria, A. (2022). Work–life balance: a systematic literature review and bibliometric analysis. *International Journal of Sociology and Social Policy*, 42(11/12), 1028-1065. <https://doi.org/10.1108/IJSSP-06-2021-0145>
- Rony, M. K. K., Alrazeeni, D. M., Akter, F., Nesa, L., Das, D. C., Uddin, M. J., Begum, J., Khatun, M. T., Noor, M. A., Ahmad, S., Tanha, S. M., Deb, T. R., & Parvin, M. R. (2024). The role of artificial intelligence in enhancing nurses' work-life balance. *Journal of Medicine Surgery and Public Health*, 3, 100135. <https://doi.org/10.1016/j.gmedi.2024.100135>
- Shrestha, S., & Das, S. (2022). Exploring gender biases in ML and AI academic research through systematic

- literature review. *Frontiers in Artificial Intelligence*, 5. <https://doi.org/10.3389/frai.2022.976838>
- Sestino, A., & De Mauro, A. (2021). Leveraging artificial intelligence in business: Implications, applications and methods. *Technology Analysis & Strategic Management*, 34(1), 16–29. <https://doi.org/10.1080/09537325.2021.1883583>
- Sirgy, M., & Lee, DJ. (2018). Work-Life Balance: an Integrative Review. *Applied Research Quality Life*, 13, 229–254. <https://doi.org/10.1007/s11482-017-9509-8>
- Swamy, N., Lal, S.R., & Nandini S. (2023). The impact of artificial intelligence on enhancing work-life balance for women in academia. *International Journal of Education, Modern Management, Applied Science & Social Science*, 5(4), 61-67.
- Tan, J., Lim-Soh, J. & Tan, P.L. (2024). The impact of teleworking on women’s Work–Life Balance and life satisfaction: a longitudinal study from Singapore. *Applied Research Quality Life*, 19, 2595–2615 <https://doi.org/10.1007/s11482-024-10340-x>
- UNESCO/OECD/IDB (2022). *The Effects of AI on the Working Lives of Women*. UNESCO, Paris, <https://doi.org/10.1787/14e9b92c-en>.
- van Wee, B., & Banister, D. (2023). Literature review papers: the search and selection process. *Journal of Decision Systems*, 33(4), 559–565. <https://doi.org/10.1080/12460125.2023.2197703>
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the Technology Acceptance Model: Four longitudinal field studies. *Management Science*, 46(2), 186–204. <https://doi.org/10.1287/mnsc.46.2.186.11926>
- WEDO (2025). How AI is helping women entrepreneurs analyze trends, consumer behavior, and competitors. Available at: https://www.joinwedo.org/how-ai-is-helping-women-entrepreneurs-analyze-trends-consumer-behavior-and-competitors/?utm_source=chatgpt.com
- Wood, J., Oh, J., Park, J., & Kim, W. (2020). The relationship between work engagement and work–life balance in organizations: A review of the empirical research. *Human Resource Development Review*, 19(3), 240-262. <https://doi.org/10.1177/1534484320917560> (Original work published 2020)

STRATEGIC IMPLICATIONS OF DIGITAL COMPETENCE, SELF-DIRECTED LEARNING, AND DIGITAL ENGAGEMENT AMONG UNIVERSITY STUDENTS: INSIGHTS FOR ADAPTING TO FUTURE DIGITAL WORK ENVIRONMENTS

Şehnaz Okkiran

Gaziantep University, Gaziantep, Türkiye, sehnazsakici@gmail.com
<https://orcid.org/0000-0002-3026-7836>

Can Demirel

Gaziantep University, Gaziantep, Türkiye, cdemirel27@gmail.com

ABSTRACT

In an era shaped by digital transformation and accelerated information flows, developing agile, self-regulated learners is essential for meeting the evolving demands of the global workforce. This study explores the intersection of self-directed learning (SDL) competencies and digital engagement behaviors among undergraduate university students, aiming to understand how digital consumption habits influence academic resilience and future career readiness—particularly in business and marketing contexts. A dual-cohort design was used, drawing on data from 100 students surveyed on SDL and lifelong learning (LL) tendencies, and 104 students assessed on technology use across four domains: social media, messaging, gaming, and general browsing. Findings reveal significant correlations between SDL levels and the quality of digital engagement. Specifically, higher SDL scores were negatively associated with excessive media consumption, while LL tendencies positively correlated with purposeful digital use such as educational content access. These results suggest that self-regulation and digital discipline are not only academic traits but also strategic behavioral assets in digitally intensive environments. The study contributes to the literature by integrating digital behavior with learning psychology, offering insights for curriculum design, talent development, and digital transformation strategies in higher education. Additionally, the findings underscore the importance of embedding SDL and digital literacy frameworks into early university curricula to foster adaptive, self-aware, and digitally competent professionals. The implications are particularly relevant for business and marketing education, where digital fluency and behavioral self-regulation are key to success in 21st-century work environments.

KEYWORDS

Self-directed learning, Digital engagement, Technology use behavior, Marketing education, Talent readiness

INTRODUCTION

In the dynamic context of business and marketing, the ability to self-manage learning and adapt to technological change is becoming an essential professional competency. The rapid integration of digital technologies has transformed both knowledge acquisition and professional expectations. This transformation highlights the strategic importance of developing self-directed and digitally competent individuals within the talent pipelines of marketing and business sectors (Kim et al., 2018; Lee et al., 2023; Ifenthaler & Yau, 2020).

Self-directed learning (SDL) refers to one's capacity to independently manage the entire learning process—from setting goals to evaluating outcomes. In modern work environments—particularly in marketing and business roles that are data-intensive, fast-paced, and client-centered—SDL is foundational to lifelong learning and adaptability (Candy, 1991). Guglielmino (2008) argues that individuals with strong SDL tendencies are better prepared to manage uncertainty, seek improvement, and integrate new tools into their workflows. More recent research emphasizes the positive impact of SDL on workplace agility and digital tool adoption among business graduates (Murphy, 2021; Anderson, 2025).

The pervasive use of mobile technologies, social media, and streaming platforms has established a dominant digital culture among university students. Their daily engagement spans communication, entertainment, and academic activities. While these tools offer educational benefits, unstructured use is associated with distraction, cognitive overload, and diminished academic persistence (Aditia et al., 2023; Chen et al., 2021). In the absence of adequate self-regulation, excessive digital engagement may impair intrinsic motivation and academic outcomes. Recent studies further reinforce these concerns by highlighting that digital self-regulation plays a critical role in mitigating screen fatigue and preserving cognitive focus in digitally saturated academic contexts (Lin & Hassan, 2025). Additionally, uncontrolled digital consumption habits among Gen Z learners have been significantly linked to attention fragmentation and decreased academic persistence (Zafar et al., 2025). These behavioral patterns emphasize the need for universities to address not only digital access but also digital discipline and intentional engagement. In this regard, digital competence and technology readiness have been identified as key predictors of self-directed learning and intrinsic motivation in hybrid learning environments (Xu et al., 2025).

In business education, digital engagement entails both potential and risk. Purposeful use enhances digital literacy, data fluency, and communication skills essential for professional success. In contrast, unregulated use can impair academic routines and core competencies such as planning and focus (Martinez et al., 2023; Jain & Hyde, 2020). These effects are more pronounced in students with lower SDL, who are prone to procrastination and digital overreliance.

This study explores the interaction between self-directed learning (SDL) and digital engagement in undergraduate students by addressing two core research questions: (1) To what extent do SDL skills predict the nature and intensity of students' digital engagement? (2) How do demographic variables—namely gender, academic standing, and socioeconomic status—shape SDL capacities and digital behavior patterns?

Foundational literature supports the idea that individuals with high SDL are more likely to use technology intentionally, treating it as a learning enabler rather than a source of distraction (Ifenthaler & Yau, 2020). Cazan and Schiopca (2014) emphasized that "openness to learning," a key trait of SDL, is closely linked to productive digital habits. Similarly, Brockett and Hiemstra (1991) described SDL as encompassing motivation, reflection, and personal responsibility—all essential for thriving in technology-integrated learning environments. The emerging concept of "digital discipline" adds further nuance, suggesting that students must learn to manage screen time and cognitive load deliberately (Zafar et al., 2025; Lin & Hassan, 2025). Conversely, studies on technology addiction and digital overuse have found that students with low self-regulation skills are more vulnerable to academic disengagement, attention fragmentation, and digital fatigue (Jain & Hyde, 2020). These patterns have implications not only for academic performance but also for long-term employability, especially as digital professionalism becomes increasingly valued in business and marketing careers (Ng, 2021).

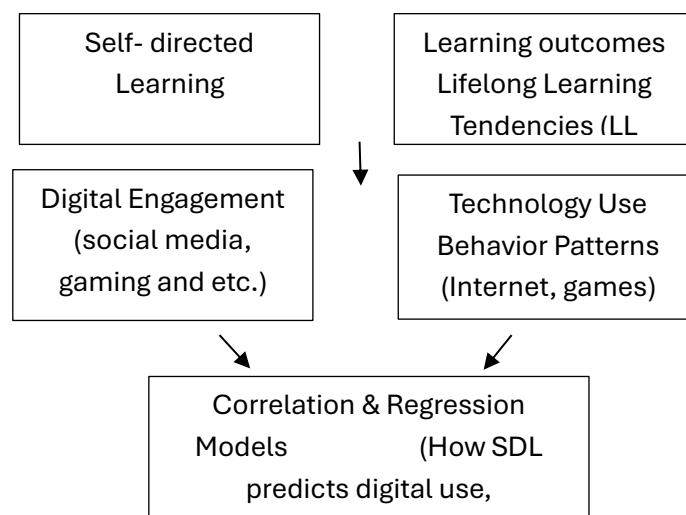
Recent research also highlights the impact of digital competence and psychological readiness on learning outcomes. Xu et al. (2025), for instance, found that technology readiness and digital skills significantly influence university students' motivation and academic performance. Similarly, Hussain et al. (2024) showed that students with higher digital self-efficacy demonstrate greater academic resilience and are more likely to succeed in innovative, technology-enhanced learning environments.

By integrating these insights, the present study contributes to a growing body of literature linking digital behavior, self-regulation, and human capital development. It offers practical implications for business educators, curriculum designers, and policymakers seeking to cultivate digitally fluent, self-aware learners who are equipped to thrive in the evolving demands of 21st-century innovation-driven work environments.

METHODOLOGY

This study employs a descriptive, cross-sectional survey design to examine the relationship between self-directed learning (SDL) skills and digital engagement behaviors among undergraduate students. The research integrates data from two complementary studies conducted at Gaziantep University, encompassing a combined total of 204 participants. Although participants were from a medical faculty, the learning and behavioral constructs—self-regulation, digital habits, and lifelong learning—are broadly applicable and especially relevant to business and marketing education.

Figure 1. Conceptual Model: SDL and Its Relationship with Digital Engagement



The conceptual model illustrates the hypothesized links between self-directed learning (SDL), digital engagement behaviors (e.g., social media, messaging, gaming, general browsing), and learning outcomes such as lifelong learning tendencies (LL). It also includes contextual variables such as gender, academic level, and socioeconomic background. The model served as the basis for correlational and regression analyses examining how SDL predicts patterns of digital behavior, and how digital engagement, in turn, relates to learning tendencies and outcomes.

The model focuses on observable learning behaviors and outcomes, while recognizing that underlying psychological variables such as academic stress and motivation may also play a moderating role.

Participants and Sampling

Participants were selected via convenience sampling from first-, second-, and third-year students. The Study 1 included 100 students (66% female, 34% male), primarily first-year students, surveyed on their SDL and lifelong learning tendencies. The Study 2 involved 104 students (approximately 80% first-year), focusing on their digital technology use patterns. All participants volunteered to join the study, and informed consent was obtained in accordance with the Gaziantep University Clinical Research Ethics Committee approval (Protocol No. 2017/137). Inclusion criteria required active enrollment in the medical faculty and willingness to complete self-report instruments. Data collection was conducted during the spring semester of 2024.

Instruments

The first instrument used in the study was a validated Self-Directed Learning and Lifelong Learning Scale, designed to evaluate students' ability to independently manage their learning processes. This composite tool assessed multiple dimensions of self-directed learning (SDL), including goal-setting, selection and application of appropriate learning strategies, self-monitoring, and effective use of learning resources. It also evaluated lifelong learning tendencies by measuring openness to learning, intrinsic motivation, and the capacity to initiate learning without external prompting. These measurement tools have been previously adapted and validated for use in Turkish higher education settings (Aşkın, 2015; Diker, 2009), and are aligned with international frameworks emphasizing autonomous, reflective learning (Brockett & Hiemstra, 1991; Garrison, 1997; Candy, 1991). Self-directed learning is widely recognized as a foundational skill for academic and professional success, particularly in dynamic and innovation-driven fields such as business, marketing, and digital strategy (Anderson, 2025).

The second instrument was a Digital Engagement Scale, developed to explore students' behaviors and habits in using various digital technologies. It examined four primary domains of digital interaction: social media usage (such as Instagram and YouTube), online messaging platforms (including WhatsApp and Telegram), online gaming, and general internet browsing—encompassing activities like online shopping, video streaming, and digital entertainment. Students reported their time spent on each platform, their primary devices for internet access, and qualitative aspects of their digital behavior, such as multitasking during academic tasks, patterns of excessive internet use, and perceptions of distraction or dependency. These behavioral categories are frequently used in studies on digital consumption and its effects on cognition, focus, and academic outcomes (Jain & Hyde, 2020 ; Aditia et al., 2023; Zafar et al., 2025).

In addition to these core areas, both instruments collected demographic data, including students' gender, academic year, GPA, and family socioeconomic background. These variables enabled subgroup analysis and deeper interpretation of how personal and contextual factors might influence learning autonomy and digital engagement patterns (Murphy, 2021).

Statistical Analysis

Data were analyzed using SPSS v27.0. Descriptive were computed for all demographic and behavioral variables. Pearson correlation analysis was used to test the relationships between SDL scores and digital engagement variables. Independent samples t-tests and ANOVA were used to assess subgroup differences by gender, class level, and socioeconomic status. Multiple regression analysis was performed to determine the predictive power of digital behaviors (e.g., time spent on social media) on SDL and academic motivation. Power analysis was conducted prior to data collection to ensure sufficient sample size. With a target power of 0.80 and medium effect size ($f = 0.25$), a minimum

sample of 98 participants was required for regression analyses, confirming that the sample of 204 was adequate.

Ethical Considerations

All participants were informed about the purpose, voluntary nature, and confidentiality of the research. Ethical approval was granted by the university’s non-invasive research ethics committee.

RESULTS

This section presents and interprets the key findings of the study, including descriptive statistics, patterns of digital engagement, and the results of correlational and regression analyses exploring the relationship between SDL, lifelong learning, and digital behavior.

Descriptive Statistics

The analysis yielded several key findings regarding the relationship between self-directed learning (SDL), lifelong learning tendencies, and digital engagement behaviors among undergraduate students. A total of 204 participants were included across both survey instruments. Descriptive statistics revealed that 66% of SDL participants and 69% of digital engagement participants identified as female. The majority (over 80%) were first-year students, providing a snapshot of early-stage academic behavior patterns.

As shown in the Table 1; in the SDL dataset (n = 100), students demonstrated moderate to high levels of self-regulation, particularly in goal-setting and resource use. Lifelong learning scores were also high, with most respondents indicating strong intrinsic motivation and openness to continuous development. Notably, 62% of participants expressed clear intentions to pursue further education post-graduation, aligning with lifelong learning orientations.

Table 1. Demographic and Academic Characteristics of the SDL Survey Participants

Variable	Category	Frequency (n)	Percentage (%)
Gender	Female	66	66%
	Male	34	34%
Academic Year	1st Year	81	81%
	2nd Year	15	15%
	3rd Year	4	4%
Postgraduate Education Intent	Yes	62	62%
	No	38	38%
Family Income Level	High	25	25%
	Low	43	43%
	Middle (implicitly assumed)	32	32%
Academic Achievement (GPA > 60)	Yes	87	87%
	No	13	13%

Digital Platform Usage Patterns

The digital engagement data ($n = 104$) showed that 94 students owned desktop computers, while 57 did not have access to a personal laptop. Despite this, nearly all participants reported using smartphones as their primary device for internet access. Table 2 mentions the distribution of daily usage time across major digital platforms among university students.

Table 2. Average Daily Usage Time Across Digital Platforms Reported by Students

Platform	% of Users (Estimated)
Instagram	59%
WhatsApp	53%
YouTube	55%
Online Gaming	61%
General Browsing	58%

This table summarizes the estimated percentage of students who reported using major digital platforms (Instagram, WhatsApp, YouTube, online gaming, and general browsing) for three or more hours per day. Daily digital activity was highest on platforms such as Instagram, YouTube, and WhatsApp, with 59% of respondents spending more than three hours per day on social media and messaging apps. Furthermore, 53% spent three to four hours on instant messaging platforms, and 61% of online gamers reported spending over one hour per day gaming—predominantly in war and sports genres.

Correlation and Regression Results

The Table 3 displays the Pearson correlation coefficients between self-directed learning scores and excessive media use, as well as between lifelong learning tendencies and educational content use.

Table 3. Correlations Between SDL and Lifelong Learning Scores and Digital Engagement Variables

Variables	r value	p value
SDL Score vs. Excessive Media Use	-0.38	< 0.01
Lifelong Learning Tendency vs. Educational Content Use	+0.42	< 0.01

Correlational analysis revealed a moderate negative relationship between SDL scores and excessive digital media use ($r = -0.38$, $p < 0.01$), suggesting that students with higher self-regulation skills were less likely to engage in unstructured or time-intensive online behaviors. Conversely, a positive relationship ($r = 0.42$, $p < 0.01$) was found between lifelong learning tendencies and selective digital use, such as accessing educational content via streaming or productivity apps.

Regression analysis indicated that digital engagement behavior significantly predicted SDL scores ($\beta = -0.31$, $p < 0.05$), particularly in dimensions related to attention control and goal setting. Socioeconomic background and gender did not significantly moderate this relationship, but academic year showed a small effect, with third-year students demonstrating better digital self-discipline.

Interpretation of Findings

These findings reinforce the notion that SDL is not merely a cognitive skill set but a behavioral framework essential for navigating digital complexity in academic and professional settings. In the context of business and marketing education, these insights point to the strategic importance of developing SDL competencies to prepare students for the demands of digital workplaces and lifelong learning in rapidly evolving industries.

Limitations and Future Research

This study has several limitations. First, the sample was limited to students from a single medical faculty, restricting the generalizability of the results. Second, data were based on self-reports, which may be affected by social desirability bias. Third, while the model emphasized behavioral aspects of SDL and digital engagement, it excluded psychological variables such as academic stress and motivation. Future research could explore factors like stress regulation and motivation as potential moderators or mediators to better explain the dynamics between SDL and digital engagement in higher education.

CONCLUSION

This study examined how SDL, lifelong learning, and digital engagement interact in today's dynamic academic landscape. Findings show that students with higher SDL and intrinsic motivation manage their digital behaviors more effectively and are more resilient to distraction and overuse. SDL emerges as a protective factor in navigating digital complexity and maintaining focus (Garrison, 1997; Brockett & Hiemstra, 1991). Its negative relationship with digital over-engagement—particularly in goal-setting and self-monitoring—supports research linking excessive screen time to impaired learning (Chen et al., 2021; Lin & Hassan, 2025). Students high in lifelong learning tend to use digital tools strategically, reducing risks of dependency (Ifenthaler & Yau, 2020).

These results suggest that SDL is not merely a personal trait, but a strategic academic and behavioral competency. Its development is essential for managing digital demands, especially in remote and tech-enhanced learning environments. Moreover, by linking SDL to structured digital engagement, the study identifies key behavioral foundations of digital fluency—a vital skill for future-ready graduates. These insights inform curriculum design, learner analytics, and talent development strategies in institutions embracing digital transformation.

Embedding SDL and digital literacy early in university curricula can improve students' self-regulation and purposeful engagement with digital tools. In turn, institutions can nurture adaptable, motivated learners who are academically resilient and prepared for evolving digital work environments.

Theoretical Implications

This study offers a theoretical contribution by integrating SDL and digital engagement into a unified behavioral-academic model, reflecting both cognitive and behavioral aspects of learner development. It moves beyond prior research that treated these constructs separately by positioning SDL as a mediating orientation that enables students to manage digital complexity while remaining autonomous.

The findings align with existing self-regulated learning theories (Brockett & Hiemstra, 1991; Garrison, 1997), revealing that SDL correlates negatively with unregulated digital use and positively with goal-aligned engagement. This dual pattern reinforces the role of SDL as both a personal strategy and a measurable form of behavioral regulation.

By incorporating lifelong learning, the model extends SDL theory toward long-term adaptability and career readiness—areas often overlooked in research on digital literacy and self-regulation. The framework also supports future interdisciplinary research across educational psychology, digital behavior, and higher education strategy. For instance, digital self-regulation could be studied in relation to motivational traits (e.g., grit, self-efficacy) or embedded into learning analytics for adaptive student support. Overall, the model positions SDL as a foundation for digital fluency and cognitive flexibility in business, marketing, and innovation-driven education.

Practical Implications

Building on these theoretical insights, the following section outlines practical implications for curriculum design, educational leadership, and institutional innovation. From an applied perspective, the findings offer clear and actionable guidance for educators, curriculum developers, and talent strategists operating within digitally intensive learning environments.

Business and marketing programs should move beyond technical training to intentionally foster behavioral competencies such as self-regulation, digital discipline, and autonomous learning. These skills are essential not only for academic success but also for employability in dynamic work environments. Accordingly, curricula should include structured goal-setting, digital self-assessments, and reflective practices to strengthen SDL from the first year.

Importantly, digital engagement patterns—especially those involving unstructured screen time, habitual multitasking, or passive browsing—should be treated as early behavioral indicators of potential academic disengagement. Universities can proactively address these risks through digital wellness initiatives, SDL coaching programs, and peer-led workshops that promote healthy and goal-oriented digital behaviors. These interventions may also benefit from integration into student advising systems and learning analytics dashboards, allowing for timely, personalized support.

At a broader institutional level, the study's findings support a strategic shift toward behavioral data-informed education planning. Behavioral analytics and cognitive profiling—when applied ethically—can help universities not only track academic progress but also monitor and shape students' digital habits over time. This opens the door to more dynamic and responsive student development systems.

For industry and human resource professionals, the SDL-digital engagement framework offers a useful lens to identify and develop high-potential talent. As digital transformation reshapes organizational roles, there is growing value in employees who are not only tech-savvy but also capable of managing their learning trajectories independently, sustaining focus amid distraction, and demonstrating behavioral agility in virtual workspaces.

Overall, the findings underscore the need for academic institutions and industry partners alike to treat SDL as a core pillar of digital readiness and workforce resilience—critical attributes for thriving in volatile, tech-driven environments.

Acknowledgment

The authors would like to express their sincere gratitude to the undergraduate students Ayşegül Çil, Muhammed Sait Han, Namık Amirov, Oğuzhan Tekin, and Vesile Beyaz from Gaziantep University Faculty of Medicine for their significant contributions to the data collection process. Additionally, the authors would like to thank TÜBİTAK for funding part of the research through the 2209-A University Students Research Projects Support Program.

REFERENCES

- Aditia, R., Thamrin, T., & Afrianti, N. (2023). Distraksi digital atau pengayaan belajar? Peran screen time terhadap self-regulated learning pada sampel mahasiswa di Indonesia. *Jurnal Ilmiah Mahasiswa Pendidikan Ekonomi*, 5(1), 54–63.
- Anderson, J. (2025). Student engagement through personalized learning in urban high schools (Doctoral dissertation, Northeastern University).
- Aşkın, C. (2015). The relationship between lifelong learning tendencies and self-directed learning skills of university students [Unpublished master's thesis, Gazi University]. In Turkish.
- Brockett, R. G., & Hiemstra, R. (1991). *Self-direction in adult learning: Perspectives on theory, research, and practice*. Routledge.
- Candy, P. C. (1991). *Self-direction for lifelong learning: A comprehensive guide to theory and practice*. Jossey-Bass.
- Cazan, A. M., & Schiopca, B. A. (2014). Self-directed learning, personality traits and academic achievement. *Procedia - Social and Behavioral Sciences*, 127, 640–644.
- Chen, Y., Sun, X., & Feng, Y. (2021). Excessive use of mobile social networking sites and academic burnout among college students: A moderated mediation model. *Computers in Human Behavior*, 114, 106576. <https://doi.org/10.1016/j.chb.2020.106576>
- Diker, A. (2009). Self-directed learning skills and learning styles of pre-service teachers [Unpublished master's thesis, Hacettepe University]. In Turkish.
- Guglielmino, L. M. (2008). Why self-directed learning? *International Journal of Self-Directed Learning*, 5(1), 1–14.
- Hussain, I., Ahmed, R., & Lee, K. (2024). Investigating the role of digital self-efficacy and innovative learning environments in shaping students' academic resilience. *International Journal of Innovation and Technology Management*, 21(8), 2450052. <https://doi.org/10.1142/S0219877024500524>
- Ifenthaler, D., & Yau, J. Y.-K. (2020). Utilization of learning analytics to support study success in higher education: A systematic review. *Educational Technology Research and Development*, 68(4), 1961–1990. <https://doi.org/10.1007/s11423-020-09753-z>
- Jain, A., & Hyde, A. M. (2020). Factors contributing to digital dependency among students for e-learning in tough times during COVID-19. *Prestige International Journal of Management and Research*, 13R(1), 56–63.
- Kaya, T., Yılmaz, M., & Demir, A. (2023). University students' technology use and digital literacy in Turkish higher education: A nationwide survey. *Turkish Online Journal of Educational Technology*, 22(1), 45–58. [In Turkish].
- Kim, H. J., Hong, A. J., & Song, H. D. (2018). The relationships of family, perceived digital competence and attitude, and learning agility in sustainable student engagement in higher education. *Sustainability*, 10(12), 4635.
- Lee, J., Park, H., & Kim, S. (2023). Digital competence and learning strategies in higher education: A comparative study. *Computers & Education*, 190, 104606. <https://doi.org/10.1016/j.compedu.2022.104606>
- Lin, S., & Hassan, A. (2025). Digital self-regulation in higher education: Strategies to mitigate screen fatigue. *International Journal of Educational Technology in Higher Education*, 22(1), 1–17.
- Martinez, L., Huang, Y., & Smith, K. (2023). Digital multitasking and academic performance among university students: Behavioral patterns and outcomes. *Journal of Educational Computing Research*, 61(2), 205–223.

- Murphy, S. M. (2021). Learning agility and its applicability to higher education (Doctoral dissertation, Teachers College, Columbia University).
- Ng, W. (2021). Exploring the use of digital tools and technologies for teaching and learning in higher education. *Education and Information Technologies*, 26(3), 3215–3233. <https://doi.org/10.1007/s10639-020-10430-2>
- Xu, Y., Liu, Y., Wang, X., & Du, X. (2025). Technology readiness and digital competence in higher education: A pathway to learning engagement and performance. *International Journal of Innovation and Technology Management*, 22(1), 2550002. <https://doi.org/10.1142/S0219877025500026>
- Zafar, M. B., Abu-Hussin, M. F., & Sulaiman, A. A. (2025). Digital distractions and work-leisure balance: Excessive information through digital consumption and its impact on work ethic among Muslims. *International Journal of Ethics and Systems*, 41(1), 195–212.

THE LEVEL OF ARTIFICIAL INTELLIGENCE USAGE AMONG THE STUDENTS OF MANAGEMENT INFORMATION SYSTEMS DEPARTMENT

Kaan Hasan Kalkan

Ankara Yıldırım Beyazıt University, Ankara, Türkiye, kalkankaanhasan@gmail.com
<https://orcid.org/0009-0006-2419-4163>

Mehmet Naci Efe

Istanbul Beykent University, İstanbul, Türkiye, naciefe@beykent.edu.tr

Simge Çoşkun

Burdur Mehmet Akif Ersoy University, Burdur, Türkiye, scoskun@mehmetakif.edu.tr

Bahadır Hamza Gül

Burdur Mehmet Akif Ersoy University, Burdur, Türkiye, bgul@mehmetakif.edu.tr
<https://orcid.org/0009-0004-1039-5197>

ABSTRACT

The rapid development of Artificial Intelligence (AI) has recently deeply affected higher education, as it has many sectors. While AI offers many transformative opportunities, it also raises significant concerns.

Especially, in the last decade, significant progress has been made in the field of artificial intelligence. These advances have made artificial intelligence a new technology with potential importance in the field of higher education. It will play an important role in both teaching and learning processes in the near future. Therefore, this study aims to determine the level of artificial intelligence usage among university students studying Management Information Systems (MIS). For this purpose, an online and face-to-face survey was conducted among MIS students. The survey aims to measure the level of artificial intelligence usage of MIS students. Our primary goal with this research is to understand the level of artificial intelligence usage of MIS students. In this study, the use of Artificial Intelligence among 188 students studying in the Management Information Systems departments of Ankara Yıldırım Beyazıt and Burdur Mehmet Akif Ersoy universities in Turkey was investigated.

KEYWORDS

Artificial intelligence, management information systems (MIS), AI in education, MIS students

INTRODUCTION

The 21st century is considered the age of technology. Technology transforms the way students learn, making education more interactive, efficient and accessible. Modern tools such as the internet have significantly improved learning by providing constant connectivity and interactive visual aids. Students can now easily access educational resources online. Digital media has revolutionized the education sector, providing access to support and learning platforms at any time of the day. In addition, the increase in online speed and capacity has made education more flexible and accessible, allowing students to receive various trainings through digital platforms. This technological change in education is constantly increasing and is reshaping the way students learn and interact with academic materials (Sublime and Renna, 2024: 3).

Artificial intelligence is a branch of science that aims to develop algorithms and systems that think similarly to humans and imitate human intelligence. It is used to solve complex problems and analyze large data sets with its sub-disciplines such as image and speech recognition, deep learning, natural language processing and machine learning. Machine learning algorithms that learn on their own based on experience without requiring reprogramming with various problem-solving techniques form the basis of Artificial Intelligence applications. In this direction, Artificial Intelligence systems are designed to operate autonomously at different levels (Telli & Aydın, 2025:139).

Today, many technologies and innovations increase access to information, affecting many sectors as well as education, forcing higher education to transform in particular. In the past, significant developments such as the emergence of writing and the invention of the printing press, as well as the recent emergence of the internet and artificial intelligence, are developments that can be considered revolutionary. While writing, printing and the internet primarily make information more accessible, artificial intelligence also provides various additional functions such as translation, summarization, simplification of complex information, advanced writing capabilities for structuring and editing content. These technologies can be likened to inventions that support cognitive processes, such as calculators and computers, which greatly reduce people's need for mental arithmetic in computation and reduce their mental mathematical capacity.

Although artificial intelligence has produced productive results, its impact on education and especially higher education is a subject worth investigating. While delegating cognitive tasks to artificial intelligence is not a problem for educated adults, the use of artificial intelligence for basic tasks such as critical thinking, summarizing and logic by university students also raises some concerns. Today, artificial intelligence, especially ChatGPT, is widely used by students in universities. While the controlled use of artificial intelligence for educational purposes and customized programs offer some opportunities for students with learning disabilities and education, they also carry some risks: Unsupervised and extensive use of these tools can lead to a decrease in basic cognitive skills or a weakness in basic knowledge.

Although artificial intelligence has produced productive results, its impact on education and especially higher education is a subject worth investigating. Although delegating cognitive tasks to artificial intelligence is not a big deal for educated adults, university students' use of artificial intelligence for basic tasks such as critical thinking, summarizing, and logic also raises some concerns (Sublime and Renna, 2024: 2-3).

Today, artificial intelligence, especially ChatGPT, is widely used by students at universities. While the controlled use of artificial intelligence for educational purposes and customized programs offer some opportunities for students with learning disabilities and education, they also carry some risks: Unsupervised and extensive use of this technology may lead to a decrease in basic cognitive skills or a weakness in basic knowledge.

Information technologies play four basic roles as an important part of education, as a tool for teaching presentation, as a way to support teaching, and as a means to enhance the overall learning experience. Technological developments have made education more interactive and engaging. While education serves the purposes of improving students' performance, encouraging curiosity and critical thinking, technology also helps students grasp and remember concepts more effectively. In this context, teachers need to adapt to new technologies that intensify educational needs due to the rapid expansion of knowledge and the increasing role of technology in education (Sublime and Renna, 2024: 4).

Information technologies facilitate the acquisition and understanding of information for students by encouraging various learning approaches. Information technologies also enhance the learning experience by encouraging participation, collaboration, creativity and critical thinking. Technologies used in education provide a more exciting and engaging learning experience for students, allowing them to work from home. In addition, these technologies help students develop valuable technology skills that will benefit them in the workplace, and contribute to environmental sustainability by reducing the need for paper and photocopies. However, it has also been shown that the widespread use of technology in education can hinder students' imagination and reduce their critical thinking abilities. Long-term screen use and media multitasking also cause negative health problems. In light of all these developments, especially in recent years, information technologies, artificial intelligence, virtual reality, game-based online learning, educational analytics and robot technologies have led to radical changes and transformations in education (Sublime and Renna, 2024: 4-5).

While AI technologies can be seen as useful for supporting struggling students, there is also concern that students may rely on these technologies to do any schoolwork, significantly jeopardizing their learning process and the potential for misinformation and compromised academic integrity. AI technologies support the learning process in various ways and to a significant extent. Students use this technology as a virtual smart assistant, for instant feedback, on-demand answers, and easy access to educational resources. AI technologies, which are particularly effective in developing writing and language skills, help students generate ideas, write essays, summarize, translate, rephrase texts, and check grammar. In addition, these technologies facilitate personalized and guided learning, helping them understand concepts, complete assignments, create structured learning plans, and clarify assignments.

On the other hand, findings suggest that over-reliance on AI technologies can reduce students' creativity and collaborative learning. This over-reliance on technology to find quick answers can hinder students' critical thinking and problem-solving skills, as students may avoid engaging in-depth or exploring alternative solutions. This problem is particularly evident in group projects, where students often turn to AI technologies individually rather than brainstorming and collaborating with peers, which negatively impacts teamwork. Additionally, the integration of AI technologies into education has raised broader concerns, such as the risk of false or misleading information, unequal access, academic integrity challenges, and potential misuse of technology (Sublime and Renna, 2024: 7-8).

Artificial intelligence (AI) has become one of the most effective digital transformation tools of our time. The use of these technologies is rapidly increasing in many areas, from education to health, from public administration to the finance sector (Russell & Norvig, 2021). Management Information Systems (MIS) departments play an important role in this transformation with their structures that bridge technology and business. In this context, determining the knowledge, attitude and usage levels of MIS students regarding artificial intelligence is of critical importance both for their individual professional development and for the digital transformation competence of institutions. This study aims to provide quantitative data on the AI awareness, usage areas and technical skills of MIS students.

The integration of AI into education has been a transformative force that is reshaping traditional learning paradigms and providing innovative solutions to enhance the educational experience. As technology evolves, university students find themselves at the forefront of a dynamic era where AI applications are increasingly becoming an integral part of the learning process. Understanding the situations of these students regarding the use of AI applications in education is crucial to measuring

the impact and effectiveness of these tools in shaping the future of university education (Almeqdadi and Shadifat, 2024:62).

AI has emerged as a growing resource in education. Advances in large language models (LLMs) have improved the ability of AI technology to understand and answer academic queries, increasing their adoption in educational settings and generating more research interest. Open online models such as OpenAI's ChatGPT, Google's Gemini, and Microsoft's Copilot have become widely used among students due to their free access and ease of use. Nearly a third of students (35.4%) reported using AI regularly, while 47% expressed concerns about the impact of AI in education. Additionally, 60% reported that their instructors or schools have not yet provided guidelines for ethical or responsible AI tool use (Pitts et. al., 2025:1-2).

In late fall 2022, the emergence of ChatGPT (generative pre-trained transformer) introduced by OpenAI has attracted great attention in society and education. The use of ChatGPT in education will be a potential tool to support students' personalized learning and increase students' engagement in the blended learning environment (Park & Doo, 2024:165).

The benefits of AI in education extend to both students and educators. These technologies support learning by providing detailed explanations of concepts through intelligent course support. In addition to explanations, they can provide instant feedback on students' work, allowing for faster improvement and iterative learning. These technologies also show potential to support personalized learning. Studies have also highlighted the potential of AI to foster creativity through idea generation, overcome language barriers for students through multilingual content translation, and democratize education by providing continuous access to educational support and resources regardless of time or geographic constraints (Pitts et al., 2025:2). In this context, we wanted to reveal the "level" of use of artificial intelligence by Management Information Systems students studying at Ankara Yıldırım Beyazıt and Burdur Mehmet Akif Ersoy universities.

This study aims to measure the level of the usage of artificial intelligence tools among university students and to identify the most frequent application types of these tools. It also aims to present some suggestions for adapting higher education strategies to effectively utilize artificial intelligence tools. In this context, our main research questions are *How often are AI tools used among college students? (1) and What are the types of AI applications commonly used among university students? (2)*

This article is organized as follows: In the Introduction section, the impact of artificial intelligence technologies on higher education is attempted to be revealed. In the Methodology section, the applied methodology is presented: the proposed survey, the demographics of the participants and the statistical tools used to interpret the results. In the Results section, the results are presented and interpreted. Finally, the study ends with a conclusion and a discussion on future perspectives.

METHODOLOGY

Artificial Intelligence (AI) refers to the simulation of human intelligence processes by machines, especially computer systems, that involve learning, reasoning, and self-correction. These processes allow machines to acquire knowledge, apply rules to reach conclusions, and improve performance through feedback and correction. In the context of education, Artificial Intelligence technologies contribute significantly to creating personalized and dynamic learning experiences. For example, Artificial Intelligence can adapt education to student needs and provide individualized support and feedback (Meylani, 2024:601).

In today's world, Artificial Intelligence (AI) has become an integral part of education and higher education. The impact of AI usage on academic performance among university students is becoming an increasingly interesting topic in educational research. Therefore, understanding the impact of AI on university student performance is of great importance. The status of AI usage among university students also reveals significant differences that are influenced by demographic and educational factors (Moosa et al., 2024: 164).

An Austrian study on AI acceptance in education found that almost 50% of students and 75% of teachers rated the opportunities for using AI higher than the potential risks. Furthermore, the study by Bećirović et al. showed that 49.7% of participants expect AI applications to increase their ability to achieve learning goals. This study showed that 73% of Austrian students feel generally competent in using AI in 2024. However, Brandlhofer and Tengler (2024) stated that although a large number of students are enthusiastic about the ability of AI to support their learning, more than 45% do not trust the output of AI applications. This is underlined by the fact that in Austria, the implementation and integration of AI tools into educational processes is still met with skepticism. 80% of Austrians are very concerned about future AI developments, especially regarding generative AI tools such as ChatGPT. These conflicting perspectives highlight the need for more comprehensive and detailed research and analysis on AI literacy and its impact on academic achievement. Furthermore, further research is needed to explain in detail the findings on the level of use of AI-enabled tools by students and their impact on students' academic performance (Bećirović et al., 2025:2-3).

In this study we aim to identify the current status of artificial intelligence usage and the level of artificial intelligence usage for university students. The study, a field survey using survey forms were conducted for analysis. Students studying in Management Information Systems (MIS) departments at Ankara Yıldırım Beyazıt (AYBU) and Burdur Mehmet Akif Ersoy (MAKU) Universities in Türkiye were chosen as the research population. Randomly selected 188 undergraduate students studying in the MIS departments of two different state universities in Türkiye were taken as the sample of the research. The number of students registered to MIS at AYBU is 240 (population) and the number of students registered to MIS at MAKU is 398 (population) in 2025. The rate of randomly selected sampling is 46.3% (111 students) for AYBU, 19.3% (77 students) for MAKU and totally 29.5% (188 students in 638 students). Analysis has been carried out using data which were obtained from the students in universities by using a survey form. The students from each class were chosen for the survey. While the survey forms were applied face to face to AYBU students, they were applied to MAKU students using the Google survey form. The survey form used in the research consists of three main sections. Demographic information, current status of using artificial intelligence by students and artificial intelligence usage levels of students. The survey forms consisted of 35 items belonging to three sets of questions. The first set measured the demographic information about students. The second set of questions measured the current status of students' use of artificial intelligence. The third set of questions measured students' artificial intelligence usage levels. For a total of 188 views respondents were asked, on a five-point scale rating from "1: never use" to "5: use a lot" to determine their levels of usage in artificial intelligence.

The collected data from those 188 survey forms were analyzed through the IBM SPSS 30 statistical package program. Before starting the test, it was checked whether there were any extreme values and missing data; no extreme values were found, but the missing data detected were completed with the "nearby points" method. Then descriptive statistics test was applied to data in order to obtain descriptive information about the participants. Descriptive statistics (frequency, percentage, mean) and tables were used. The information about description values of students obtained from the

test results are given in Table 1, Table 2, and Table 3. When the distribution of participants according to age groups was examined, it was seen that 21.3% of the participants were in the 21 age group.

Table 1. Frequencies about age of participants

Age	Frequency	Percent	Cum. Percent
18	6	3.2	3.2
19	18	9.6	12.8
20	32	17.0	29.8
21	40	21.3	51.1
22	31	16.5	67.6
23	31	16.5	84.0
24 and above	30	16.0	100,0
Total	188	100	

When the distribution of participants according to gender groups was examined, it was seen that 51.6% of the participants are female, 48.4% are male.

Table 2. Frequencies about gender of participants

Gender	Frequency	Percent	Cum. Percent
Male	91	48.4	48.4
Female	97	51.6	100
Total	188	100	

When the distribution of the participants according to their class was examined, it was seen that 28.2% of the students were first-year students and 28.2% were fourth-year students.

Table 3. Frequencies of students' class

Grade	Frequency	Percent	Cum. Percent
1 st class	53	28.2	28.2
2 nd class	46	24.5	52.7
3 rd class	36	19.1	71.8
4 th class	53	28.2	100
Total	188	100	

When the duration of participants' use of artificial intelligence is taken into account, 42.5% of the students stated that they have been using artificial intelligence for more than 2 years. The rate of those who have been using it for 2 years is 31.4% and the rate of those who have been using it for less than 1 year is 10.1%.

Table 4. Frequencies of artificial intelligence usage duration

AI usage duration	Frequency	Percent	Cum. Percent
Less than 1 year	19	10.1	10.1
1 year	30	16.0	26.1
2 years	59	31.4	57.5
More than 2 years	80	42.5	100
Total	188	100	

When the frequency of participants' use of artificial intelligence technologies is taken into consideration, 46.8% of the students stated that they use artificial intelligence technologies very often, 30.9% stated that they use them, 19.1% stated that they use them occasionally, and 3.2% stated that they rarely use them.

Table 5. Frequencies of use of artificial intelligence technologies

Frequency of AI usage	Frequency	Percent	Cum. Percent
I rarely use it	6	3.2	3.2
I use it occasionally	36	19.1	22.3
I use it	58	30.9	53.2
I use it very often	88	46.8	100
Total	188	100	

When the participants' level of use of artificial intelligence technologies is taken into consideration, 35.6% of the students stated that they use artificial intelligence technologies, 30.9% stated that they use them a lot, 25.5% stated that they use them moderately, 7.4% stated that they use them a little, and 0.5% stated that they do not use them at all.

Table 6. Frequencies of artificial intelligence usage level

AI usage level	Frequency	Percent	Cum. Percent
Never use	1	0.5	0.5
Somewhat use	14	7.4	8
Moderate use	48	25.5	33.5
Use	67	35.6	69.1
Use a lot	58	30.9	100
Total	188	100	

Considering the application types of artificial intelligence technologies used by the participants, the results obtained are given in Table 7.

Table 7. AI application types usage levels

Types of AI applications	<i>Never Use-1</i>		<i>Somewhat Use-2</i>		<i>Moderate Use-3</i>		<i>Use-4</i>		<i>Use a lot-5</i>		μ	σ
	f	%	f	%	f	%	f	%	f	%		
research	3	1.6	23	12.2	16	8.5	42	22.3	104	55.3	4.18	1.12
general learning purposes	6	3.2	21	11.2	26	13.8	39	20.7	96	51.1	4.05	1.18
algorithm & programming	9	4.8	32	17.0	26	13.8	46	24.5	75	39.9	3.78	1.27
summary creation	10	5.3	31	16.5	24	12.8	50	26.6	73	38.8	3.77	1.27
translation	16	8.5	32	17.0	19	10.1	53	28.2	68	36.2	3.66	1.34
writing a project	11	5.9	34	18.1	34	18.1	52	27.7	57	30.3	3.59	1.25
text creation	14	7.4	28	14.9	35	18.6	66	35.1	45	23.9	3.53	1.22
homework preparation	13	6.9	39	20.7	29	15.4	52	27.7	55	29.3	3.52	1.29
presentation & slide prep.	26	13.8	34	18.1	32	17.0	46	24.5	50	26.6	3.32	1.40
academic editing tools	22	11.7	44	23.4	36	19.1	41	21.8	45	23.9	3.23	1.36
counseling	31	16.5	35	18.6	31	16.5	44	23.4	47	25.0	3.22	1.43
chatbots	32	17.0	34	18.1	33	17.6	43	22.9	46	24.5	3.20	1.43
taking note	29	15.4	39	20.7	36	19.1	41	21.8	43	22.9	3.16	1.39
math. operations & analysis	32	17.0	40	21.3	33	17.6	49	26.1	34	18.1	3.07	1.37
Writing an article	43	22.9	43	22.9	35	18.6	30	16.0	37	19.7	2.87	1.44
grammar checkers	39	20.7	45	23.9	32	17.0	47	25.0	25	13.3	2.86	1.36
literature search	49	26.1	36	19.1	34	18.1	34	18.1	35	18.6	2.84	1.47
image processing	56	29.8	48	25.5	30	16.0	32	17.0	22	11.7	2.55	1.38
time management	66	35.1	49	26.1	26	13.8	16	8.5	31	16.5	2.45	1.46
video creation	80	42.6	50	26.6	25	13.3	18	9.6	15	8.0	2.14	1.28
automation	86	45.7	47	25.0	28	14.9	16	8.5	11	5.9	2.04	1.22
sound and music production	107	56.9	37	19.7	19	10.1	14	7.4	11	5.9	1.86	1.22
3D modeling	125	66.5	32	17.0	18	9.6	9	4.8	4	2.1	1.59	0.99

With the results of this study, the most frequently used types of AI application by students were described as research, general learning purposes, algorithm & programming, summary creation, translation, writing a project, text creation, homework preparation, presentation & slide preparation, academic editing tools, counseling, chatbots, taking note and mathematical operations & analysis.

RESULTS

Today, the availability and quality of AI-supported tools have increased significantly, and these technologies are increasingly used in educational fields. Many university students experience the effects of AI tools in their educational processes. These experiences also affect students' general development, including personal, cognitive and moral dimensions. Therefore, effective and responsible use of AI tools and increasing AI literacy allow university students to gain a competitive advantage in the ever-growing digital environment (Bećirović et al., 2025:1-2).

While some previous studies have indicated that relying on AI-powered tools negatively impacts student performance, other studies argue that well-founded AI tool use positively supports student performance. High AI literacy has been found to be associated with greater engagement with AI tools for learning purposes. This leads to better learning outcomes, improved academic performance, and greater student satisfaction due to individualized AI-powered adaptive learning. AI-powered tools can support students in many areas, from simple information search to interactive exchanges that allow for individualized and personalized learning experiences, and can provide support in various areas such as research, writing, and design (Bećirović et al., 2025:2).

The most frequently used AI-based tools were ChatGPT (78%), GitHub Copilot (17%), Google Bard (22%), and Midjourney (11%). Their usage purposes were as follows: Academic content creation (65%), Code writing or completion (33%), Visual production (11%), and Question answering and learning support (44%).

According to the findings of the research, it has been determined that Management Information Systems department students use artificial intelligence tools for the purposes of research, general learning purposes, algorithm & programming, summary creation, translation, writing a project, text creation and homework preparation. Secondly, it was determined that the students of the Management Information Systems department students moderately used presentation and slide preparation, academic editing tools, counseling, chatbots, taking note, math operation & analysis, writing an article, grammar checkers and literature search. Moreover, it was concluded that the students slightly used the image processing, time management, video creation, automation, audio and music production features of Artificial Intelligence. Furthermore, it was concluded that students never used 3D modeling at all in their use of artificial intelligence. Finally, these results obtained from the management information systems department students have shown that the students mostly use or moderately used artificial intelligence in academic studies related to their own departments and in line with the needs of the IT sector, however it is never used or is slightly used for engineering purposes such as design issues and 3D modeling, which are less relevant to the management information systems department.

CONCLUSION

A study on the use of AI-based tools among higher education students in Slovenia was conducted by Doe and Smith. This study addressed how students can contribute to sustainable educational processes by using AI technologies responsibly and effectively (Doe & Smith, 2025).

The study, conducted by Rossi & Dupont in France and Italy, examined how frequently students between the ages of 13 and 25 use large language models such as ChatGPT and their views on these tools. While the research reveals that these technologies are widely used, it also highlights some risks, such as a lack of critical thinking, especially among young users (Rossi & Dupont, 2024).

Pitts et al. (2025) reported in their study in the USA that students were concerned about the effects of AI chatbots on information accuracy and academic honesty, which posed risks to critical thinking skills. Chan and Hu's (2023) study in Hong Kong showed that students found AI useful in terms of personalized learning and research support, but had reservations about privacy and ethical challenges.

Keuning et al. (2024) found that computer science students frequently used AI tools in programming tasks and that this use developed over time. Almeqdad and Al Shadifat (2024) found that science students in Jordan used AI applications to provide benefits such as personalized learning, but also had concerns such as data privacy and algorithmic biases. Moosa et al. (2025) showed that AI literacy in the Maldives had positive effects on students' perceptions of academic performance.

Tierney et al. (2025) in their study in the United Kingdom stated that students evaluated the teaching and learning experiences of AI in terms of positive and negative aspects and had various views towards this technology. Marshik et al. (2024) revealed that students and faculty members generally had similar views on the benefits and harms of AI in education, but there were some important differences between perceptions.

It can be recommended to implement more comprehensive AI literacy programs, integrate AI-focused curricula into teaching plans, and establish support systems for the effective use of AI in universities.

To address students' concerns about academic integrity and information reliability, universities should set policies regarding the use of AI. Universities can effectively develop and implement educational systems by leveraging the potential of AI in areas such as instant feedback and personalized learning support. In addition to these, it should not be ignored that the direct use of the outputs obtained through the use of artificial intelligence in the academic world can cause plagiarism and this can lead to ethical problems, and students should be taught how to review literature studies and type correct bibliography notation on this subject and students should be given ethical awareness. Thus, universities can enhance the quality of students' educational experiences while preserving the integrity and accuracy of the learning process with AI.

It is recommended to increase the number of AI and data science-based applied courses in the curriculum, to direct students to open source projects and hackathons, to increase internship and project opportunities through university-industry collaborations, and to support individual AI projects with academic consultancy.

REFERENCES

- Almeqdadi, F. & Al Shadifat, T. (2024). The perceptions of science students on artificial intelligence applications: Benefits and concerns. Brill Academic Publishers.
- Almeqdadi, F. & Shadifat, K. A. (2024). Perceptions of scientific college students about using AI applications in Education. *J. of Science of Learning and Innovations*, (1), p.61-89.
- Aydın, Ö. (2022). Üniversite öğrencilerinin yapay zekâ teknolojilerine yönelik tutumları. *Eğitim Teknolojileri Dergisi*, 10 (1), p. 45-60.
- Bećirović, S., Polz, E. & Tinkel, I. (2025). Exploring students' AI literacy and its effects on their AI output quality, self-efficacy, and academic performance. *Smart Learning Environments*, 2025, 12 (29), p.1-25. <https://doi.org/10.1186/s40561-025-00384-3>
- Chan, T. & Hu, L. (2023). Personalized learning and ethical considerations in artificial intelligence: Insights from Hong Kong students. *arXiv Preprint*.
- Davenport, T. H., & Ronanki, R. (2018). Artificial intelligence for the real world. *Harvard Business Review*, 96 (1), p. 108-116.
- Doe, J. & Smith, A. (2025). Perceptions of artificial intelligence among university students in Slovenia. *J. of Educational Technology*, 12 (3), p. 45–67.
- Jaiteh, D., Smith, L. & Oliveira, R. (2024). University students' perceptions of artificial intelligence: Opportunities and challenges. *J. of Higher Education Research*, 12 (4), p. 325-342.
- Keuning, H., van der Meer, L. & Bouwmeester, M. (2024). Adoption and evolution of AI tools among computer science students. *arXiv Preprint*.
- Marshik, S., Thompson, G. & Quinn, A. (2024). Student and faculty perceptions of artificial intelligence in education: A comparative study. *International J. of Educational Technology*, 29 (2), p. 142-158.
- Meylani, R. (2024). Artificial intelligence in the education of teachers: A qualitative synthesis of the cutting-edge research literature. *J. of Computer and Education Research*, 12 (24), ISSN: 2148-2896. Oct. 2024, p.600-637. <https://doi.org/10.18009/jcer.1477709>
- Moosa, D., Bozkurt, V., Reesha, A. & Shina, A. (2024). The effects of artificial intelligence (AI) literacy and use on students' perceptions of academic performance in the Maldives. *J. of Information Economics and Man*.

(Bilgi Ekonomisi ve Yönetimi Dergisi-BEYDER), V.19, No.2, p.163-174. Doi: 10.54860/beyder.1606467.

- Moosa, F., Nasheed, A. & Shareef, R. (2025). The impact of AI literacy on students' academic performance perceptions. Home Academic Press.
- Park, Y. & Doo, M. Y. (2024). Role of AI in blended learning: A systematic literature review. *Int. Review of Research in Open and Distributed Learning*, Feb. 2024, 25 (1), p. 164-196.
- Pitts, G., Marcus, V. & Motamedi, S. (2025). Student perspectives on the benefits and risks of AI in education. May 4, 2025. <https://doi.org/10.48550/arXiv.2505.02198>, arXiv:2505.02198v1
- Pitts, D., Morrison, J. & Carter, A. (2025). Student concerns about academic integrity and AI chatbots. *Educational Psychology Review*, 37 (1), p. 22-39.
- Rossi, M. & Dupont, L. (2024). Usage of large language models like ChatGPT among young students in France and Italy. *European J. of Digital Education*, 10 (2), p. 89–102.
- Russell, S. & Norvig, P. (2021). *Artificial intelligence: A modern approach*. (4th ed.). Pearson.
- Sublime, J. & Renna, I. (2024). Is ChatGPT massively used by students nowadays? A survey on the use of large language models such as ChatGPT in educational settings. Dec23, 2024. DOI:10.48550/arXiv.2412.17486. arXiv:2412.17486v1
- Sublime, J. & Renna, M. (2024). The use of large language models by young students: A cross-national survey in France and Italy. *J. of Digital Learning*, 18 (3), p. 112-128.
- Telli, S. G. & Aydın, S. (2025). The use of artificial intelligence in universities: Transformations, returns and preparation for the future (Üniversitelerde yapay zekânın kullanımı: Dönüşümler, getiriler ve geleceğe hazırlık). *J. of University Research*, 2025, 8 (1), p. 139-148. <https://doi.org/10.32329/uad.1609305>
- Tierney, K., Goldsmith, E. & Watson, P. (2025). The role of artificial intelligence in teaching & learning: Student perspectives in the UK. *British Journal of Educational Research*, 48 (1), p. 56-74.

Statements & Declarations

The authors declare that no funds, grants, or other support were received during the preparation of this manuscript. The authors have no relevant financial or non-financial interests to disclose. All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by [Kaan Hasan Kalkan], [Mehmet Naci Efe], [Simge Çoşkun] and [Bahadır Hamza Gül]. The first draft of the manuscript was written by [Kaan Hasan Kalkan] and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

NAVIGATING THE DIGITAL TRUSTSCAPE: A SYSTEMATIC REVIEW OF ONLINE REVIEWS AND REVIEW AUTHENTICITY

Fatma Pelin Erel

Tekirdağ Namik Kemal University, Tekirdağ, Türkiye, psucuoglu@nu.edu.tr
<https://orcid.org/0000-0003-2393-8096>

Yasemin Oraman

Tekirdağ Namik Kemal University, Tekirdağ, Türkiye, yoraman@nku.edu.tr
<https://orcid.org/0000-0001-6776-7861>

ABSTRACT

As digital shopping gains momentum, the factors that influence or guide consumer decision-making in these transactions are becoming an increasingly prominent area of research. Online reviews are one of the factors that affect online consumers. This study aims to conduct a comprehensive analysis of the literature exploring the influence of online customer reviews in e-commerce on consumer behavior, brand credibility, purchasing decisions, and sales performance published in Web of Science Core Collection between 2014 and 2024. A total of 35 articles were identified as relevant through a keyword-based search and subsequent content analysis. The findings revealed that online reviews significantly influence consumer behavior. This paper also identified the analysis frequently used to detect fake reviews are structural equation modeling, Support Vector Machine technique and text mining.

KEYWORDS

Digital marketing, online reviews, consumer behavior, strategic marketing, e-wom

INTRODUCTION (Objectives, theoretical background, literature review etc.)

As the digitalization thrives, more people are incorporating digital processes into their daily lives. Potential customers who choose to shop online—without physically touching or inspecting the product—tend to rely on online reviews to reduce the uncertainty involved in such decisions. User-generated product feedback plays a pivotal role in shaping consumer choices (King et al., 2014; Babić Rosario et al., 2016). Online reviews have emerged as a key element shaping consumer behavior, influencing purchase decisions, and defining brand perception in the e-commerce environment. With the increasing reliance on peer-generated content, consumers now frequently consult online reviews before engaging in purchasing activities. As a result, they spend more time reading these reviews, seeking assistance from them during their decision-making process (Zhu & Zhang, 2010). With the increasing reliance on peer-generated content, consumers now frequently consult online reviews before engaging in purchasing activities. This behavior has positioned online reviews not only as a tool for information exchange but also as a form of digital social proof that influences buyer trust and decision-making.

The aim of this study is to systematically analyze academic articles published between 2014 and 2024 that investigate the impact of online customer reviews on consumer behavior, purchase decisions, fake review detection, and SEO performance within the context of e-commerce. The study employs a descriptive content analysis method to identify thematic patterns, methodological trends, and

research gaps in the literature. This study also aims to investigate which areas have seen more academic attention and which have received little or no focus between 2014 and 2024 in relation to the selected keywords. Specifically, it seeks to identify the gaps in the literature and highlight the fields where research has been particularly concentrated.

Recent developments in sentiment analysis, text mining, and digital marketing strategies have further amplified the importance of online reviews. At the same time, concerns about fake reviews have drawn scholarly and managerial attention, prompting the development of detection methods to safeguard authenticity.

Although a growing body of research addresses various aspects of online reviews, the literature remains fragmented across disciplines such as marketing, information systems, and computer science. To better understand the scope and evolution of this research field, a descriptive content analysis of proceedings and peer-reviewed articles published between 2014 and 2024 is warranted.

This study aims to systematically review scholarly work related to four specific areas of inquiry: (1) the effect of online reviews on consumer behavior, (2) the role of e-commerce reviews in purchase decision-making, (3) the application of sentiment analysis in fake review detection, and (4) the influence of online reviews on SEO performance. By categorizing and synthesizing the findings of existing research, this paper seeks to identify trends, thematic clusters, methodological approaches, and areas requiring further exploration.

LITERATURE REVIEW

As the digital shopping thrives, consumers need online reviews when they purchase online. They want to reduce the risk and uncertainty that inherently come with online shopping. Research to date suggests that consumers actively search for information to reduce the uncertainty and risk they associate with purchasing decisions (Locander & Hermann, 1979). This behavior is particularly evident in online shopping environments, where the absence of physical interaction with products increases consumers' perceived risk. In response, consumers often rely on indirect cues—especially the experiences and evaluations shared by other users—to inform their decisions. Among these cues, electronic word-of-mouth (eWOM) has gained prominence due to its perceived authenticity, relatability, and accessibility. As a result, eWOM has become one of the most influential external information sources in digital commerce. Research has confirmed a strong link between eWOM and consumers' purchase intentions (Furner et al., 2018). It's not only the e-wom that affects the online purchase. Online review ratings, such as star ratings or numerical scores, have been found to significantly influence product sales by serving as quick and easily interpretable indicators of overall customer satisfaction (Duan et al., 2008). Review texts, which provide detailed user experiences and product evaluations, also affect purchase decisions by offering qualitative insights that help consumers assess product suitability and quality (X. Sun et al., 2017). Reviewer profiles, can shape consumers' trust in the review and ultimately impact their likelihood of purchasing the product (Forman et al., 2008). Product characteristics interact with online reviews in complex ways and can moderate the influence of review content on consumer behavior (Zhu & Zhang, 2010).

METHODOLOGY

The scope of this research is to explore and synthesize existing academic literature related to online customer reviews in e-commerce, with a focus on their influence on consumer behavior and business performance.

Descriptive content analysis is used to analyze the data. The main aim of the content analysis to guide future academic studies within the scope of the subject discussed and to determine the

general trend on the subject (Ültay et al., 2021). Descriptive content analysis is one of the three types of content analysis. The other two are namely, meta-analysis and meta-synthesis (Çalik & Sözbilir, 2014). Descriptive content analysis is a systematic method employed to examine and classify existing literature within a specific research area. Rather than interpreting or theorizing the content, this approach focuses on identifying recurring themes, research trends, methodological patterns, and key findings across selected studies. It is particularly useful for providing an overview of the current state of knowledge and highlighting research gaps in the field (Çalik et al., 2008). In this study, descriptive content analysis is applied to evaluate how online customer reviews in e-commerce have been addressed in the academic literature, especially in relation to consumer behavior, brand credibility, purchasing decisions, and sales performance.

Conceptual Assumptions

Online reviews significantly influence consumer decision-making processes.

The quality and credibility of reviews directly affect purchasing behavior.

Text mining and sentiment analysis techniques are commonly used to detect fake reviews.

Rationale of the Study

This study focuses exclusively on areas where publications were found using specific keyword combinations in the Web of Science (WoS) database, ensuring data-driven and well-defined scope.

Online reviews have become a central element of digital commerce; therefore, reviewing the academic discourse on this topic is both timely and necessary. With the rise of fake reviews and the increasing importance of SEO, analyzing academic studies that address these dimensions provides a valuable and up-to-date perspective.

The intersection of e-commerce, consumer psychology, marketing, and computer science makes this topic strategically important for interdisciplinary academic research.

Contribution to the Field

This study presents a thematic overview of the existing literature. It identifies concentrated areas of research and gaps that need to be addressed in future studies. It provides practical insights for e-commerce professionals and digital marketers regarding the strategic management of customer reviews, trust, and visibility. In an era where e-commerce continues to evolve at an unprecedented pace, understanding the multifaceted impact of online customer reviews (OCRs) has become crucial for both academic inquiry and practical application. The originality of this study lies in its comprehensive and systematic analysis of OCR-related research over a decade (2014–2024), spanning several interrelated yet often independently studied dimensions—consumer behavior, purchase decisions, fake review detection, and SEO performance.

This study also stands out for its methodological breadth and conceptual depth. By employing a descriptive content analysis of academic publications, it does not merely summarize findings but identifies thematic patterns, methodological trends, and key knowledge gaps. This level of synthesis is necessary to understand how the field has evolved, which topics have been saturated, and where scholarly attention remains limited or absent.

Data Source and Data Collection Tools

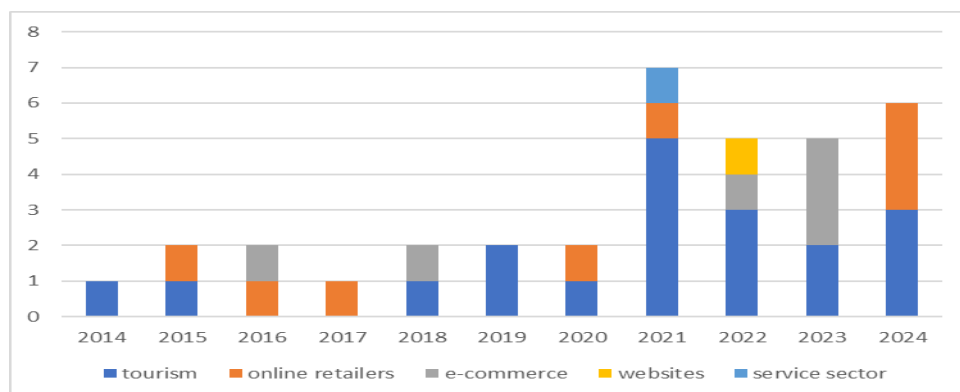
The research focused solely on academic literature from the Web of Science Core Collection. Relevant keyword combinations were searched within both Author Keywords and Keywords Plus using quotation marks and the conjunction "AND." The six keyword sets used were: (A) "Online

reviews" AND "consumer behavior", (B) "E-commerce reviews" AND "purchase decision", (C) "Customer feedback" AND "brand trust", (D) "Fake reviews detection" AND "sentiment analysis", (E) "Online reviews impact on sales", and (F) "SEO" AND "online reviews". Publication years were not restricted, but the resulting studies spanned from 2014 to 2024. Author Keywords yielded 20 studies for A, 3 for B, 2 for D, and 1 for F, with no results for C and E. Keywords Plus returned 9 studies for A only. In total, 35 studies were included—32 journal articles and 3 conference proceedings. No additional exclusions were applied, and these publications form the complete data set for the study.

Research Design and Data Analysis

This study employs a descriptive content analysis to systematically review academic literature on online reviews in e-commerce from 2014 to 2024. Its main goal is to identify key findings and suggestions for future research. A total of 35 relevant studies were analyzed by publication year, research findings, and future directions, and were grouped into five thematic clusters. Tourism emerged as the most studied domain (54%), followed by online retail (29%), e-commerce (11%), websites (1%), and the service sector (1%). This distribution highlights a significant research gap in areas outside tourism. The study also reveals a rising trend in publication frequency in recent years. Most of the included works were journal articles (91.4%), indicating a preference for peer-reviewed dissemination, with only 8.6% presented at conferences. The findings aim to provide a structured overview of current scholarly discussions and point to areas where further research is needed, especially beyond the dominant field of tourism.

Chart.1. Distribution of Number of Studies by Subject According to Years



RESULTS

The analysis of the selected 35 studies reveals several commonalities regarding the influence and structure of online consumer reviews. First and foremost, it is evident that online reviews significantly affect consumer decisions, satisfaction, and trust in e-commerce environments (Cain et al., 2024; McKinney & Shin, 2016; Putrananda et al., 2021; Sostar et al., 2024; Torabi & Bélanger, 2021a; M. Zhang et al., 2017; X. Zhang et al., 2024; Zinko et al., 2021). A recurring theme across multiple studies is the distinction between genuine and fake reviews, where genuine reviews tend to be longer and more informative, whereas fake reviews are often less useful or influential (Kumar et al., 2024; Reyes-Menendez et al., 2020; Tabany & Gueffal, 2024; Wahyuni & Djunaidy, 2016). The presence of visual elements, such as images accompanying reviews, is also found to enhance consumers' trust and increase their purchase intention (Simonetti & Bigne, 2022; Zinko et al., 2021). Furthermore, electronic word-of-mouth (eWOM) and social influence mechanisms, particularly on platforms like social media, play a critical role in shaping consumer attitudes and business strategies

(Berné Manero et al., 2023; Grinberg et al., 2015; Reyes-Menendez et al., 2020; Torabi & Bélanger, 2021b).

Across several studies, it was observed that richness, consistency, emotional value, and trustworthiness of reviews were critical factors in stimulating purchase intention (Putrananda et al., 2021; Torabi & Bélanger, 2021a; M. Zhang et al., 2017; X. Zhang et al., 2024). Lastly, the implementation of algorithmic and decision-support frameworks was highlighted as a valuable tool for managing conflicting review information and facilitating more efficient consumer decision-making (Möhrling et al., 2020; Yang et al., 2023). Taken together, these common findings suggest a multifaceted yet coherent picture of the power and complexity of online consumer reviews.

The future research suggestions presented across these studies offer valuable direction for academics and researchers aiming to deepen their understanding of online reviews and consumer behavior.

Cultural, geographic, and demographic influences on review perception and eWOM effectiveness remain underexplored. Future research should examine consumer behavior across different cities, countries, and ethnic groups to research the substantive, emotional, and non-emotional elements of online reviews' effect on consumers' purchase decisions. (Kumar et al., 2024), and stratify participants by age or generation to uncover satisfaction and loyalty patterns and investigate the impact of e-WOM on repurchase intention and consumer loyalty (Torabi & Bélanger, 2021a).

Moreover, incorporating emotional and psychological dimensions into current models—particularly within diverse cultural contexts—may enhance both predictive accuracy and real-world relevance (Schuckert et al., 2015; Wang et al., 2023). Methodologically, the adoption of incentive-compatible designs and analysis of user attentional patterns across review content layouts could improve understanding of how users engage with review platforms (Simonetti & Bigne, 2022). Finally, moving beyond single-platform or language-specific studies and embracing multilingual datasets and advanced text mining techniques will be crucial for capturing the evolving dynamics of digital consumer feedback ecosystems (Kim et al., 2023). Table 1 shows the details of the articles reviewed

Table 1. The Details of the Articles in the Review

	Year	Title	Authors	Keywords
1	2023	Exploring Latent Characteristics of Fake Reviews and Their Intermediary Role in Persuading Buying Decisions(Kumar et al., 2023)	Kumar R, Mukherjee S, Rana N P	E-commerce Reviews and Purchase Decision
2	2021	Substance, Emotional and Non-Emotional Content of Online Review Influence on Purchase Decisions in Indonesian E-Commerce(Putrananda et al., 2021)	Putrananda, I., Handayani, P. W., Azzahro, F	E-commerce Reviews and Purchase Decision
3	2023	Online Product Decision Support Using Sentiment Analysis and Fuzzy Cloud-Based Multicriteria Model Through Multiple E-Commerce Platforms(Yang et al., 2023)	Yang Z, Li Q , Charles V , Xu B, Gupta S	E-commerce Reviews and Purchase Decision
4	2024	Sentiment Analysis and Fake Amazon Reviews Classification Using SVM	Tabany M, Gueffal M	Fake Reviews Detection and

		Supervised Machine Learning Model(Tabany & Gueffal, 2024)		Sentiment Analysis
5	2016	Fake Review Detection from a Products Review Using Modified Method of Iterative Computation Framework (Wahyuni & Djunaidy, 2016)	Wahyuni E D, Djunaidy A	Fake Reviews Detection and Sentiment Analysis
6	2020	Understanding Online Consumer Behavior and eWOM Strategies for Sustainable Business Management in the Tourism Industry(Reyes-Menendez et al., 2020)	Reyes-Menendez A, Correia M B, Matos N, Adap C	Online Reviews and Consumer Behavior
7	2021	Seeing is Believing: The Effects of Images on Trust and Purchase Intent in eWOM for Hedonic and Utilitarian Products(Zinko et al., 2021)	Zinko R, de Burgh-Woodman H, Furner Z Z, Kim S J	Online Reviews and Consumer Behavior
8	2023	“No, Thanks”: How Do Requests for Feedback Affect the Consumption Behavior of Non-Compliers?(Perez et al., 2023)	Perez D, Oestreicher-Singer G, Zalmanson L, Rubin M M	Online Reviews and Consumer Behavior
9	2019	The importance of behavioral data to identify online fake reviews for tourism businesses: a systematic review(Reyes-Menendez et al., 2019)	Reyes-Menendez A, Saura J R, Filipe F	Online Reviews and Consumer Behavior
10	2016	Exploring Criteria Consumers Use in Evaluating Their Online Formal Wear Rental Experience: A Content Analysis of Online Reviews (McKinney & Shin, 2016)	McKinney E, Shin E	Online Reviews and Consumer Behavior
11	2022	Behavioral Patterns beyond Posting Negative Reviews Online: An Empirical View(M. Sun & Zhao, 2022)	Sun M, Zhao J	Online Reviews and Consumer Behavior
12	2021	The Influence of Situational Constraints on Consumers’ Evaluation and Use of Online Reviews: A Heuristic-Systematic Model Perspective(Lee & Hong, 2021)	Lee j, Duclos R, Haghighi N	Online Reviews and Consumer Behavior
13	2022	When and Why Language Assertiveness Affects Online Review Persuasion(Huang et al., 2022)	Huang H, Liu S Q, Lu Z	Online Reviews and Consumer Behavior
14	2015	Examining the Awareness and	Grinberg I, Bhuyan S,	Online Reviews and

		Persuasive Effects of Online WOM(Grinberg et al., 2015)	Jin Y, Wang L	Consumer Behavior
15	2019	Do Country and Culture Influence Online Reviews? An Analysis of a Multinational Retailer's Country-Specific Sites(Barbro et al., 2019)	Barbro P A, Mudambi S M, Schuff D	Online Reviews and Consumer Behavior
16	2024	Which Receives More Attention, Online Review Sentiment or Online Review Rating? Spillover Effect Analysis from JD.com(Shan et al., 2024)	Shan S, Yang Y, Li C	Online Reviews and Consumer Behavior
17	2019	Internet Platforms: An Advantage for Both Cyber Consumer and Internet-Based Businesses(Mitucă et al., 2019)	Mitucă M O, Suci M C , Pătruț B	Online Reviews and Consumer Behavior
18	2024	The Influence of Online Reviews on Hotel Attractiveness Perceptions: A Gender-Based Comparative Study(Sostar et al., 2024)	Sostar M, Andrić B, Ramanathan H N	Online Reviews and Consumer Behavior
19	2020	Google Popular Times: Towards a Better Understanding of Tourist Customer Patronage Behavior (Möhring et al., 2020)	Möhring M, Keller B, Schmidt R, Dacko S	Online Reviews and Consumer Behavior
20	2022	How Visual Attention to Social Media Cues Impacts Visit Intention and Liking Expectation for Restaurants(Simonetti & Bigne, 2022)	Simonetti A, Bigne E	Online Reviews and Consumer Behavior
21	2023	Elements of information ecosystems stimulating the online consumer behavior: A mediating role of cognitive and affective trust(J. Wang et al., 2023)	Wang J, Shahzad F, Ashraf S F	Online Reviews and Consumer Behavior
22	2015	Hospitality and Tourism Online Reviews: Recent Trends and Future Directions (Schuckert et al., 2015)	Schuckert M, Liu X, Law R	Online Reviews and Consumer Behavior
23	2021	The Influence of Reviewer and Consumer Congruence in Online Word-of-Mouth Transactions (Furner et al., 2021)	Furner C P, Yoon T E, Zinko R, Goh S H	Online Reviews and Consumer Behavior
24	2017	The Online Reviews' Effects on Internet Consumer Behavior: An Exploratory Study(M. Zhang et al.,	Zhang M, Ding S, Bian Y	Online Reviews and Consumer Behavior

		2017)		
25	2021	Influence of Online Reviews on Student Satisfaction Seen through a Service Quality Model(Torabi & Bélanger, 2021)	Torabi M, Bélanger C H	Online Reviews and Consumer Behavior
26	2024	Risky Business: Effects of Risk-Related Reviews and Priming Cues in Uncertain Times(Cain et al., 2024)	Cain L, Kim L J, Tanford S	Online Reviews and Consumer Behavior
27	2024	Power of Sentiment Expressions on Peer-to-Peer Rental Platforms: A Mixed-Method Approach(X. Zhang et al., 2024)	Zhang X, Wei X, Zhang T, Liang S, Ma Y, Law R	Online Reviews and Consumer Behavior
28	2023	The impact of electronic word-of-mouth management in hotel ecosystem: insights about managers' decisionmaking process(Berné Manero et al., 2023)	Berne Manero d C M, Tartaglione A M, Russo G, Cavacece Y	Online Reviews and Consumer Behavior
29	2021	How the Spread of User-Generated Contents (UGC) Shapes International Tourism Distribution: Using Agent-Based Modeling to Inform Strategic UGC Marketing (Y. Zhang et al., 2021)	Zhang Y, Gao J, Cole S, Ricci P	Online Reviews and Consumer Behavior
30	2018	Impact of individual cultural values on hotel guests' positive emotions and positive eWOM intention Extending the cognitive appraisal framework(Wen et al., 2018)	Wen J, Hu Y, Kim H J	Online Reviews and Consumer Behavior
31	2019	Understanding the antecedents and consequences of the perceived usefulness of travel review websites(P. Wang & Li, 2019)	Wang P, Li H	Online Reviews and Consumer Behavior
32	2023	Mining the determinants of review helpfulness: a novel approach using intelligent feature engineering and explainable AI(Kim et al., 2023)	Kim J, Lee H, Lee H	Online Reviews and Consumer Behavior
33	2022	Demystifying fake news in the hospitality industry: A systematic literature review, framework, and an agenda for future research(Vasist & Krishnan, 2022)	Vasist P N, Krishnan S	Online Reviews and Consumer Behavior
34	2014	Please, talk about it! When hotel popularity boosts preferences (Viglia	Viglia G, Furlan R, Ladrón-de-Guevara	Online Reviews and Consumer Behavior

		et al., 2014)		
35	2022	Too much of a good thing? The unforeseen cost of tags in online retailing(Sepehri et al., 2022)	Sepehri A, Duclos R, Haghghi N	SEO and Online Reviews

CONCLUSION

This study provides a comprehensive synthesis of 35 academic articles examining the role of online reviews in consumer behavior, with a particular focus on the influence of review quality, credibility, and the detection of fake reviews. The findings consistently highlight that online reviews significantly impact consumer decision-making, aligning with the first conceptual assumption. Both the presence and perceived authenticity of reviews serve as critical cues in shaping purchase intentions.

Moreover, the quality and credibility of online reviews—such as the level of detail, tone, and source trustworthiness—have been shown to directly influence consumer trust and buying behavior, which supports the second conceptual assumption. Positive reviews generally lead to more favorable attitudes toward products, while low-quality or suspicious reviews often result in skepticism or avoidance.

In line with the third conceptual assumption, numerous studies have utilized text mining and sentiment analysis techniques to identify fraudulent reviews. These analytical methods have proven effective in detecting inconsistencies in language use, extreme sentiment expressions, and reviewer behavior patterns, which are often indicative of inauthentic content.

Despite some variability in focus and methodology among the articles, the overarching patterns suggest that online review platforms play a pivotal role in shaping modern consumption. The integration of automated tools for evaluating review authenticity, alongside a growing consumer awareness of manipulation tactics, underscores the dynamic nature of this field and the necessity for continuous academic and technological advancements.

In conclusion, the literature confirms the conceptual assumptions and demonstrates that online reviews are not only influential but also complex informational tools that require critical analysis, both by consumers and researchers.

When a general evaluation is made, considering that 54% of the studies included in this research were conducted in the field of tourism, the most striking implication for future research is the need for studies that include these keywords or address these topics in other sectors as well. Moreover, no studies were found that included the keywords customer feedback and brand trust, or online reviews' impact on sales. Investigating these topics in future research would contribute further to the field. Additionally, it was observed that there are very few studies focusing on the keywords SEO and online reviews, fake review detection and sentiment analysis, e-commerce reviews and purchase decisions. Taking these topics into account in future research areas will support the development of a broader understanding of this domain.

When the limitations of this study are considered; first, this review was conducted using articles exclusively from the Web of Science Core Collection, which inherently led to the exclusion of publications indexed in other databases. Second, a broad range of keywords and key phrases was employed in the search strategy. While this approach enhances the comprehensiveness and holistic scope of the review, the dynamic nature of the field suggests that future studies should consider incorporating an expanded set of relevant terms. Nevertheless, by analyzing 35 selected articles, this

review offers meaningful insights into the existing body of literature. For a more extensive understanding in future research, integrating studies from multiple databases could yield a broader and more diversified perspective on the topic.

REFERENCES

- Barbro, P. A., Mudambi, S. M., & Schuff, D. (2019). Do Country and Culture Influence Online Reviews? An Analysis of a Multinational Retailer's Country-Specific Sites. *Journal of International Consumer Marketing*, 32(1), 1–14. <https://doi.org/10.1080/08961530.2019.1635552>
- Berné Manero, M. del C., Moretta Tartaglione, A., Russo, G., & Cavacece, Y. (2023). The impact of electronic word-of-mouth management in hotel ecosystem: insights about managers' decision-making process. *Journal of Intellectual Capital*, 24(1), 227–256. <https://doi.org/10.1108/JIC-07-2021-0201>
- Cain, L., Kim, E. J., & Tanford, S. (2024). Risky Business: Effects of Risk-Related Reviews and Priming Cues in Uncertain Times. *Journal of Travel Research*, 63(1), 64–79. <https://doi.org/10.1177/00472875221147143>
- Duan, W., Gu, B., & Whinston, A. B. (2008). The dynamics of online word-of-mouth and product sales—An empirical investigation of the movie industry. *Journal of Retailing*, 84(2), 233–242. <https://doi.org/https://doi.org/10.1016/j.jretai.2008.04.005>
- Forman, C., Ghose, A., & Wiesenfeld, B. (2008). Examining the Relationship Between Reviews and Sales: The Role of Reviewer Identity Disclosure in Electronic Markets. *Information Systems Research*, 19(3), 291–313. <http://www.jstor.org/stable/23015450>
- Furner, C. P., Yoon, T. E., Zinko, R., & Goh, S. H. (2021). The Influence of Reviewer and Consumer Congruence in Online Word-of-Mouth Transactions. *Journal of Electronic Commerce in Organizations*, 19(3). <https://doi.org/http://dx.doi.org/10.4018/JECO.2021070101>
- Furner, C. P., Zinko, R., & Zhu, Z. (2018). Examining the Role of Mobile Self-Efficacy in the Word-of-Mouth / Mobile Product Reviews Relationship. *Int. J. E-Services Mob. Appl.*, 10(4), 40–60. <https://doi.org/10.4018/IJESMA.2018100103>
- Grinberg, I., Bhuyan, S., Jin, Y., & Wang, L. (2015). Examining the Awareness and Persuasive Effects of Online WOM. *International Journal of Online Marketing*, 5(1), 1–19. <https://doi.org/10.4018/ijom.2015010101>
- Huang, H., Liu, S. Q., & Lu, Z. (2022). When and why Language Assertiveness Affects Online Review Persuasion. *Journal of Hospitality and Tourism Research*, 47(6), 988–1016. <https://doi.org/10.1177/10963480221074280>
- Kim, J., Lee, H., & Lee, H. (2023). Mining the determinants of review helpfulness: a novel approach using intelligent feature engineering and explainable AI. *Data Technologies and Applications*, 57(1), 108–130. <https://doi.org/10.1108/DTA-12-2021-0359>
- Kumar, R., Mukherjee, S., & Rana, N. P. (2023). Exploring Latent Characteristics of Fake Reviews and Their Intermediary Role in Persuading Buying Decisions. *Information Systems Frontiers*, 26(3), 1091–1108. <https://doi.org/10.1007/s10796-023-10401-w>
- Lee, J., & Hong, I. B. (2021). The influence of situational constraints on consumers' evaluation and use of online reviews: A heuristic-systematic model perspective. *Journal of Theoretical and Applied Electronic Commerce Research*, 16(5), 1517–1536. <https://doi.org/10.3390/jtaer16050085>
- McKinney, E., & Shin, E. (2016). Exploring Criteria Consumers Use in Evaluating Their Online Formal Wear Rental Experience: A Content Analysis of Online Reviews. *Clothing and Textiles Research Journal*, 34(4), 272–286. <https://doi.org/10.1177/0887302X16654269>
- Mitucă, M.-O., Suciuc, M.-C., & Pătruț, B. (2019). Internet Platforms: An Advantage for Both Cyber Consumer and Internet-Based Businesses. *Broad Research in Artificial Intelligence and Neuroscience*, 10(3), 106–116.

- Möhring, M., Keller, B., Schmidt, R., & Dacko, S. (2020). Google Popular Times: towards a better understanding of tourist customer patronage behavior. *Tourism Review*, 76(3), 533–569. <https://doi.org/10.1108/TR-10-2018-0152>
- Perez, D., Oestreicher-Singer, G., Zalmanson, L., & Rubin, M. M. (2023). “No, Thanks”: How Do Requests for Feedback Affect the Consumption Behavior of Non-Compliers? *Marketing Letters*, 34(1), 83–97. <https://doi.org/10.1007/s11002-022-09631-w>
- Putrananda, I., Handayani, P. W., & Azzahro, F. (2021). Substance, Emotional and Non-Emotional Content of Online Review Influence on Purchase Decisions in Indonesian E-Commerce. 2021 International Conference on Advanced Computer Science and Information Systems, ICACSIS 2021. <https://doi.org/10.1109/ICACSIS53237.2021.9631323>
- Reyes-Menendez, A., Correia, M. B., & Matos, N. (2020). Understanding online consumer behavior and ewom strategies for sustainable business management in the tourism industry. *Sustainability (Switzerland)*, 12(21), 1–14. <https://doi.org/10.3390/su12218972>
- Reyes-Menendez, A., Saura, J. R., & Filipe, F. (2019). The importance of behavioral data to identify online fake reviews for tourism businesses: A systematic review. *PeerJ Computer Science*, 2019(9). <https://doi.org/10.7717/peerj-cs.219>
- Schuckert, M., Liu, X., & Law, R. (2015). Hospitality and Tourism Online Reviews: Recent Trends and Future Directions. *Journal of Travel and Tourism Marketing*, 32(5), 608–621. <https://doi.org/10.1080/10548408.2014.933154>
- Sepehri, A., Duclos, R., & Haghighi, N. (2022). Too much of a good thing? The unforeseen cost of tags in online retailing. *International Journal of Research in Marketing*, 39(2), 336–348. <https://doi.org/10.1016/j.ijresmar.2021.10.004>
- Shan, S., Yang, Y., & Li, C. (2024). Which Receives More Attention, Online Review Sentiment or Online Review Rating? Spillover Effect Analysis from JD.com. *Behavioral Sciences*, 14(9). <https://doi.org/10.3390/bs14090823>
- Simonetti, A., & Bigne, E. (2022). How visual attention to social media cues impacts visit intention and liking expectation for restaurants. *International Journal of Contemporary Hospitality Management*, 34(6), 2049–2070. <https://doi.org/10.1108/IJCHM-09-2021-1091>
- Sostar, M., Andrić, B., & Ramanathan, H. N. (2024). The Influence of Online Reviews on Hotel Attractiveness Perceptions: A Gender Based Comparative Study. 27th Biennial International Congress on Tourism and Hospitality Industry -Trends and Challenges. <https://doi.org/http://dx.doi.org/10.20867/thi.27.17>
- Sun, M., & Zhao, J. (2022). Behavioral Patterns beyond Posting Negative Reviews Online: An Empirical View. *Journal of Theoretical and Applied Electronic Commerce Research*, 17(3), 949–983. <https://doi.org/10.3390/jtaer17030049>
- Sun, X., Sun, C., Quan, C., Ren, F., Tian, F., & Wang, K. (2017). Fine-Grained Emotion Analysis Based on Mixed Model for Product Review. *International Journal of Networked and Distributed Computing*, 5(1), 1–11. <https://doi.org/10.2991/ijndc.2017.5.1.1>
- Tabany, M., & Gueffal, M. (2024). Sentiment Analysis and Fake Amazon Reviews Classification Using SVM Supervised Machine Learning Model. *Journal of Advances in Information Technology*, 15(1), 49–58. <https://doi.org/10.12720/jait.15.1.49-58>
- Torabi, M., & Bélanger, C. H. (2021). Influence of online reviews on student satisfaction seen through a service quality model. *Journal of Theoretical and Applied Electronic Commerce Research*, 16(7), 3063–3077. <https://doi.org/10.3390/jtaer16070167>
- Vasist, P. N., & Krishnan, S. (2022). Demystifying fake news in the hospitality industry: A systematic literature review, framework, and an agenda for future research. *International Journal of Hospitality Management*, 106. <https://doi.org/10.1016/j.ijhm.2022.103277>

- Viglia, G., Furlan, R., & Ladrón-de-Guevara, A. (2014). Please, talk about it! When hotel popularity boosts preferences. *International Journal of Hospitality Management*, 42, 155–164. <https://doi.org/10.1016/j.ijhm.2014.07.001>
- Wahyuni, E. D., & Djunaidy, A. (2016). Fake Review Detection from a Product Review Using Modified Method of Iterative Computation Framework. <https://doi.org/10.1051/conf/2016>
- Wang, J., Shahzad, F., & Ashraf, S. F. (2023). Elements of information ecosystems stimulating the online consumer behavior: A mediating role of cognitive and affective trust. *Telematics and Informatics*, 80. <https://doi.org/10.1016/j.tele.2023.101970>
- Wang, P., & Li, H. (2019). Understanding the antecedents and consequences of the perceived usefulness of travel review websites. *International Journal of Contemporary Hospitality Management*, 31(3), 1086–1103. <https://doi.org/10.1108/IJCHM-06-2017-0380>
- Wen, J., Hu, Y., & Kim, H. J. (2018). Impact of individual cultural values on hotel guests' positive emotions and positive eWOM intention: Extending the cognitive appraisal framework. *International Journal of Contemporary Hospitality Management*, 30(3), 1769–1787. <https://doi.org/10.1108/IJCHM-07-2017-0409>
- Yang, Z., Li, Q., Charles, V., Xu, B., & Gupta, S. (2023). Online Product Decision Support Using Sentiment Analysis and Fuzzy Cloud-Based Multicriteria Model Through Multiple E-Commerce Platforms. *IEEE Transactions on Fuzzy Systems*, 31(11), 3838–3852. <https://doi.org/10.1109/TFUZZ.2023.3269741>
- Zhang, M., Ding, S., & Bian, Y. (2017). The online reviews' effects on internet consumer behavior: An exploratory study. *Journal of Electronic Commerce in Organizations*, 15(4), 83–94. <https://doi.org/10.4018/JECO.2017100107>
- Zhang, X., Wei, X., Zhang, T., Liang, S., Ma, Y., & Law, R. (2024). Power of Sentiment Expressions on Peer-to-Peer Rental Platforms: A Mixed-Method Approach. *Journal of Travel Research*, 63(2), 428–446. <https://doi.org/10.1177/00472875231158598>
- Zhang, Y., Gao, J., Cole, S., & Ricci, P. (2021). How the Spread of User-Generated Contents (UGC) Shapes International Tourism Distribution: Using Agent-Based Modeling to Inform Strategic UGC Marketing. *Journal of Travel Research*, 60(7), 1469–1491. <https://doi.org/10.1177/0047287520951639>
- Zhu, F., & Zhang, X. (Michael). (2010). Impact of online consumer reviews on sales: The moderating role of product and consumer characteristics. *Journal of Marketing*, 74(2), 133–148. <https://doi.org/10.1509/jmkg.74.2.133>
- Zinko, R., Burgh-Woodman, H. De, Furner, Z. Z., & Kim, S. J. (2021). Seeing is believing: The effects of images on trust and purchase intent in ewom for hedonic and utilitarian products. *Journal of Organizational and End User Computing*, 33(2), 85–104. <https://doi.org/10.4018/JOEUC.20210301.0a5>

***STRATEGIC
MANAGEMENT AND
INNOVATION***

EFFECTS OF BUSINESS MODELS ON BANK PERFORMANCE

Kamelia Assenova

UNWE, Sofia, Bulgaria, kameliaa@unwe.bg

<https://orcid.org/0000-0001-8726-0654>

ABSTRACT

The bank's business model has a significant impact on its performance, including profitability, risk exposure, efficiency and resilience to economic shocks.

Identifying banking business models requires a set of variables that define the space of possible strategies. In this respect, the use of balance sheet and income statement data has a long history in the banking literature. Although other non-financial variables, such as types of customers and products, can also provide information about a bank's strategy. Specifically, it uses a set of variables that reflect a bank's strategic choices related to the structure of liabilities, assets, capital, and earnings. The object of research are Bulgarian banks. Due to that Euro does not adopt in the country, the situation for these banks is example for all banks without Eurozone in Europe. The subject is the impact of using business model on bank profitability is measured with return of assets, return of equity and interest margin.

The banks that are more retail-oriented are better able to perform proper loan selection and credit risk assessment. The high deposit ratios appear to be particularly beneficial for non-retail banks, which typically rely more on wholesale funding sources. The business models characterized by a more diversified income structure are on average more profitable without being less stable. The analysis may provide suggestions as to which business model choices could be relevant and how effect on profitability and stability may be assessed.

KEYWORDS

Banking, Factor analyzes, Bank performance

INTRODUCTION

The 2007–2008 financial crisis underscored vulnerabilities within banking systems worldwide, prompting regulatory reforms such as Basel III and initiatives to restrict certain banking activities. These changes have driven banks to reassess their business models, which are key in determining stability and performance (Altunbas et al., 2011; Beltratti & Stulz, 2012). COVID 19 pandemic and the role of banking by recovery of economy also required the change of business model for management of banks.

The bank's business model has a significant impact on its performance, including profitability, risk exposure, efficiency and resilience to economic shocks. This paper aims to analyze the bank business models, evaluate classification techniques, and explore their implications for bank stability.

Identifying banking business models requires a set of variables that define the space of possible strategies. In this respect, the use of balance sheet and income statement data has a long history in the banking literature. Although other non-financial variables, such as types of customers and products, can also provide information about a bank's strategy. Specifically, it uses a set of variables that reflect a bank's strategic choices related to the structure of liabilities, assets, capital, and earnings. The object of research are Bulgarian banks. Due to that Euro does not adopt in the country, the situation for these banks is an example for all banks without Eurozone in Europe. The subject is the impact of using business model on bank profitability is measured with return of assets, return of equity and net interest margin.

LITERATURE REVIEW

The analysis of bank performance is the subject of many researches. An analyze the determinants of bank profitability were made from Short (1979) and Bourke (1989). In the case of the European banking system, important contributions to the profitability literature have been made by Molyneux and Thornton (1992), Demirgüç-Kunt and Huizinga (2000), Goddard et al. (2004), Micco et al. (2007) and Pasiouras and Kosmidou (2007). In most of these studies, variables such as size, capitalization, risk have been found to have a significant impact on bank profitability.

A growing number of studies also focus on the relationship between business model and bank profitability. The advantages of diversification of business strategies compared to specialization in one area were first highlighted in the theoretical work of Sharpe (1990) and Diamond (1991). Mergaerts and Vander Vennet (2015), who empirically investigate the impact of business models on bank performance during the financial crisis, find that retail-oriented banks record higher profitability and greater stability. Köhler (2015) suggests that income diversification increases the performance of retail-oriented banks but lowers stability for investment banks.

Demirgüç-Kunt and Huizinga (2010) show that income diversification and more wholesale funding increase banks' risk-taking behavior, while their contribution to efficiency is modest. Although diversification is associated with a number of opportunities, this benefit may be offset by the costs arising from increased volatility exposure (Stiroh and Rumble, 2006). An increase in non-interest activities has also been found to be negatively related to performance by Busch and Kick (2015), as an increase in fee-based activities, in the case of commercial banks, increases the volatility of ROA and ROE.

The successful implementation of different business models depends on a number of bank characteristics and the market environment, such as capital (Baele, 2007), funding sources (Demirgüç-Kunt and Huizinga, 2010), securitization (Boot and Thakor, 2010), corporate governance (Laeven and Levine, 2009), central bank liquidity (Altunbas et al., 2011) or, business cycles (Bolt et al., 2010). The banks, on average, migrate to alternative business models aim improvement of economic results. (Ayadi, 2020)

Previous research highlights that certain characteristics, including, dependence on short-term funding, and aggressive credit growth, heighten bank vulnerability, low capital ratios (Altunbas et al., 2011). Conversely, diversification of income and funding sources can enhance resilience but may also increase risk (Demirgüç-Kunt & Huizinga, 2010; Köhler, 2015). The challenge lies in accurately classifying banks' business models to understand their risk profiles and performance.

Köhler (2015) explores the role of income diversification, noting that while diversification can improve profitability, it may also increase risk if not managed properly. Demirgüç-Kunt and Huizinga (2010) highlight that diversified income sources and wholesale funding can raise systemic risk, especially during turbulent periods.

Classifying banks by business models typically involves clustering based on observable financial ratios and structural characteristics (Altunbas et al., 2011).

METHODOLOGY

Bank Business model

The concept of business models originates from the literature on strategic groups (Porter, 1979), i.e. groups of economic institutions operating in the same sector and using similar strategies. The space of possible strategies in banking, and hence of possible business models, is spanned by a number of

strategic variables that reflect the long-term choices of bank management in terms of assets, funding, capitalization and diversification.

Identifying banking business models requires a set of variables that define the space of possible strategies by using balance sheet and income statement data. (Amel and Rhoades, 1988, Passmore, 1985). We use a set of variables that reflect the bank's strategic decisions related to the structure of assets, liabilities, capital, and earnings, including financial ratios related to the bank's risk profile (see also, for example, Altunbas et al., 2011).

Data Collection

The study uses , quarterly data comprising balance sheet and income statement variables from banks, covering multiple years pre- and post-crisis. Key performance indicators include return on equity (ROE), return on assets (ROA), and net interest margin (NIM).

Business model variables

Variables reflect strategic decisions regarding asset structure (e.g., ratio of net loans to income-generating assets), liability composition (e.g., deposit-to-liabilities ratio), income diversification (e.g., non-interest income share) and capital adequacy.

Profit is calculated as the sum of net interest income and non-interest income less operating expenses and loan loss provisions, i.e. we focus on the recurring portion of profit on a pre-tax basis.

Our set of business model variables reflects the bank's strategic choices related to asset, liability, capital and income structure.

Asset's Structure. The ratio of net loans to earning assets reflects the extent to which the bank is engaged in traditional intermediation activities, i.e., the transformation of liquid deposits into illiquid loans, reflecting the role of a delegated observer (Diamond, 1984).

Liability's structure. The ratio of deposits to liabilities indicates the dependence on traditional customer deposits. Gatev et al. (2009) further show that banks with access to deposits can benefit from synergies with their lending activities, especially during periods of stress in financial markets.

Income diversification ratio measures the importance of non-interest income relative to net interest income.

Classification Techniques

Quantitative analysis based on observed variables.

Proposed factor analysis approach, generating continuous scores to capture mixed business models.

Econometric modeling using Mundlak (1978) data methodology to distinguish between cross-sectional heterogeneity and within-bank variations.

RESULTS

Data

The research uses the data for: bank deposits, bank loans, bank assets, profit, receivables from interest, bank provisions, interest rate of deposits and of credits.

The research studies all banks in Bulgarian bank system. All of them are universal commercial banks. Their main activities are attraction of deposits and main part of them to invest in earning assets as loans. Additional condition by using the data is the information to be available for the whole period from 2018 to 2025. The period includes 3 stages: period of high economic growth – 2018 -2019; Covid19 pandemic crises – 2020 – 2021; after Covid 19 recovery and sustainable economic growth – 2022 – 2025.

The analyze of loans to total assets shows Bulgarian banks keep main function as intermediator between supplier and beneficiaries of loans. It is not so good diversification of assets and in this case increasing of risk and reduces potential profit by different investment not only in credits.

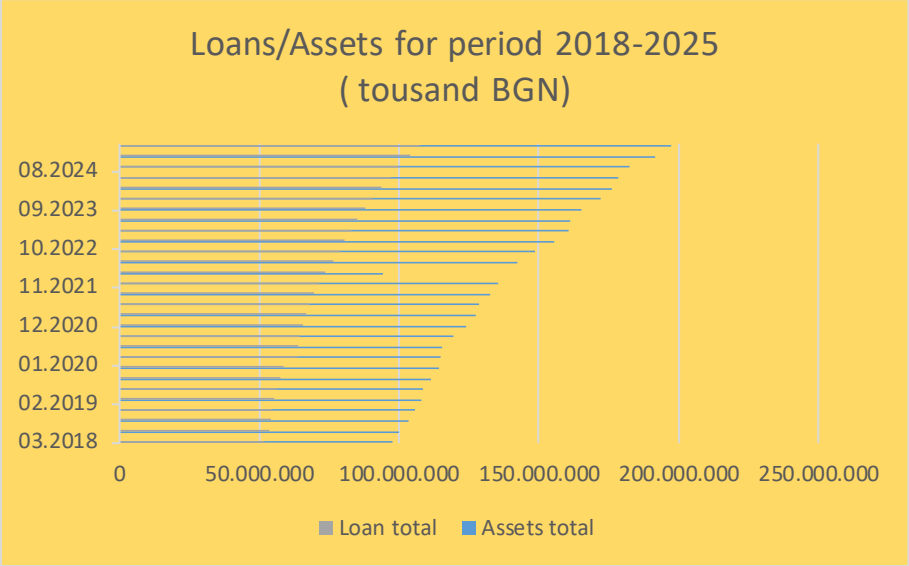


Fig.1 Loan/Assets for period 2018-2025

Source: BNB

The bank is engaged in traditional intermediation activities, i.e., the transformation of liquid deposits into illiquid loans.

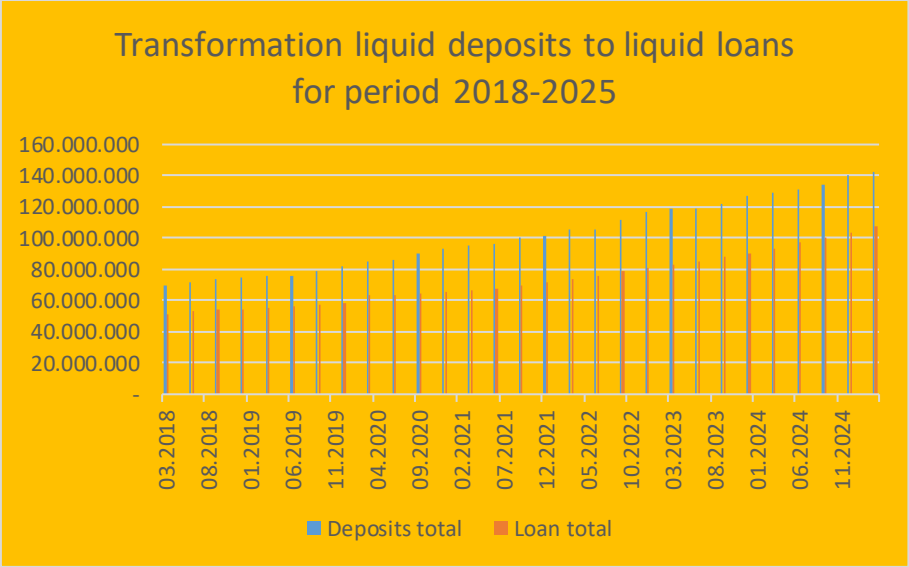


Fig 2 Transformation liquid deposits to liquid loans for period 2018-2025

Source: BNB

The main part from receivables come from interest payment of client of banks (more 50% from total amount). The lack of diversification is a problem during the crises. The banks need to look for additional sources during that time when client reduce repayment of credits and interest.

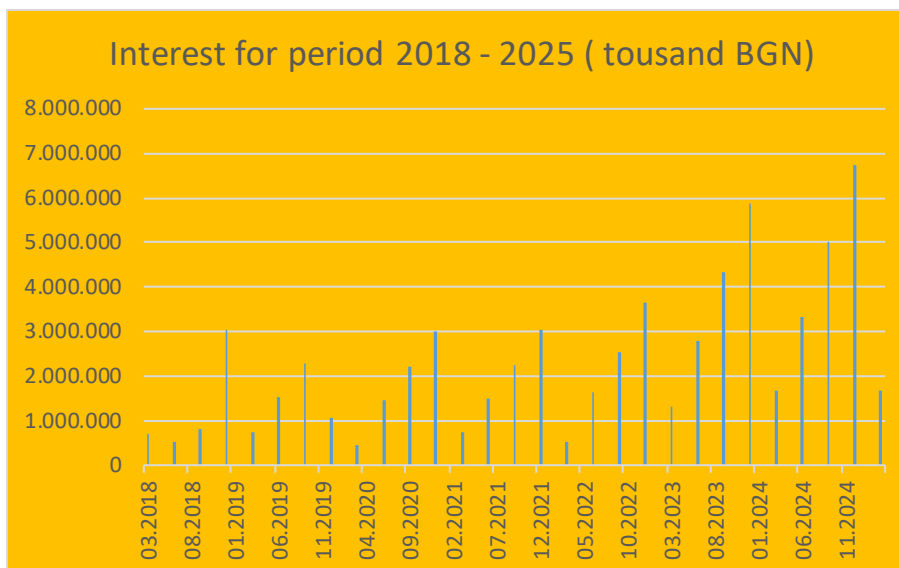


Fig.3 Interest for period 2018-2025

Source: BNB

Despite the positive impact on the net interest margin, a higher loan ratio is associated with lower profitability in the long run. This implies that banks that focus on lending typically exhibit a worse risk-return trade-off than those with an alternative asset structure. Higher lending ratios appear to enable banks to generate both more net interest and non-interest income on each BGN of assets (at the expense of higher operating costs). However, the overall effect on ROA is negative due to the need for additional provisions for credit losses per asset. Even holding credit risk constant, a higher loan loss ratio can increase the cost of loan impairment for the average asset. As a consequence, the increased revenue induced by the higher loan ratio is lost on account of the additional costs that this strategy entails.

The rate of return on own capital are between 2% in the beginning of period to 16% in the end of 2024. It reported permanent increasing of rate of return during whole period and it confirm business model according realization of profit is appropriate for the condition of the work of Bulgarian banks.

Impact on Financial Performance and Stability
Our set of business model variables reflects the bank's strategic choices related to asset, liability, capital and income structure.

The structure of incomes is most important factor for the successful work of banks. The diversification of incomes could increase economic results. The non – interest income improves bank performance and sustainability of banks during the crises.(example: in time of Covid 19 pandemic when more of repayment of credits are stopped and interest income sharply declined). Diversification of income improve mainly the results for retail banks.

First, the research investigates differences of rate of return of own capital and bank performance in different economic stages for period 2018-2025. During the pre- crises period ROE is on middle level – 6.69%. During the COVID 19 pandemic ROE deeply decreases to 1.53%. Main reasons are deterioration of passive and assets operations. From one site, business and household withdrawn deposits to balance incoming and outgoing cash flows. From other site, as in all countries in Europe, the part of measures of governments were credits guaranteed from state. It expanded the credit for business, but not to expand the activities. They used these loans to balance cash flows in the firms.

For household – increasing of unemployment and reduced the salaries in several sectors also was a reason for expansion of consumer credits. For the third period – recovery the economy and sustainable development ROE is 16.19%. Average for whole period is 7.5152%.

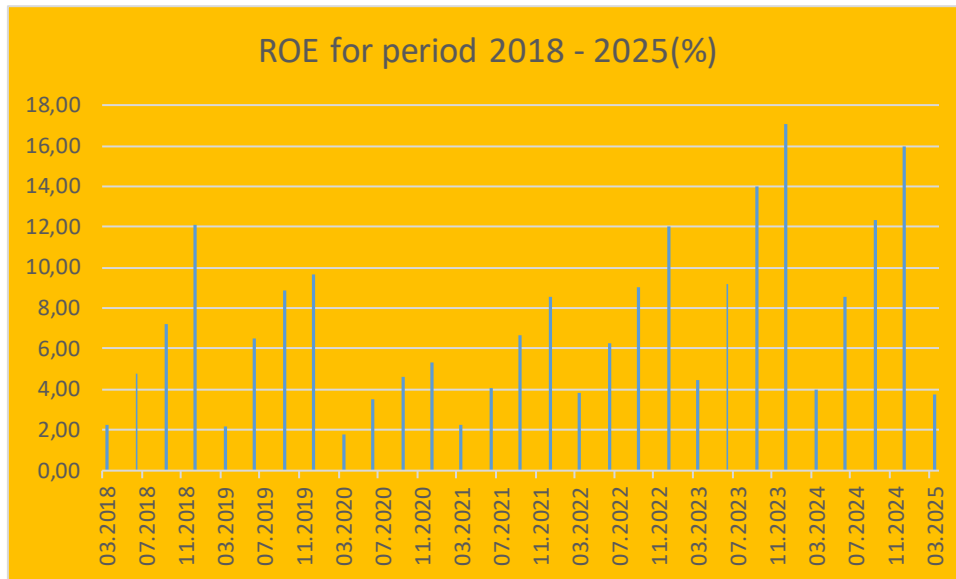


Fig.4 ROE for period 2018-2025

Source: BNB

ROE is important indicator for owners of banks. Due to it that they take the decisions deteriorating results of this ratio will change the management also of assets and liabilities of banks.

The banks with higher capital ratio perform better in terms of ROA. This positive impact could be explained that for capitalized banks, not involved in risky investments and able easy in periods of crises reduce cost of external finding.

The ratio of loans to earning assets reflects the extent to which the bank is engaged in traditional intermediation activities. In terms of asset structure, higher loan-to-value ratios are associated with higher return on assets (ROA) and net sales. The banks that focus on lending tend to exhibit a better risk-return ratio than those with an alternative asset structure. The ROA in pre- crises period is 0.034%, proximity the same is after crises period – 0.035%. During 2020-2021- years of COVID pandemic - ROA increased. It depends on the amount of credits (explained above) and interest rates. Average ROA for whole period is 0.084%.

The loan loss provision to loan ratio is a forward-looking indicator of loan quality and reflects the bank's own view of the quality of its loans. By ROA is negative effect due to the need for additional provisions for credit losses on an asset. Even with credit risk held constant, a higher loan loss ratio can increase the cost of loan impairments for the average asset. However, loan loss provisions (LLPs) can be used to smooth income (Laeven and Majnoni, 2003) and can be distorted by cost of living, especially during a financial crisis. As a consequence, the increased revenue induced by the higher loan ratio is lost on account of the additional costs associated with such a strategy.

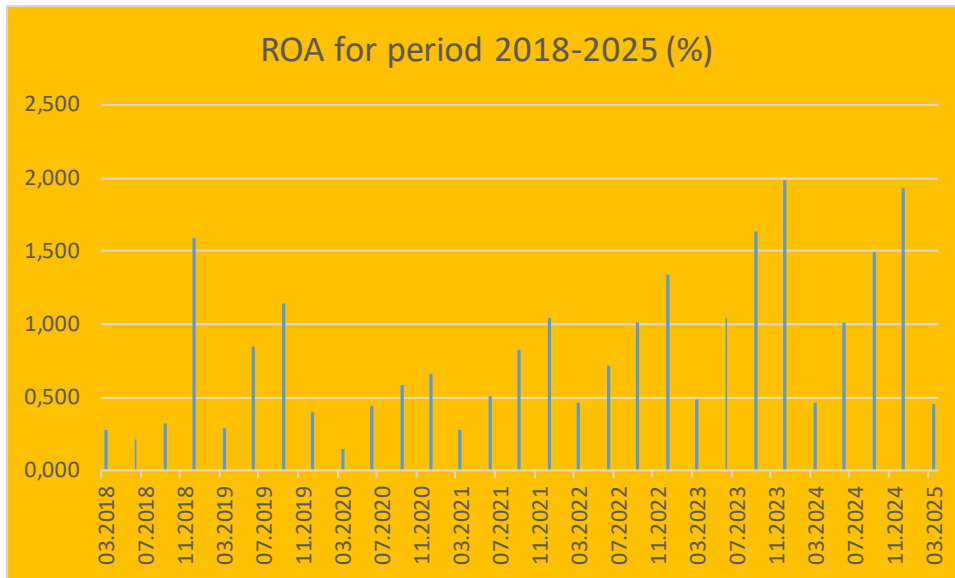


Fig.5 ROA for period 2018-2025

Source: BNB

The interest margin shows the factors that can increase profit and ROE. As you could see, the net interest margin is high. This is due to the low level of interest rates on deposits and the attraction of a large amount of deposits in the banking system, which cancels the need to look for more expensive additional sources. In the case of household deposits, the impact is even stronger because they hold a larger share of deposits, and interest rates on consumer loans are higher than those for business loans.

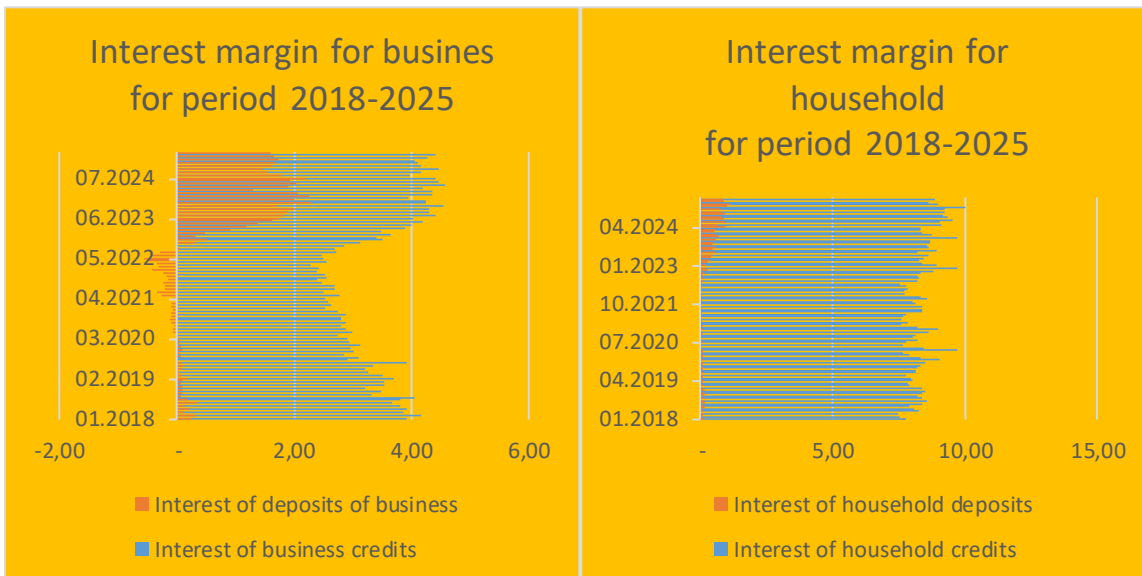


Fig.6 Interest margin for period 2018-2025

Below are main variables describing the model.

Table 1. Main variables

Ratio	Unit	Mean
Return of equity	%	7.5271
Return of assets	%	0.8431
Interest margin - business	%	2.91
Interest margin - household	%	8.20

Source: Authors

Regression results indicate that retail-oriented banks with high deposit dependence and larger capital ratios tend to exhibit higher profitability and stability. Conversely, low income diversification correlates with reduced performance. The influence of credit-to-assets ratios is nuanced: while generally negative, it appears less detrimental in banks with a retail orientation, owing to superior credit risk management. Regression analyses show that banks with higher reliance on retail deposits and larger capital buffers tend to achieve higher profitability and exhibit greater stability. Specifically, the regression coefficients indicate:

- Income diversification correlates with higher profitability but may also increase risk if not managed properly.
- The credit-to-asset ratio impacts performance negatively overall but less so among retail-oriented banks, owing to their superior credit risk management.

The findings suggest that strategic choices, particularly reliance on retail deposits and diversification, significantly influence bank resilience. The methodological contribution of combining factor analysis with panel econometrics offers a nuanced understanding of business models' effects, accommodating the existence of hybrid strategies.

The findings suggest that fostering retail-oriented, well-capitalized banks with stable funding sources can enhance resilience, especially in turbulent economic conditions. Policymakers should consider these strategic dimensions when designing regulatory frameworks and stress testing.

CONCLUSION

This study research banking models and their implications for financial stability. The proposed factor analysis approach offers a flexible tool for classifying complex strategies, accommodating hybrid models. The results advocate for strategies emphasizing retail deposits, diversification, and capital strength to promote resilience.

The banks that are more retail-oriented are better able to perform proper loan selection and credit risk assessment. The high deposit ratios appear to be particularly beneficial for non-retail banks, which typically rely more on wholesale funding sources. The business models characterized by a more diversified income structure are on average more profitable without being less stable. The analysis may provide suggestions as to which business model choices could be relevant and how effect on profitability and stability may be assessed.

REFERENCES

- Altunbas, Y., Molyneux, P., & Pasiouras, F. (2011). Features of the most and least stable banks: A look at the European banking sector. *Journal of Banking & Finance*, 35(3), 651–666. <https://doi.org/10.1016/j.jbankfin.2010.08.013>
- Altunbas, Y., Manganelli, S., Marques-Ibanez, D.(2011). Bank risk during the financial crisis – Do business models matter? ECB Working Paper Series No. 1394. European Central Bank, Frankfurt.
- Ayadi, R., P. Bongine, B. Casu, and D. Cucinelli.(2020). Bank Business Model Migrations in Europe: Determinants and Effects. *British Journal of Management* Vol.32(4), 1007 -1026.

- Basel Committee on Banking Supervision. (2014). Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools. Bank for International Settlements.
- Baele, L., C. Pungulescu, J.T. Horst.(2007). Model uncertainty, financial market integration and the home bias puzzle. *Journal of International Money and Finance* 26, 606-630.
- Beltratti, A., & Stulz, R. M. (2012). The credit crisis around the globe: Why did some banks perform better? *Journal of Financial Economics*, 105(2), 234–251. <https://doi.org/10.1016/j.jfineco.2012.03.002>
- Bolt, W., Hoeberichts, M., de Haan, L.(2010). Bank profitability during recessions.DNB Working Paper no.251.
- Boot, A.W.A. And Thakor, A.V.(2010). The accelerating integration of banks and markets and its implications for regulation. In *The Oxford Handbook of Banking*, (A. Berger, Ph. Molyneux and J.S. Wilson, eds.), 58-90.
- Bourke, P.(1989). Concentration and other determinants of bank profitability in Europe, North America and Australia. *Journal of Banking and Finance* 13 (1), 65– 79.
- Busch, R., Kick, T.(2015). Income structure and bank business models: Evidence on performance and stability from the German banking industry, *Schmalenbach Business Review* 67, 226-253.
- Demirgüç-Kunt, A., & Huizinga, H. (2010). Bank activity and funding strategies: The impact on risk and returns. *Journal of Financial Economics*, 98(3), 626–650. <https://doi.org/10.1016/j.jfineco.2010.06.005>
- Diamond, D. W. (1991). Monitoring and reputation: The choice between bank loans and directly placed debt. *Journal of Political Economy* 8(1), 689–721.
- European Commission. (2013). Banking Union: Strengthening resilience and promoting stability. European Commission Report.
- Goddard, J., Molyneux, P., Wilson, J., 2004. The profitability of European banks: A cross-sectional and dynamic panel analysis. *Manchester School* 72 (3), 363– 381.
- E. Gatev, T. Schuermann, P.E. Strahan(2009).Managing bank liquidity risk: how deposit-loan synergies vary with market conditions, *Rev. Financ. Stud.*, 22 (3) (2009), pp. 995-1020
- Köhler, M. (2015). Income diversification and bank stability. *Review of Finance*, 19(4), 1399–1430. <https://doi.org/10.1093/rof/rfu041>
- Köhler, M.(2015). Which banks are riskier? The impact of business models on bank stability. *Journal of Financial Stability* 16, 195–212.
- Laeven, L. and Levine R.(2009). Bank governance, regulation and risk-taking. *Journal of Financial Economics* 93(2), 259-275.
- Mergaerts, F., Vander Vennet, R., 2015. Business models and bank performance: A long-term perspective. *Journal of Financial Stability* 22, 57-75.
- Micco, A., Panizza, U., Yanez, M., 2007. Bank ownership and performance. Does politics matter? *Journal of Banking and Finance* 31(1), 219–241.
- Molyneux, P., 2011. *Bank Performance, risk and firm financing*. Palgrave Macmillan Studies in Banking and Financial Institutions.
- Mundlak, Y. (1978). On the pooling of time series and cross section data. *Econometrica*, 46(1), 69–85. <https://doi.org/10.2307/1913646>
- Pasiouras, F., Kosmidou, K., 2007. Factors influencing the profitability of domestic and foreign commercial banks in the European Union. *Research in International Business and Finance* 21 (2), 222–237.
- Sharpe, S. A., 1990. Asymmetric information, bank lending and implicit contracts: A stylized model of customer relationships. *Journal of Finance* 45(4), 1069–1087.
- Short, B., 1979. The relation between commercial bank profit rates and banking concentration in Canada, Western Europe and Japan. *Journal of Banking and Finance* 3(3), 209–219.
- Stiroh, K., Rumble, A., 2006. The dark side of diversification: The case of US financial holding companies. *Journal of Banking and Finance* 30(8), 2131–2161

INNOVATION STARTS INSIDE: THE IMPACT OF ORGANIZATIONAL STRUCTURE ON INNOVATION PERFORMANCE

Gonca Lazođlu Gr

Giresun University, Institute of Social Science, goncalazoglu@gmail.com
<https://orcid.org/0000-0003-0030-6248>

Kurtuluş Yılmaz Genç

Giresun University, Faculty of Economic and Administrative Sciences, kyilmazgenc@gmail.com
<https://orcid.org/0000-0001-5637-2995>

ABSTRACT

This study explores the relationship between organizational structure and innovation performance in small and medium-sized enterprises (SMEs) operating in the Organized Industrial Zones of Ordu, Turkey. Employing a mixed-methods approach, the research integrates quantitative data from structured questionnaires (n = 54) with qualitative insights from in-depth interviews. Statistical analyses including exploratory factor analysis, correlation, t-tests, regression, and Hayes' PROCESS macro (Model 4) reveal a significant and positive correlation between organizational structure and innovation performance ($r = 0.654$, $p < 0.01$). Firms with R&D departments and formal innovation strategies demonstrate notably higher innovation outcomes. However, mediation analysis indicates that sectoral classification does not significantly influence this relationship. Thematic analysis of qualitative data further confirms that flexible structures, democratic leadership, and employee participation are perceived as essential drivers of innovation. Decentralized decision-making and transparent communication were also found to foster an innovation-friendly organizational climate. The findings suggest that internal structural alignment plays a more critical role than sectoral context in enhancing innovation capacity. This research contributes to the literature by emphasizing the strategic importance of organizational design in fostering innovation, especially within emerging economies. Practical recommendations are offered for managers and policymakers aiming to improve innovation performance through structural transformation.

KEYWORDS

Organizational Structure, Innovation Performance, SMEs, Sectoral Mediation

INTRODUCTION

Organizational structures refer to the system through which practices such as task distribution, coordination, and control are directed to achieve organizational goals. Considering that the primary goal of a business is to maximize its profit, it has become increasingly difficult to attain this objective in today's competitive landscape. The rapid globalization driven by network technologies has rendered the competitive environment highly dynamic and challenging for enterprises to navigate.

In such an environment, businesses aiming to survive and maximize their profits tend to restructure their organizational configurations with an innovative approach. By doing so, they attempt to differentiate themselves and become pioneers in their respective sectors.

CONCEPTUAL FRAMEWORK

Concepts Related to Innovation

Innovation is generally defined through notions such as the generation of knowledge or ideas, creativity, and development. Hamel describes innovation in business as changes in traditional

principles, processes, and practices. Drucker associates innovation directly with entrepreneurship. According to Rogers, innovation refers to “ideas, practices, or objects that are perceived as new by individuals or organizations.” Freeman distinguishes between innovation and invention by asserting that while an invention refers to a new or improved tool, method, or model, innovation involves the economic use of new systems, tools, or methods of production.

The Evolution of the Innovation Concept

The evolutionary development of innovation has been categorized into five generations by Rothwell, later expanded to include a sixth generation. The first generation is the “technology-push model,” while the second is the “demand-pull model.”

The third is the “interactive model,” followed by the fourth, the “integrated model.” The fifth model, known as the “network model,” emphasizes external integration. The sixth generation is defined as the “learning-based and ICT-supported model.”

Organizational Theories Supporting Innovation

The organizational ecology theory explains the evolutionary adaptation of organizations to environmental conditions (Hannan & Freeman, 1977). The contingency theory suggests that organizational structures must vary in response to environmental uncertainty (Lawrence & Lorsch, 1967). The resource dependence theory focuses on the relationships organizations establish with their environment to access vital resources (Pfeffer & Salancik, 1978).

The organizational network theory emphasizes the importance of network relationships for the flow of information and social capital (Powell, 1990). Lastly, the new institutional theory explains how organizations institutionalize their structures to gain legitimacy (DiMaggio & Powell, 1983).

Innovation Performance and Its Indicators

Innovation performance refers to the extent to which businesses can effectively implement innovative activities, assessed through a multidimensional lens. Although financial outcomes are the most concrete indicators in the literature, strategic, organizational, cultural, and process-related metrics are also considered (Damanpour, 1991). Prominent indicators include leadership, vision, organizational structure, corporate culture, knowledge sharing, internal communication, customer orientation, environmental sensitivity, and technological capability (Amabile, 1996; OECD, 2005).

Theoretical Link Between Organizational Structure and Innovation Performance

Based on previous research, the structure of an organization plays a pivotal role in determining its innovation performance. For instance, Damanpour (1991) emphasized that organic structures are more conducive to innovation compared to mechanistic ones, which often hinder the flexibility and responsiveness required in dynamic markets. Similarly, Dedahanov et al. (2017) highlighted the importance of employee trust and organizational support as key mediators in the structure-innovation nexus. Innovation is not merely a technical or technological output; it is also a strategic process shaped by the internal characteristics of an organizational structure. In this respect, organizational structure is considered a key element that directly affects an enterprise’s capacity for innovation.

The literature strongly supports the view that flexible and horizontal structures, along with participatory management, enhance innovation capacity (Hage, 1999; Mintzberg, 1983).

Hage (1999) argues that organizational complexity and flexibility foster innovation, while Dedahanov et al. (2017) highlight the positive influence of democratic leadership styles and pluralistic decision-making on innovative capacity.

This perspective points to a positive relationship between innovation and structures that encourage employee participation in decision-making. Supporting evidence includes open internal communication, knowledge-based decision-making, and the incorporation of employee feedback.

METHODOLOGY

Research Objective and Model

The primary objective of this study is to investigate the impact of organizational structure characteristics on innovation performance among businesses operating in the Organized Industrial Zones of Ordu, Turkey, and to analyze whether the sector in which the firms operate plays a mediating role in this relationship. The proposed model assumes a direct relationship between organizational structure and innovation performance, with the sector acting as a potential mediator.

3 Population and Sample

The research population consists of businesses located in the Organized Industrial Zones of Ordu. In this context, data were collected from 54 firms, which constitute the sample of the study. The sampling method employed was convenience sampling.

Data Collection Tools

The data collection tools used in the research include the Organizational Structure Scale, Innovation Activities Scale, Innovation Performance Scale, and General Business Performance Scale. In addition, a demographic information questionnaire, an open-ended questions form, and an interview (qualitative) form were utilized for data collection. The scales and questionnaires were developed by the researcher. Furthermore, relevant literature sources were also consulted (Rangus, Drnovsek, Minin & Spithoven, 2017; Hoonsopon & Ruenrom, 2012; Demirel & Taşgit, 2016; Ponta, Puliga & Manzini, 2021).

Data Analysis Methods

The data were analyzed using the SPSS software. Initially, descriptive statistics were calculated, followed by Exploratory Factor Analysis (EFA) to determine the factor structures of the variables. EFA results indicated that each scale loaded onto a single factor with factor loadings exceeding 0.60, thereby supporting construct validity. Cronbach's Alpha reliability coefficients were above 0.80 for all subscales.

Table 1: Factor Loadings and Cronbach's Alpha Values of the Scales

Scale	Factor Loadings	Cronbach's Alpha
Organizational Structure	0.62 – 0.84	0.88
Innovation Performance	0.65 – 0.87	0.91
General Performance	0.63 – 0.85	0.86

The normality of data distribution was assessed through skewness and kurtosis values, all of which fell within the ± 1 range. Furthermore, both the Kolmogorov-Smirnov and Shapiro-Wilk tests confirmed the normal distribution of the data, indicating the appropriateness of using parametric tests.

4. FINDINGS AND DISCUSSION

4.1. Descriptive Findings

The descriptive analysis of the participating 54 businesses reveals several key characteristics related to firm practices, 75% of respondents confirmed the implementation of a formal innovation strategy in their organizations. In addition, 63% of the firms reported having an internal Research and Development (R&D) unit, while 48% indicated that they had established a separate unit specifically dedicated to innovation activities.

These findings collectively suggest that there is a growing strategic awareness regarding the importance of innovation among SMEs operating in the OIZ. However, the relatively lower

percentage of firms with dedicated innovation units highlights that structural integration and institutionalization of innovation practices remain in progress. Although strategic intent is present, the development of internal capabilities and organizational infrastructure necessary to fully operationalize innovation strategies appears to be uneven across firms. This points to the need for a more comprehensive and systematic approach to embedding innovation into the organizational architecture of SMEs in emerging industrial regions.

demographics and innovation-related practices.

A substantial portion of these enterprises were founded after the year 2000, indicating a relatively young business population. The dominant sectors represented were food production and general manufacturing, reflecting the industrial profile of the Ordu Organized Industrial Zones (OIZ).

In terms of firm size, approximately 61% of the businesses employed between 10 and 49 workers, classifying them as small enterprises within the SME definition. When it comes to innovation-related

Table 2: Demographic Characteristics of Participating Firms

Demographic Variable	Frequency	Percentage (%)
Firms established after 2000	41	75.9
Firms with 10–49 employees	33	61.1
Firms with an R&D unit	34	63.0
Firms implementing an innovation strategy	41	75.9
Firms with a dedicated innovation department	26	48.1

Factor and Normality Analyses

The Exploratory Factor Analysis (EFA) revealed three main structures: Organizational Structure, Innovation Performance, and General Performance. Each scale loaded onto a single factor with factor loadings above 0.60, indicating robust construct validity. The internal consistency for each scale, as measured by Cronbach’s Alpha, was also high (Table1).

Normality analysis indicated that skewness and kurtosis values were within the acceptable range of ± 1 . In addition, results from the Kolmogorov-Smirnov and Shapiro-Wilk tests supported the assumption of normal distribution, confirming the appropriateness of using parametric tests for further statistical analysis.

Hypothesis Testing

Pearson Correlation Analysis

The variables included in the correlation matrix are:

Organizational Structure (OS)

Innovation Performance (IP)

Innovation Activities (IA)

General Performance Level (GPL)

Table 3: Pearson Correlation Coefficients Among Key Variables

Variable Pair	Pearson's r	p-value	Significance
OS – IP	0.684**	< 0.001	Significant
OS – IA	0.799**	< 0.001	Significant
OS – GPL	0.595**	< 0.001	Significant
IP – IA	0.874**	< 0.001	Significant
IP – GPL	0.707**	< 0.001	Significant
IA – GPL	0.666**	< 0.001	Significant

a. Correlations are significant at the 0.01 level ($p < 0.01$)

H1: There is a statistically significant and positive relationship between organizational structure and innovation performance.

The correlation coefficient between organizational structure and innovation performance was found to be 0.684, which indicates a moderate to strong positive relationship according to Cohen's (1988) criteria. The associated p-value (< 0.001) confirms that this relationship is highly significant, thus supporting Hypothesis H1.

H2: There is a statistically significant and positive relationship between innovation performance and general performance.

The Pearson correlation coefficient between innovation performance and general performance was calculated as 0.707, also statistically significant at the 0.001 level. This confirms Hypothesis H2.

H3: There is a statistically significant and positive relationship between organizational structure and general performance.

The analysis revealed a positive correlation of 0.595 between organizational structure and general performance, which is significant at the 0.001 level. Thus, Hypothesis H3 is accepted.

H4: There is a statistically significant and positive relationship between innovation activities and innovation performance.

A strong correlation of 0.874 was observed between innovation activities and innovation performance, with a significance level of $p < 0.001$, confirming Hypothesis H4.

H5: Innovation performance varies according to whether the manager adopts a democratic or autocratic leadership style.

The correlation analysis between innovation performance (IP) and managerial leadership style (democratic vs. autocratic, DLS) revealed a statistically significant and positive relationship:

Table 4: Pearson Correlation Between Innovation Performance and Democratic Leadership Style

Variable Pair	Pearson's r	p-value
IP – DLS	0.575**	< 0.001

The coefficient value of 0.575 indicates a moderate positive relationship, and the significance level of $p < 0.001$ confirms the reliability of the result. Therefore, Hypothesis H5 is supported, suggesting that democratic leadership styles are associated with higher innovation performance.

H6: There is a statistically significant and positive relationship between employee participation in decision-making and innovation performance.

The correlation between innovation performance and employee participation in decision-making (EPDM) also yielded statistically significant results:

Table 5: Pearson Correlation Between Innovation Performance and Employee Participation in Decision-Making

Variable Pair	Pearson's r	p-value
IP – EPDM	0.585**	< 0.001

With a Pearson correlation coefficient of 0.585, this finding supports Hypothesis H6, indicating that greater employee involvement in decision-making processes contributes positively to innovation performance.

H7: The sector mediates the relationship between innovation performance and organizational structure.

T-Tests

H8: Innovation performance differs between firms with and without an innovation strategy.

H8₀: There is no significant difference in the mean innovation performance between firms that have an innovation strategy and those that do not.

H8_A: There is a significant difference in the mean innovation performance between firms that have an innovation strategy and those that do not.

Table 6: Independent Samples T-Test for H8

Group Statistics										
		M6	N	Mean	Std. Deviation	Std. Error Mean				
IP		1,00	47	4,3777	,73882	,10777				
		2,00	7	2,7857	1,22838	,46429				
Independent Samples Test										
		Levene's Test for Equality of Variances					t-test for equality of means		95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
IP	Equal variances assumed	4,131	,047	4,848	52	<,001	1,59195	,32838	,93301	2,25088
	Equal variances not assumed			3,340	6,661	,013	1,59195	,47663	,45318	2,73071
Independent Samples Effect Size										
		Standardizer ^a		Point Estimate	95% Confidence Interval					
					Lower	Upper				
IP	Cohen	,81054		1,964	1,077	2,835				
	Hedge	,82247		1,936	1,062	2,794				
	Glass	1,22838		1,296	,199	2,337				

a. The denominator used to estimate effect sizes varies by method. Cohen's d uses the pooled standard deviation, while Hedges' g applies a correction factor to the pooled standard deviation, making it more accurate for small sample sizes. Glass's delta uses the standard deviation of the control group only.

Since Levene's Test indicated unequal variances, the result under the "equal variances not assumed" condition is considered more appropriate. The result shows that the mean difference between the two groups is statistically significant and represents a large effect. Consequently, it is concluded that innovation performance differs significantly depending on whether a firm has an innovation strategy. Therefore, the alternative hypothesis (H8_A) is accepted.

H10: Innovation performance differs between firms depending on whether they have an R&D (Research and Development) unit.

H10₀: There is no significant difference in the mean innovation performance scores between firms with and without an R&D unit.

H10_A: There is a significant difference in the mean innovation performance scores between firms with and without an R&D unit.

Table 7: Independent Samples T-Test for H10

Group Statistics										
		M8	N	Mean	Std. Deviation	Std. Error				
Mean										
IP		1,00	17	4,7206	,38408	,09315				
		2,00	37	3,9189	1,05088	,17276				
Independent Samples Test										
		Levene's Test for Equality of Variances					t-test for equality of means		95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
IP	Equal variances assumed	14,457	<,001	3,040	52	,004	,80167	,26369	,27253	1,33081
	Equal variances not assumed			4,084	50,392	<,001	,80167	,19628	,40751	1,19583
Independent Samples Effect Size										
		Standardizer ^a			Point Estimate		95% Confidence Interval			
							Lower		Upper	
IP	Cohen	,89997			,891		,288		1,486	
	Hedge	,91321			,878		,248		1,464	
	Glass	1,05088			,763		,157		1,359	

- a. The denominator used to estimate effect sizes varies by method. Cohen's d uses the pooled standard deviation, while Hedges' g applies a correction factor to the pooled standard deviation, making it more accurate for small sample sizes. Glass's delta uses the standard deviation of the control group only.

Given the outcome of Levene's test, the "equal variances not assumed" result is deemed more appropriate. The findings indicate a statistically significant and substantially large difference between the groups. Consequently, it is concluded that innovation performance significantly differs depending on whether a firm has an R&D unit. Therefore, the alternative hypothesis (H10_A) is accepted.

Mediation Analysis via Hayes PROCESS

To examine whether the sector in which a firm operates mediates the relationship between organizational structure and innovation performance, Hayes' PROCESS macro (Model 4) was applied. The mediation analysis was conducted using 5,000 bootstrap resamples at a 95% confidence interval to assess the indirect effect.

The results revealed that the sector variable did not have a statistically significant indirect effect on the relationship between organizational structure and innovation performance. Specifically, the confidence interval for the indirect effect included zero:

Indirect effect CI = [-0.08, 0.03], $p > 0.05$

These findings indicate that the sector does not meaningfully alter the strength or direction of the relationship between organizational structure and innovation performance. In other words, regardless of the sector in which firms operate, internal structural configurations remain the primary determinants of innovation capacity.

This result highlights that flexible and participatory organizational structures contribute to innovation outcomes irrespective of sectoral context. The finding reinforces the idea that structural transformation should be treated as a strategic priority across all sectors, rather than being tailored solely to industry-specific conditions.

CONCLUSION

This study investigated the relationship between organizational structure and innovation performance among SMEs located in the organized industrial zones of Ordu, Turkey. By adopting a mixed-methods approach and testing ten hypotheses, the research aimed to clarify the structural and strategic determinants of innovation outcomes. Quantitative results supported H1, indicating a statistically significant and positive relationship between organizational structure and innovation performance.

This finding aligns with prior research emphasizing the role of decentralized, flexible, and participatory structures in fostering innovation (Damanpour & Evan, 1984; Hage, 1999). Furthermore, the acceptance of H2 and H3 demonstrates that innovation performance is closely associated with overall business performance and that organizational structure contributes to both dimensions.

The significant findings for H4, H8A, H9A, and H10A reveal that firms with dedicated innovation strategies, innovation-related units, and R&D departments show significantly higher innovation performance than those without. These results validate the argument that structural alignment with strategic innovation goals enhances firms' capacity to generate and implement novel solutions (Tidd et al., 2005; OECD, 2005). Notably, the hypothesis H5, which explored whether leadership style (democratic vs. autocratic) influences innovation performance, was not statistically supported.

This outcome suggests that while leadership style may have contextual importance, it is not a standalone determinant of measurable innovation output in this sample. However, H6, which found a positive relationship between employee participation in decision-making and innovation performance, reinforces the value of inclusive governance structures.

The mediation hypothesis (H7) regarding the sector's role in moderating the structure-innovation link was not supported, indicating that structural effects transcend sectoral boundaries. This finding suggests that internal organizational design may be a more critical driver of innovation than external industry dynamics in the context of SMEs.

Effect size estimations across accepted hypotheses (e.g., Cohen's $d > 0.8$ in H8A–H10A) indicate that these relationships are not only statistically significant but also practically meaningful. Firms with innovation-aligned structures exhibited substantially better performance outcomes.

The theoretical underpinnings of this study are grounded in classical organizational theory. According to Chandler (1962), structure follows strategy, implying that innovative goals require adaptive and decentralized organizational forms. These insights align with the findings of the present study, which reveals that flexible structures significantly contribute to higher innovation performance.

In conclusion, this study highlights the centrality of structural and strategic coherence in driving innovation among SMEs operating in emerging economies.

The empirical evidence suggests that internal organizational design—particularly when it is flexible, participatory, and strategically aligned—significantly enhances a firm’s ability to generate, implement, and sustain innovation.

Consequently, organizational transformation should be recognized by both policymakers and enterprise leaders as a critical strategic necessity rather than a mere functional adjustment. This includes establishing decentralized structures that empower cross-functional collaboration, institutionalizing R&D functions, fostering transparent communication, and embedding innovation objectives into the organizational culture. These efforts should be supported by training programs, leadership development, and incentive systems that reinforce innovation-oriented behaviors at all levels of the organization.

To foster structural adaptability in SMEs, it is essential for public institutions and industry stakeholders to collaboratively design and implement support tools, including innovation grants, tax breaks, and digitalization incentives. Innovation capacity-building initiatives must go beyond technology investments to include organizational diagnostics, structural audits, and change management support tailored to SME needs.

Future research may benefit from exploring the longitudinal impacts of structural reforms on innovation performance, particularly in volatile economic environments. Moreover, comparative sectoral and cross-national studies could uncover context-specific dynamics and enable the development of industry-tailored frameworks for structural innovation. Integrating digital transformation readiness, sustainability practices, and inter-organizational collaboration into future models could also provide a more holistic understanding of innovation ecosystems.

Promoting innovation within SMEs goes beyond the mere adoption of new technologies; it requires a fundamental rethinking of how organizations are structured, governed, and engaged with their internal and external stakeholders. A sustained commitment to strategic and structural alignment will be critical for enhancing the global competitiveness and resilience of SMEs in the years ahead.

REFERENCES

- Amabile, T. M. (1996). *Creativity in context*. Westview Press.
- Audretsch, D. B., Coad, A., & Segarra, A. (2014). Firm growth and innovation. *Small Business Economics*, 43(4), 743–749. <https://doi.org/10.1007/s11187-014-9560-x>
- Chandler, A. D. (1962). *Strategy and structure: Chapters in the history of the American industrial enterprise*. MIT Press.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.
- Cosh, A., Fu, X., & Hughes, A. (2010). Organisation structure and innovation performance in different environments. *Small Business Economics*, 35(4), 375–394.
- Damanpour, F., & Evan, W. M. (1984). Organizational innovation and performance: The problem of 'organizational lag'. *Administrative Science Quarterly*, 29(3), 392–409.
- Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, 34(3), 555–590.
- Dedahanov, A. T., Rhee, J., Yoon, J., & Cheong, J. O. (2017). Organizational structure and innovation: Does centralization foster or hinder creativity? *Technological Forecasting and Social Change*, 114, 24–30.

- DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, 48(2), 147–160.
- Drucker, P. F. (2002). *Yenilikçilik ve girişimcilik* (B. Çorakçı, Trans.). Sistem Yayıncılık.
- Field, A. (2013). *Discovering statistics using IBM SPSS statistics* (4th ed.). SAGE Publications.
- Freeman, C. (1991). Networks of innovators: A synthesis of research issues. *Research Policy*, 20(5), 499–514.
- Hage, J. (1999). Organizational innovation and organizational change. *Annual Review of Sociology*, 25, 597–622.
- Hamel, G. (2006). *The future of management*. Harvard Business Press.
- Hannan, M. T., & Freeman, J. (1977). The population ecology of organizations. *American Journal of Sociology*, 82(5), 929–964.
- Hedges, L. V. (1981). Distribution theory for Glass's estimator of effect size and related estimators. *Journal of Educational Statistics*, 6(2), 107–128.
- Hoonsopon, D. ve Ruenrom, G. (2012). The Impact of Organizational Capabilities on the Development of Radical and Incremental Product Innovation and Product Innovation Performance. *Journal of Managerial Issues*, 24(3), s. 250-276.
- Lawrence, P. R., & Lorsch, J. W. (1967). *Organization and environment: Managing differentiation and integration*. Harvard Business School Press.
- Mintzberg, H. (1983). *Structure in fives: Designing effective organizations*. Prentice-Hall.
- OECD. (2005). *Oslo manual: Guidelines for collecting and interpreting innovation data* (3rd ed.). OECD Publishing.
- Pfeffer, J., & Salancik, G. R. (1978). *The external control of organizations: A resource dependence perspective*. Harper & Row.
- Ponta, L., Puliga, G. ve Manzini, R. (2021). A measure of innovation performance: the Innovation Patent Index. *Management Decision*, s. 73-96.
- Powell, W. W. (1990). Neither market nor hierarchy: Network forms of organization. *Research in Organizational Behavior*, 12, 295–336.
- Rangus, K., Drnovsek, M., Minin, A. D. ve Spithoven, A. (2017). The role of open innovation and absorptive capacity in innovation performance: Empirical evidence from Slovenia. *Journal of East European Management Studies*, s. 39-62
- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.
- Rothwell, R. (1994). Industrial innovation: Success, strategy, trends. In M. Dodgson & R. Rothwell (Eds.), *The handbook of industrial innovation* (pp. 33–53). Edward Elgar Publishing.
- Sapolsky, H. M. (1967). Organizational structure and innovation. *Journal of Business*, 40(4), 497–510.
- Taşgıt, Y., & Demirel, Y. (2016). Yenilik performansının ölçülmesinde çok boyutlu bir yaklaşım önerisi. *Kahramanmaraş Sütçü İmam Üniversitesi Sosyal Bilimler Dergisi*, 13(1), 67–92.
- Tidd, J., Bessant, J., & Pavitt, K. (2005). *Managing innovation: Integrating technological, market and organizational change* (3rd ed.). Wiley.
- Tonta, Y. (2007). *Bilgi hizmetlerinde araştırma yöntemleri*. Türk Kütüphaneciler Derneği Yayınları.

STRATEGIC ANALYSIS OF THE IMPACT OF GLOBAL SEA LEVEL EVENTS ON COASTAL AIRPORTS

Didem RODOPLU ŞAHİN

Kocaeli University, Kocaeli, Türkiye, drodoplu@gmail.com
<https://orcid.org/0000-0002-1779-8472>

Nalan AKYURT

Kocaeli University, Kocaeli, Türkiye, akyurtnalan@gmail.com
<https://orcid.org/0009-0002-1383-7785>

ABSTRACT

Global climate change poses serious threats to coastal infrastructures through secondary effects such as sea level rise, increased storm intensity, extreme weather events and ground subsidence. International airports located on the coast or in low altitude areas are vulnerable to the multidimensional effects of climate change, both physically and operationally. Since airports are strategically important as the locomotive of economic development and key to global connectivity, their climate-based vulnerabilities create knock-on effects from local to regional and global scales.

This research aims to analyze the effects of sea level rise due to climate change on coastal airports. In the study, five strategic airports selected from Europe and Asia were examined in terms of their spatial and structural characteristics. In the analyses, the future threat levels of these airports were evaluated based on global climate scenarios such as RCP 4.5 and RCP 8.5.

The method of the study is based on the "Coastline Paradox" modeling, which takes into account the uncertainties in coastal measurement. This model, unlike classical coastal risk analyses, contributes to spatial planning and decision support processes by modeling uncertainty areas more precisely. In addition, SWOT analysis was conducted for each airport and historical vulnerabilities were compared with current projections through case events such as Typhoon Jebi. The study results reveal that many analyzed airports have become seriously vulnerable not only due to direct flooding but also due to indirect effects such as regional air traffic disruptions, infrastructure chain disruption and economic losses. In particular, airports with low elevations, prone to ground subsidence and high flood risk were determined to be in the medium-high risk group in projections until 2100. On the other hand, it was observed that some airports with advanced technology and supported by sustainable investments have the potential to demonstrate resilience. This study offers a holistic approach that evaluates the potential impacts of climate change on coastal airports in terms of governance, sustainability and operational continuity beyond physical damage. The findings are guiding for civil aviation authorities, urban planners, climate policy developers and infrastructure engineers. This study contributes to the literature by providing a strategic framework on how the aviation sector can be made more resilient to the climate crisis.

KEYWORDS: Climate change, Sea level rise, Coastal airports, Risk analysis, Adaptation

INTRODUCTION

Climate change, one of the most critical environmental problems of the 21st century, is not only limited to temperature increases; it also seriously threatens infrastructures located especially in coastal areas through secondary and complex effects such as sea level rise, increased frequency of extreme weather events, ground subsidence, salinization and storm-related disasters. One of the

areas where these effects are felt most intensely is international airports located near the coastline, at low altitude and with strategic importance. Airports are not only transportation hubs, but also structures that are the centers of economic vitality, tourism, international trade and emergency response capacity in times of crisis. Therefore, the vulnerability of such structures to climatic and geophysical threats can have significant consequences not only at the local level but also on a global scale. In particular, the IPCC's Sixth Assessment Report (AR6, 2021) emphasizes that under the highest risk projection, the RCP 8.5 scenario, the global average sea level could rise by more than 1 meter by 2100. This increase may have multidimensional consequences such as permanent flooding, infrastructure deformations, workforce disruptions and disruption of logistics chains in transportation infrastructures built close to the coast. In this context, Hanson et al. (2011) stated that more than 50% of the airports located in large coastal cities around the world will be directly affected by this rise. Similarly, Camus et al. (2016) stated that sea level rise is not a threat alone; it should be evaluated together with tides, storm surge and wave dynamics, and drew attention to the necessity of multivariate risk analyses. In addition, Kulp and Strauss (2019) revealed that sea level projections are insufficient to predict sensitivity, especially in low-lying regions, and this situation creates serious uncertainties in infrastructure planning in many regions, especially in Southeast Asia. In the literature, studies examining the sensitivity of airports to climate-based risks have generally focused on two separate axes: meteorological threats and structural vulnerabilities. Extreme precipitation, wind and storm are presented as examples of meteorological threats. Examples of structural vulnerabilities include ground subsidence and infrastructure resilience. For example, Koetse and Rietveld (2009) drew attention to the economic costs of adapting to climate change in transportation infrastructures, while Jacobs et al. (2018) addressed the effects of airport managers' risk perceptions on decision-making processes and infrastructure resilience. However, most of the existing literature falls short of providing comprehensive models that integrate spatial analyses with administrative or strategic planning dimensions. The contribution of this study is that it addresses a multi-scale vulnerability analysis, which is rarely encountered in the literature, at the level of spatial, administrative and measurement uncertainties. The "Coastline Paradox" model used in the study provides a more sensitive analysis framework that can be integrated into decision support processes by taking into account the measurement difficulties arising from the fractal structure of coastal morphology. The application of this model at the airport scale enables an innovative approach in terms of spatial planning, disaster management and sustainable infrastructure development. At the same time, in this study, not only existing vulnerabilities; The risk profiles that may occur in line with the possible climate scenarios to be encountered in the near, medium and distant future have also been systematically evaluated.

In this context, the study focuses on the following basic research problem:

To what extent are international airports located in coastal areas vulnerable to risks such as sea level rise due to climate change? What are the spatial and administrative factors that increase this vulnerability and how can a strategic adaptation framework be developed against these risks?

The following research questions are asked in line with this problem:

1. To what extent are the selected airports at risk from sea level rise under the IPCC's RCP 4.5 and RCP 8.5 scenarios?
2. Under which climate scenarios do the geographical location, altitude value, ground structure and existing infrastructure systems cause these airports to become more vulnerable?
3. How can the strengths and weaknesses, opportunities and threats of these airports be classified with SWOT analysis?
4. What kind of methodological contributions does the "Coastline Paradox" modeling provide in the creation of risk maps for coastal infrastructures?

5. Based on the findings, what kind of measures are suggested in terms of sustainable planning, governance strategies and infrastructure resilience?

METHODOLOGY

The methodological framework of this study is based on the “Coastline Paradox” model, which addresses the measurement complexities and spatial uncertainties of coastlines. This model theoretically explains the situation where measurement lengths vary depending on the scale and resolution used due to the fractal nature of coastlines. In this context, eliminating measurement inconsistencies that arise in the risk analysis of infrastructures located close to the coastline is of critical importance in terms of more precise spatial planning and decision support processes. The “Coastline Paradox” model was adopted as the basic methodological basis that strengthens the spatial risk assessment in the study. Within the scope of the study, a total of 10 international airports selected from the Asian and European continents were evaluated as samples. These airports are:

- Asia: Kansai International Airport (Japan), Shanghai Pudong Airport (China), Changi Airport (Singapore), Wenzhou Yongqiang Airport (China), Nanyang Jiangying Airport (China)
- Europe: Amsterdam Schiphol Airport (Netherlands), Heathrow Airport (UK), Copenhagen Airport (Denmark), Dublin Airport (Ireland), Lisbon Airport (Portugal)

In selecting these airports, criteria such as proximity to the coastline, low-altitude ground structures, being internationally important transportation hubs and potential exposure to climate change risks were taken into consideration. For each airport, analysis was conducted based on physical parameters such as distance to sea level, altitude information, ground type, regional hydroclimatic conditions and infrastructure features. In the analyses, climate projections for the years 2050 and 2100 were taken into account in line with the RCP 4.5 and RCP 8.5 scenarios. These scenarios are assumptions developed by the IPCC that model the climatic effects that may occur if global greenhouse gas emissions continue at different levels.

Open- source data sets provided by institutions such as the National Oceanic and Atmospheric Administration (NOAA), the Intergovernmental Panel on Climate Change (IPCC) and the National Civil Aviation Authority of each country were used in the data generation process. These data were analyzed with the help of Geographic Information Systems (GIS) software and spatial modeling was performed. Potential vulnerability levels for each airport were calculated through quantitative scores and spatial risk levels were visualized.

In addition, the strengths, weaknesses, opportunities and threats for each airport were systematically determined using the SWOT analysis method. Thanks to this analysis, not only the physical structural characteristics of the airports but also parameters such as institutional capacity, technological infrastructure and governance adequacy were evaluated. Thus, the relationships between operational continuity and the level of climate-related threats were revealed with a holistic approach.

In addition, in order to strengthen the methodological framework and validate the model, Typhoon Jebi, which affected Kansai International Airport in Japan in 2018, was taken as a case study. This case was evaluated as a real event where sea level rise, storm surge and infrastructure deformation caused operational disruptions due to the direct effect of the typhoon, and the obtained modeling results were compared with historical data. This comparison made an important contribution both in terms of testing the validity of the methodological approach and in terms of seeing to what extent the future scenarios are based on realistic foundations. As a result, this method provides a strong methodological basis for analyzing spatial risk, reducing uncertainties, integrating multiple data sources and creating strategic decision support processes. This aspect of the study has an integrative nature in terms of planning, engineering and governance dimensions in terms of airports' adaptation to climate change.

RESULTS

As a result of multi-layered spatial analyses and scenario-based modeling conducted within the scope of this research, it has been determined that the majority of international airports located close to the coastline are at medium to high risk in climate scenarios where sea levels rise and extreme weather events intensify. Especially under the RCP 8.5 scenario, the possibility of a 1-meter sea level rise by 2100 poses serious threats to airports built at low altitude, close to deltas or on filled ground. Considering that a 1 cm sea level rise can affect approximately 1 meter inland, permanent floods, ground deformations and transportation disruptions that may occur in these areas create an inevitable picture. In addition, factors such as ground subsidence, storm surge, intense rainfall regime and deficiencies in drainage infrastructure are among the main factors that increase vulnerability levels. SWOT analyses have shown that despite the strong technical capacity and institutional infrastructure of each airport, if sufficient spatial adaptation and infrastructural measures cannot be developed against climate change, even these infrastructures may remain at high risk. This situation is not limited to physical fragility, but also indicates a fragility cycle that can create chain effects on operational continuity, passenger safety, airline network structure and regional economy.

In addition, in light of projections based on the RCP 8.5 scenario, possible future forced migration movements, increasing CO₂ concentrations and coastal regression trends threaten both the physical existence of the analyzed airports and the sustainability of the air transportation networks around them. It is seen that these threats are not limited to direct physical effects, but also have the potential to spread to a wider geography with indirect systemic effects. For example, it is foreseen that certain infrastructures such as London Heathrow Airport do not carry a direct risk of flooding in the short term, but are indirectly affected due to disruptions in regional logistics systems and economic vulnerabilities.

The aviation sector; With its high-tech infrastructure systems, continuous service delivery, global connectivity and strategic economic importance, it presents a highly sensitive and fragile structure against the climate crisis. Although the sector has been able to respond relatively quickly to crises such as terrorist attacks, global epidemics and political instability in the past, it has been shown that this adaptation capacity is limited in the face of structural and permanent environmental threats caused by climate change and that reversal can be much more costly. Therefore, not only the protection of existing airports but also the re-planning of new infrastructure projects with a climate-focused risk perspective has become a critical necessity.

CONCLUSION

This study provides an original contribution to the literature in terms of evaluating the effects of climate change on coastal airports with a multi-dimensional analysis framework. In particular, the application of the “Coastline Paradox” model at the airport scale represents an innovative approach that allows the integration of methodological problems arising from spatial measurement uncertainties and the fractal structure of coastlines into decision support systems. At the same time, scenario-based spatial modeling combined with SWOT analyses offers the opportunity to comprehensively evaluate not only physical threats but also managerial capacity, institutional adaptation ability and strategic planning dynamics. In this context, the study not only produces physical vulnerability maps but also suggests a guiding framework in terms of multi-stakeholder governance models, strategic planning tools and climate adaptation policies. The analysis model presented by the study establishes a multi-scale bridge between airport planning, disaster risk management, environmental sustainability and international aviation policies. This comprehensive approach can be considered as a basic reference framework in the process of harmonizing aviation infrastructures with climate adaptation strategies.

In line with these findings, the recommendations listed below constitute the basis for policies and practices to be developed to make airports resilient to threats originating from climate change:

1. Structural engineering solutions such as elevated terminal platforms, seawalls, flood barriers and emergency backup terminal systems should be implemented to protect coastal infrastructures.
2. Multi-parameter risk analyses should be conducted in line with climate scenarios. In these analyses, not only sea level but also multiple factors such as sedimentation, ground subsidence, storm surge and ground permeability should be evaluated together.
3. Risk maps should be created for each airport in light of the outputs obtained from the SWOT analysis and investment priorities should be determined in line with these maps.
4. International authorities such as ICAO (International Civil Aviation Organization) and ACI (Airports Council International) should create airport-based climate risk protocols; these protocols should be made mandatory both in inspection processes and project approvals.
5. Multi-stakeholder governance models should be established that will ensure effective collaboration among local governments, civil aviation authorities, climate policy makers, infrastructure investors and community-based stakeholders; through these models, strategic adaptation processes can be synchronized at both local and global levels.

REFERENCES

- Becken, S., & Mackey, A. (2017). The adaptation of tourism infrastructure to climate change: A review of the literature. *Journal of Sustainable Tourism*, 25(12), 1779–1793.
- Coffman, M., Bernstein, P., & Wee, S. (2018). The impacts of climate change on US coastal transportation infrastructure. *Transportation Research Part D: Transport and Environment*, 62, 407–419. <https://doi.org/10.1016/j.trd.2018.04.004>
- Dawson, R. J., Shaw, A., Wescoat, J. L., & Bates, P. D. (2018). Climate change and the future of coastal urban infrastructure. *Climatic Change*, 148(1-2), 163–175. <https://doi.org/10.1007/s10584-018-2194-4>
- Graham, D. B., & McVey, R. T. (2017). *Climate Change Impacts on U.S. Transportation Infrastructure*. U.S. Department of Transportation, Federal Highway Administration.
- Hanson, S., Nicholls, R., Ranger, N., Hallegatte, S., Corfee-Morlot, J., Herweijer, C., & Chateau, J. (2011). A global ranking of port cities with high exposure to climate extremes. *Climatic Change*, 104(1), 89–111. <https://doi.org/10.1007/s10584-010-9977-4>
- IPCC. (2021). *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. <https://www.ipcc.ch/report/ar6/wg1/>
- Jacobs, W., Wessels, H., & Scheltema, A. (2018). Airport managers' perceptions of climate change risks: Implications for resilience. *Journal of Transport Geography*, 70, 105–115.
- Jain, S., & Balakrishnan, A. (2020). Climate change adaptation for airports: A review of challenges and opportunities. *Journal of Air Transport Management*, 85, 101784. <https://doi.org/10.1016/j.jairtraman.2020.101784>
- Keskitalo, E. C. H. (2014). *Climate Change and the Adaptive Capacity of Forests*. Routledge.
- Koetse, M. J., & Rietveld, P. (2009). The impact of climate change and weather on transportation systems. *Transportation Research Part D: Transport and Environment*, 14(3), 205–221.
- Kulp, S. A., & Strauss, B. H. (2019). New elevation data triple estimates of global vulnerability to sea-level rise and coastal flooding. *Nature Communications*, 10, Article No. 4844. <https://doi.org/10.1038/s41467-019-12808-z>
- Meyer, M. D., & Miller, E. J. (2014). *Urban transportation planning (3rd ed.)*. McGraw-Hill.

- Rosenbloom, D., & Mead, K. (2017). Climate Change and Transportation: Research Challenges and Opportunities. Transportation Research Board.
- Smith, A. J., & Rind, D. (2019). The vulnerability of coastal infrastructure to climate change: A case study of major airports. *Environmental Science & Policy*, 92, 198–205.
<https://doi.org/10.1016/j.envsci.2018.11.008>
- Zafra-Gómez, J. L., & Ruiz-Montoya, L. (2021). Climate change impacts on European airports: A spatial analysis of exposure and vulnerability. *Journal of Cleaner Production*, 281, 124845.
<https://doi.org/10.1016/j.jclepro.2020.124845>

THE RELATIONSHIP BETWEEN ABSORPTIVE CAPACITY, PRODUCT INNOVATION, FIRM PERFORMANCE AND MARKET TURBULENCE

Cemal ZEHİR

Yıldız Technical University, İstanbul, Türkiye, czehir@yildiz.edu.tr

Yasin ŞEHİTOĞLU

Yıldız Technical University, İstanbul, Türkiye, ysehit@yildiz.edu.tr

<https://orcid.org/0009-0007-8376-4565>

Sümeyye Çiçek VURAL

Yıldız Technical University, İstanbul, Türkiye, scvural@yildiz.edu.tr

<https://orcid.org/0000-0002-0706-9460>

ABSTRACT

This research examines the relationships among firms' absorptive capacity, product innovation, performance, and market turbulence. Quantitative data were collected through surveys from 211 medium- and large-sized firms operating in various sectors in Türkiye. Data were analyzed using SPSS PROCESS Macro, and direct and indirect relationships between the variables were examined. The research results supported the hypotheses regarding the mediation of product innovation in the relationship between absorptive capacity and firm performance, and the moderating effect of market turbulence.

KEYWORDS

Absorptive capacity, Product innovation, Firm performance, Market turbulence

INTRODUCTION

In today's environmental conditions where knowledge production and technological change are faster than ever, the influence of effective product development on the high performance of firms is quite significant. However, developing a new product and making this product stand out in the market is not easy. When examined within the framework of the resource-based view, it is possible to associate a successful innovation process with how valuable, rare, imitative and irreplaceable the information and technologies the firm possesses are. Information is one of the most important resources a firm possesses (Ávila, 2022). As in many processes, information has an importance that cannot be ignored in the product development process. Product innovation basically occurs when the firm's own information and valuable information obtained from the external environment are effectively combined (Müller et al., 2021). At this point, it is seen that the absorptive capacity (AC) of the firm has great importance in the process (Akgün et al., 2019). Because AC is closely related to acquiring and using information in the external environment. Cohen and Levinthal (1990) defined AC as "the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends." In this context, this research intends to examine the relationship between AC and product innovation and the potential mediation of product innovation.

Another objective of the study is to examine how market turbulence affects the strength of the relationship between AC and firm performance. The turbulence of the market indicates that sectoral conditions are constantly and rapidly reshaping, and that customer preferences and behaviors are experiencing frequent and unpredictable changes (Li, 2022; Qiu et al., 2020). Market turbulence is a very important factor for firm performance. In highly turbulent markets, firms often have to make innovations and improvements to meet customer needs. The strength of the relationship between AC and firm performance may also vary depending on environmental conditions (Li et al., 2020). AC is

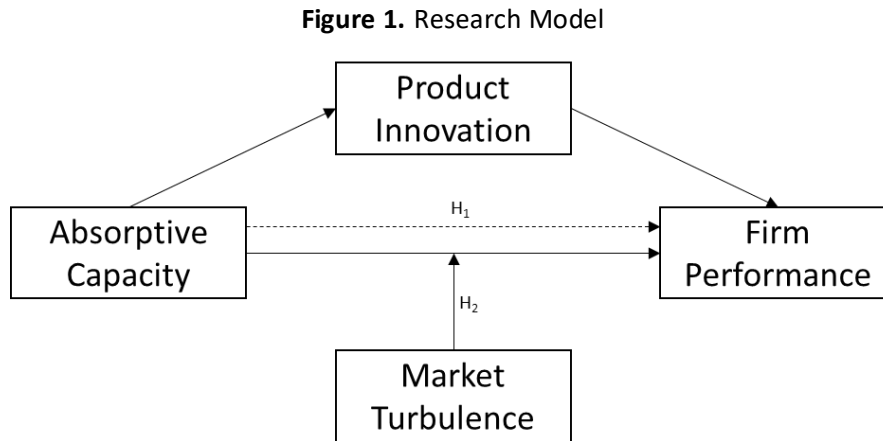
closely related to the recognition and acquisition of knowledge outside the firm. Therefore, it can be expected that absorption activities in turbulent and non-turbulent markets will also differ (Hussain et al., 2022).

The hypotheses created for these purposes are as follows:

H1: Product innovation mediates the relationship between absorptive capacity and firm performance.

H2: Market turbulence has a moderating effect on the relationship between absorptive capacity and firm performance.

The hypotheses between variables are expressed visually in Figure 1.



METHODOLOGY

In this research, quantitative research method was used to investigate the relationships among AC, product innovation, firm performance, and market turbulence. Quantitative data were collected by questionnaire technique. In the first part of the questionnaire, demographic information of the firms was included, and then scales obtained from reliable sources were used to measure the variables. The scales used to measure the variables, their sources and item numbers are listed in Table 1.

Table 1. Scales

Variables	Source	Number of items
Absorptive capacity	Santoro et al. (2018)	3
Product innovation	Zhang & Li (2010)	5
Market Turbulence	Jaworski & Kohli (1993)	6
Firm performance	Li & Liu (2014)	7

The population of the research consists of large-scale firms operating in the Marmara Region. Convenience sampling was used as the sampling method. During the data collection process, data were collected from a total of 211 firms from different sectors (such as manufacturing, IT, automotive, energy, telecommunications, construction). The size of the firms in the sample was measured by the number of employees. Medium-sized firms were defined as those with more than 250 but fewer than 500 employees, while large firms were defined as those with more than 500 employees. Information on firm size and age is presented in Table 2. After the completion of the data collection process, the data were analyzed with the SPSS PROCESS macro program.

Table 2. Firm size and age

		Frequency	Percent
Employee numbers	250–499	42	19,9
	500–999	33	15,6
	1,000 and above	136	64,5
Firm age	Less than 5	3	1,4
	5–10	17	8,1
	11–25	38	18,0
	25–50	80	37,9
	More than 50	73	34,5

RESULTS

Following the data collection process, the collected data were first examined in terms of meeting the conditions of reliability and validity. When the factor loadings were analyzed using EFA, it was observed that the factor loadings of some items remained low. One item from the firm performance variable and three items from the market turbulence variable were removed from the analysis due to low factor loadings. The factor loadings of all remaining items are at acceptable levels. After examining the factor loadings, Cronbach's alpha values of the variables were calculated. The alpha values of all variables were above 0.70, thus confirming the reliability of the scales. All factor loadings and alpha values can be seen in Table 3.

Table 3. Factor loadings of variables

Variables	Cronbach's Alpha	Factor Loadings
Firm Performance	0,883	
FP2		0,818
FP5		0,805
FP1		0,764
FP7		0,723
FP4		0,703
FP6		0,640
Product Innovation	0,900	
PI3		0,850
PI2		0,849
PI4		0,763
PI1		0,753
PI5		0,739
Absorptive Capacity	0,775	
AC2		0,832
AC1		0,777
AC3		0,749
Market Turbulence	0,755	
MT1		0,885
MT2		0,854
MT5		0,576
Extraction Method: Principal Component Analysis		
Rotation Method: Varimax with Kaiser Normalization		
KMO: 0,871, Total Variance Explained: 68,82		

Table 4 shows the results of the correlation analysis. Correlation analysis revealed a positive and significant relationship between all variables included in the analysis. The weakest relationship was found between absorptive capacity and market turbulence (0,216), while the strongest relationship was found between absorptive capacity and firm performance (0,532).

Table 4. Correlation table

	1	2	3	4
1. Absorptive Capacity				
2. Market Turbulence	,216**			
3. Product Innovation	,396**	,397**		
4. Firm Performance	,449**	,330**	,532**	

** . Correlation is significant at the 0.01 level (2-tailed).

Model 5 in the SPSS PROCESS macro program was used to test the mediator and moderator relationships in the research model. Tables 5 and 6 show the coefficients for direct and indirect relationships. First, when the direct relationships were examined, it was found that there was a positive and significant relationship between AC and product innovation ($\beta = 0,560$, $p < 0.000$), between AC and firm performance ($\beta = 0,292$, $p < 0.000$), and between product innovation and firm performance ($\beta = 0,295$, $p < 0.000$). In addition, product innovation was found to mediate the relationship between AC and firm performance (Table 6). Since there is a significant relationship between AC and firm performance in the presence of product innovation, it can be said that product innovation partially mediates the relationship between the two variables. These data support hypothesis H1. Another finding of the analyses is that market turbulence negatively moderates the impact of AC on firm performance. When market turbulence is high, the relationship between AC and firm performance weakens. This confirms the moderating role of market turbulence, supporting hypothesis H2.

Table 5. Direct effects

	Coeff.	SE	t	p
AC -> PI	,560	,090	6,226	,000
AC -> FP	,292	,068	4,325	,000
PI -> FP	,295	,051	5,830	,000
MT -> FP	,112	,049	2,291	,023
AC*MT -> FP	-,215	,073	-2,930	,004

Table 6. Indirect effect

	Effect	BooSE	BootLLCI	BootULCI
AC -> PI -> FP	,165	,047	,085	,267

Level of confidence: %95
Number of bootstrap samples: 5,000

CONCLUSION

In this research, the relationships between AC, product innovation, firm performance and market turbulence were examined. First, the mediation of product innovation was tested and the effect of both acquiring knowledge and transforming it into innovation in achieving high performance was examined. In addition, it was investigated how market turbulence transformed the effect of AC on firm performance. Within the scope of the research, the relationship between AC and performance

in developing countries was tried to be explained with the data collected from large-scale firms operating in Türkiye. The findings indicate that product innovation plays a significant partial mediating role in this relationship. Consistent with this result, Truong and Nguyen (2024) also concluded in their study in Vietnam that innovation mediates the relationship between knowledge absorptive capacity and business performance. While absorbing external knowledge is important for firm performance, it's not sufficient on its own. Concretizing this knowledge by transforming it into innovative product outputs is critical to performance. Another finding in this model is that the direct relationship between absorptive capacity and firm performance is negatively moderated. As market turbulence increases, the direct contribution of absorptive capacity to firm performance decreases. The results support the evidence presented by Li et al. (2020) regarding the disadvantages of absorptive capacity. This finding demonstrates that absorptive capacity does not provide the same level of benefit under all circumstances and that it is more difficult to translate this capacity into positive performance outcomes in markets with high uncertainty, as existing information tends to become outdated quickly. This study theoretically supports the resource-based perspective, demonstrating that absorptive capacity contributes to firm performance not only directly but also through intermediary mechanisms such as product innovation. Furthermore, the negative moderating effect of market turbulence on these relationships suggests that environmental factors can alter the value of internal resources. From a practitioner's perspective, firms can strengthen their innovation potential by increasing their absorptive capacity and thus enhance their performance. However, if external environmental turbulence is high, the direct contribution of this capacity to performance may be limited. Therefore, managers should focus not only on information gathering and processing, but also on the effective use and adaptation of this information against environmental uncertainties. This study has several limitations. Because the data are cross-sectional, causal relationships should be interpreted with caution. Furthermore, only product innovation was considered as a mediating variable in the model. Future research could include different types of innovation and various environmental conditions in the model. Furthermore, longitudinal studies could reveal the varying effects of environmental turbulence over time. Sectoral comparisons and analyses in different country contexts will also increase the generalizability of the results.

REFERENCES

- Akgün, A. E., Keskin, H., Kocoglu, I., & Zehir, C. (2019). The relationship among organizational symbols, firm absorptive capacity, and product innovativeness. *Engineering Management Journal*, 31(3), 158-176.
- Ávila, M. M. (2022). Competitive advantage and knowledge absorptive capacity: The mediating role of innovative capability. *Journal of the Knowledge Economy*, 13(1), 185-210.
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35(1), 128-152.
- Hussain, N., Bhatti, W. A., Khan, S. A., Arslan, A., & Tarba, S. Y. (2022). Firm absorptive capacity: multidimensionality, drivers and contextual conditions. *Journal of Knowledge Management*, 26(10), 2718-2742.
- Jaworski, B. J., & Kohli, A. K. (1993). Market orientation: antecedents and consequences. *Journal of Marketing*, 57(3), 53-70.
- Li, D. Y., & Liu, J. (2014). Dynamic capabilities, environmental dynamism, and competitive advantage: Evidence from China. *Journal of Business Research*, 67(1), 2793-2799.
- Li, L. (2022). Digital transformation and sustainable performance: The moderating role of market turbulence. *Industrial Marketing Management*, 104, 28-37.
- Li, Y., Kwok, R. C. W., Zhang, S., & Gao, S. (2020). How could firms benefit more from absorptive capacity under technological turbulence? The contingent effect of managerial mechanisms. *Asian Journal of Technology Innovation*, 28(1), 1-20.
- Müller, J. M., Buliga, O., & Voigt, K. I. (2021). The role of absorptive capacity and innovation strategy in the design of industry 4.0 business Models-A comparison between SMEs and large enterprises. *European*

Management Journal, 39(3), 333-343.

Santoro, G., Vrontis, D., Thrassou, A., & Dezi, L. (2018). The Internet of Things: Building a knowledge management system for open innovation and knowledge management capacity. *Technological Forecasting and Social Change*, 136, 347-354.

Truong, B. T. T., & Nguyen, P. V. (2024). Driving business performance through intellectual capital, absorptive capacity, and innovation: The mediating influence of environmental compliance and innovation. *Asia Pacific Management Review*, 29(1), 64-75.

Qiu, L., Hu, D., & Wang, Y. (2020). How do firms achieve sustainability through green innovation under external pressures of environmental regulation and market turbulence?. *Business Strategy and the Environment*, 29(6), 2695-2714.

Zhang, Y., & Li, H. (2010). Innovation search of new ventures in a technology cluster: the role of ties with service intermediaries. *Strategic Management Journal*, 31(1), 88-109

FROM METRICS TO DIGITAL INNOVATION

THE INTERPLAY BETWEEN UNIVERSITY CHARACTERISTICS, SUSTAINABILITY PERFORMANCE, AND INDUSTRY OUTCOMES IN THE GCC REGION

Oualid Abidi

Australian University – Kuwait, College of Business, West Mishref, Kuwait, o.abidi@au.edu.kw
<https://orcid.org/0000-0002-0099-889X>

Vladimir Dzenopoljac

Zayed University, College of Interdisciplinary Studies, Dubai, United Arab Emirates,
vladimir.dzenopoljac@zu.ac.ae
<https://orcid.org/0000-0003-2974-6466>

Aleksandra Dzenopoljac

SP Jain School of Global Management, Dubai, United Arab Emirates, aleksandra.dzenopoljac@spjain.org
<https://orcid.org/0009-0006-7717-7535>

ABSTRACT

This research paper investigates the relationships between university characteristics, namely institutional size and the degree of international exposure, and their sustainability performance in the Gulf Cooperation Council (GCC) region. Additionally, the study also examines whether a high sustainability performance promotes industry-related outcomes, such as research funding and patents citing university intellectual contributions. Using quantitative methods with SmartPLS, and drawing on secondary data gathered on 31 GCC universities listed in major global rankings (QS and Times Higher Education), our findings reveal that neither size nor international outlook have a significant influence on GCC university sustainability scores. However, our study results indicate a strong and statistically significant connection between higher sustainability ratings and industry outcomes. These results suggest that GCC universities which are performing well on sustainability metrics have more attractiveness to industry incumbents. This is possibly due to their alignment with broader environmental and social goals. For university managers in the GCC region, there is a clear implication urging the need to invest more actively in sustainability, not only as part of its ethical and societal mission, but also to enhance the university's appeal for potential partnerships with the industry.

KEYWORDS

Sustainability; World University Rankings; GCC; University, Industry-university collaboration.

INTRODUCTION

Higher education institutions are playing an increasingly crucial role in addressing sustainability issues, which fosters their innovation capabilities and supports industry development particularly in the Gulf Cooperation Council (GCC) region (Luomi et al., 2014). Countries such as Kuwait, Saudi Arabia, the United Arab Emirates (UAE), Qatar and others have launched bold national visions and reforms aiming at boosting environmental innovation notably via academic-industry cooperation. Despite this, several universities in the region still fail in devising and implementing comprehensive and impactful sustainability strategies (Oxford Business Group, 2023; PwC Middle East, 2024). While several top-tier universities in the GCC region have demonstrated their capacity to engage in

meaningful sustainability projects, such as the UAE University's renewable energy programs or King Fahd University's patent output, it appears that sustainability is still underrepresented in university strategic plans across the region (Oxford Business Group, 2023; PwC Middle East, 2024; RDIA, 2024; UAEU, 2022; 2024). Therefore, this research aims to examine whether focusing on sustainability draws strong outcomes from the industry. The study advocates the assumption that sustainability-engaged universities are more likely to create rewarding overlaps with the industry particularly in sectors where ESG (environmental, social, governance) concerns are crucial. The study outcomes will also help in highlighting any potential cultural and governance constraints that are specific to the GCC region (Uyar et al., 2019; Yamen et al., 2018), which may affect the way local universities apprehend sustainability and collaboration with the industry.

Moreover, this study aims to assess the extent to which GCC university attributes of size and international exposure, plays a role in determining its performance with regard to sustainability ratings, as per Times Higher Education (THE) and Quacquarelli Symonds (QS) World University Rankings. Literature discussed the role of university size as a driver of sustainability performance. It is argued that larger institutions possess more resources and influence enabling a stronger engagement in impactful sustainability actions (Leal Filho et al., 2019). Large universities are prototypes of mini agglomerations with specific patterns of consumption, waste, transportation and energy management systems (Alshuwaikhat & Abubakar, 2008). These characteristics are typically aligned with traditional sustainability targets of QS and THE if proper strategic planning is in place. Therefore, this study assumes that larger GCC university size would be associated with better sustainability scores. Exploring this hypothetical relationship among GCC universities in particular is important because of their solid resource endowments, potentially facilitating their progression in world sustainability rankings.

Similarly, a university's international outlook measured through different indicators, such as the number of international student numbers and faculty recruited overseas, might also increase GCC university sustainability performance. Having an international outlook is likely to open up new benchmarking opportunities for the university alongside knowledge flows and exposure to international sustainability standards. Thus, globally connected universities could be more suited to adopt bolder sustainability initiatives (Liu et al., 2019).

In the same sense, large and internationally engaged universities are anticipated to have a better chance for achieving stronger industry bonds as they have greater visibility and appeal to potential partners (Abo-Khalil, 2024; Ghabban et al., 2019). Large universities tend to leverage collaboration with corporations which boosts their research productivity. These institutions are also able to develop more robust research facilities which is likely to attract partnerships with the industry (Garcia et al., 2020; Tijssen et al., 2009).

Based on these ideas, the below Table 1 presents an overview of the five research hypotheses tested in the present study. The research model with the hypothesized associations are presented in the subsequent Figure 1:

Table 1: Hypotheses Development

Hypotheses	Theoretical support
<i>H1: A university's <u>size</u> positively influences its <u>sustainability score</u></i>	Sustainability has been neglected in the strategic plans of most GCC universities. Indeed, only 5% of mission statements and 11.5% of strategic documents have made reference to sustainability objectives (Bystrov & Panigrahi, 2021). However, the situations is changing with recent reforms emphasizing sustainability in educational curricula (Amin et al., 2023). Larger higher educational institutions are replicas of small cities demonstrating salient sustainability performance drawing on their prolific resources and robust infrastructure (de Villiers et al., 2025). Well-defined strategies and accountability plans are in place in larger universities to alleviate their heavier environmental footprint (Anderson, 2025).
<i>H2: A university's <u>international outlook</u> positively influences its <u>sustainability score</u></i>	Universities enhance their international exposure thanks to collaborations conducted at a global level. It can also be fostered by recruiting diverse students and through participation in international organizations. Increasing international visibility can grant academic institutions exposure to broader sustainability practices and perspectives. International partnerships can help universities in imparting global sustainability standards into their operations, teaching, and research (Liu et al., 2019). Furthermore, studies indicate that international student ratios and research networks are significant predictors of university sustainability performance (de Villiers et al., 2025). Cross-border collaborations are likely to support research quality, aligned with sustainability priority objectives (Abo-Khalil, 2024). Finally, universities with international manpower greatly benefit from their access to a diverse pool of talented academics with high expertise in sustainability projects.
<i>H3: A university's <u>size</u> positively affects its <u>industry research outcomes</u></i>	Large universities possessing significant amount of resources with well-established research output can foster their bonds with the industry, thereby reinforcing their research impact. Reliance on sufficient finances allows higher education institutions to allocate appropriate budgets to upgrade research infrastructure and build long-standing collaborations with industrial groups (Garcia et al., 2020). As per a study carried out by Abdalla et al. (2024), the investment of Arab universities in sustainability plans is largely determined by the amount of their publications in that area. This requires a sufficiently large institutional scope and size.
<i>H4: A university's <u>international outlook</u> positively affects its <u>industry research outcomes</u></i>	International exposure, achieved through global scale research collaborations and international hiring efforts, exerts a positive influence on university's research productivity (Payumo et al., 2019). GCC universities engaged in international research collaborations with a focus on attracting international students and faculty, appear as more appealing to industry incumbents. With international faculty composition, universities are able to leverage their networks to foster rewarding partnerships with different industry actors. Hojeij (2024) contends that the extension of networks supports information flows between Arab universities and the industry. In the same sense, increasing bilateral investments across the GCC economies promotes university-industry collaborations (Abidi et al., 2018).
<i>H5: A university's <u>sustainability score</u> positively influences its <u>industry research outcomes</u></i>	The partnerships established between corporations and academic institutions are needed for the reinvention of business sustainability strategies on one hand, and the translation of academic research into real solutions on the other hand (Hanieh et al., 2015). de la Poza et al. (2021) argue that the universities achieving high sustainability scores are well positioned to play major role industry sustainability innovations plans. Nonetheless, Rybnicek and Königsgruber (2019) highlighted the importance of reaching common agreements on the scope and outcomes of industry-university research collaboration to optimize efficacy and mitigate any obstacles.

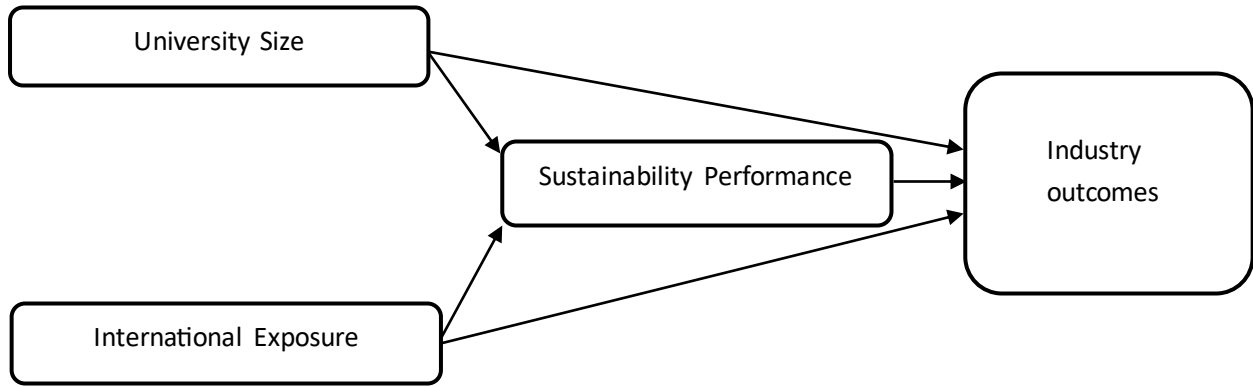


Figure 1: Research Model

METHODOLOGY

The study used a quantitative approach based on Partial Least Squares Structural Equation Modeling (PLS-SEM). The analysis was performed with the SmartPLS software. Data was obtained from the 2025 QS and THE World University Rankings for 31 universities in the GCC region (QS Quacquarelli Symonds, 2025; Times Higher Education, 2025). The included model variables are university size (measured by number of full-time students), international outlook (referring to the scope of international students and staff), sustainability performance (QS score), and industry outcomes (captured by THE rankings score, and measured via patents citing university research as well as research income received from the industry). After verifying the compiled dataset for completeness, the model direct and indirect effects between the model variables were tested. A bootstrapping technique with 5000 resamples was applied to ensure statistical validity, with significance assessed at a 95% confidence interval.

RESULTS

The results obtained offer a nuanced view. University size and international orientation have no statistically significant impact neither on sustainability performance nor on industry outcomes. The R^2 value for sustainability was 0.008, indicating almost no explanatory power from these independent variables. However, the R^2 value for industry outcomes was 0.484, which suggests that sustainability performance, along with other explanatory variables, roughly explain half of the variance of industry outcomes. Overall, only one hypothesis 5 testing the relationship between sustainability score and industry outcomes was statistically significant ($\beta = 0.641$, $p < 0.001$). Interestingly, the study confirms the strong role of sustainability in developing industry links. Institutions that more heavily prioritize sustainability are more likely to be viewed as relevant by corporate actors who may face an increasing pressure to align with ESG principles. In this sense, sustainability plans of GCC universities seem to have market relevance for local corporations by serving by sustainability missions.

The rejection of H1; H2; H3 and H4 demonstrates that reaching higher sustainability score will benefit GCC universities in terms of collaboration with industry partners. Practically, this is translated into salient benefits, such as funding and patent citations. The significant associations between size/international outlook and either sustainability or industry outcomes also helps in deriving interesting observations. For instance, possessing more resources is not a pre-requisite for higher sustainability rating. Therefore, smaller colleges or universities in the GCC can also play a significant

role in promoting sustainability efforts. Neither size nor international outlook will constrain the progression of local higher education institutions in this regard. Sustainability can be fostered with small ideas and limited investments such as green infrastructure, focused research agendas, and integration of SDGs into curricula. It can also be supported by locally relevant solutions with input received from domestic actors including faculty. To succeed, sustainability actions should be specific, not replicated. It might also appear that governmental influence and national strategies might limit the implementation of university-led sustainability actions. Hence, these findings are likely to challenge the common perceptions about the antecedents of sustainability and industry outcomes in higher education.

CONCLUSION

In conclusion, this study reveals that sustainability does not only represent a moral engagement or a reputational concern for universities. It also conveys a strategic relevance by influencing their bonds with the industry in the GCC region. While size and international exposure may enhance the institution's visibility and branding efforts, they have no particular correlation with sustainability objectives and effect on industry innovation endeavors. The study suggests that a more pragmatic and well-tailored design of sustainability choices will drive tangible benefits. Being convinced of the real potential of sustainability engagement, **GCC university policy makers** need to revisit their strategic priorities to focus more effectively on integrating sustainability actions into core operations and academic practices. This underscores the importance of not treating sustainability as a mere fashion and trademark with superficial symbolic commitment. This could place GCC colleges and universities in more prominent positions in national development plans and global agendas.

Additional **managerial implications** can be derived from this study. In terms of strategic alignment, GCC university leaders should integrate sustainability objectives into the mission statements as well as the strategic plans. This will emphasize the institution's commitment and capacity to meet different stakeholder expectations, particularly those from the industry. In regards to policy advocacy, GCC academic leaders should be eager to commit the necessary resources and networks to influence and actively contribute in shaping the national and regional sustainability policies specifically in areas such as public transportation and waste management. As a matter of fact, policy advocacy will significantly facilitate the achievement of the sustainability objectives of ambitious GCC universities.

The main **limitation** of this study concerns the limited sample used in the analysis (31 universities). This was implied by the removal of cases with missing data, as we merged two ranking databases, namely QS and THE. **Future research** should dig deeper into the sustainability aspects that drive stronger impact in terms of industry outcomes, e.g., energy use, or water conservation, sustainability education. In addition, it will be worthwhile to conduct qualitative research providing a detailed description of concrete campus sustainability experience across GCC region. Moreover, qualitative studies can be conducted to provide an in-depth exploration of rewarding and context-specific sustainability practices and strategies applied on GCC campuses, resulting in higher sustainability scores and industry research outcomes. Such research will help in examining the interaction between contextual challenges and university endowments, and how they shape the institution's sustainability prospects.

REFERENCES

Abdalla, S., Ramadan, E., Al-Belushi, M. A. K., & Al-Hooti, N. (2024). Unveiling the Role of Arab Universities in

- Advancing Sustainable Development Goals: A Multi-Dimensional Analysis. *Sustainability*, 16(14), 5829. <https://doi.org/10.3390/su16145829>
- Abidi, O., Antoun, R., Habibniya, H., & Dzenopoljac, V. (2018). Firm-specific determinants of FDI from GCC to MENA countries. *Journal of International Studies*, 11(4), 9–21. <https://doi.org/10.14254/2071-8330.2018/11-4/1>
- Abo-Khalil, A. G. (2024). Integrating Sustainability into Higher Education Challenges and Opportunities for Universities Worldwide. *Heliyon*, 10(1), e12345. <https://doi.org/10.1016/j.heliyon.2024.e12345>
- Alshuwaikhat, H. M., & Abubakar, I. (2008). An integrated approach to achieving campus sustainability: assessment of the current campus environmental management practices. *Journal of cleaner production*, 16(16), 1777-1785. <https://doi.org/10.1016/j.jclepro.2007.12.002>
- Amin, H., Zaman, A., & Tok, E. (2023). Education for Sustainable Development and Global Citizenship Education in the GCC: A Systematic Literature Review. *Globalisation, Societies and Education*, 21(3), 381-399. <https://doi.org/10.1080/14767724.2023.1967825>
- Anderson, K. (2025). What is sustainability reporting and why is it important? Greenly. Retrieved July 5, 2025, from <https://greenly.earth/en-us/blog/company-guide/what-is-sustainability-reporting-and-why-is-it-important>
- Bystrov, I., & Panigrahi, S. (2021). Commitment of Higher Education Institutions to Sustainability Agenda: Evidences from GCC Countries. *Sustainability*, 13(17), 9832. <https://doi.org/10.3390/su13179832>
- de la Poza, E., Merello, P., Barbera, A., & Celani, A. (2021). Universities' Reporting on SDGs: Using THE Impact Rankings to Model and Measure Their Contribution to Sustainability. *Sustainability*, 13(4), 2118. <https://doi.org/10.3390/su13042118>
- de Villiers, C., Dimes, R., Houqe, M. N., Hu, N., & Molinari, M. (2025). University sustainability performance as a catalyst for societal change. *Accounting, Auditing & Accountability Journal*, 38(5), 1428–1453. <https://doi.org/10.1108/AAAJ-06-2024-7133>
- Garcia, R., Araújo, V., Mascarini, S., Santos, E. G., & Costa, A. R. (2020). How long-term university-industry collaboration shapes the academic productivity of research groups. *Innovation*, 22(1), 56-70. <https://doi.org/10.1080/14479338.2019.1632711>
- Ghabban, F., Selamat, A., Ibrahim, R., Krejcar, O., Marešová, P., & Herrera-Viedma, E. (2019). The Influence of Personal and Organizational Factors on Researchers' Attitudes Towards Sustainable Research Productivity in Saudi Universities. *Sustainability*, 11(16), 4337-4360. <https://doi.org/10.3390/su11164337>
- Hanieh, A. A., AbdElall, S., Krajnik, P., & Hasan, A. (2015). Industry-Academia Partnership for Sustainable Development in Palestine. *Procedia CIRP*, 26, 109–114. <https://doi.org/10.1016/j.PROCIR.2014.07.184>
- Hojeij, Z. (2024). An overview of university–industry collaboration in the Arab world. *Journal of Innovation and Entrepreneurship*, 13(40). <https://doi.org/10.1186/s13731-024-00400-9>
- Leal Filho, W., Vargas, V. R., Salvia, A. L., Brandli, L. L., Pallant, E., Klavins, M., ... & Vaccari, M. (2019). The role of higher education institutions in sustainability initiatives at the local level. *Journal of cleaner production*, 233, 1004-1015. <https://doi.org/10.1016/j.jclepro.2019.06.059>
- Liu, Z., Moshi, G. J., & Awuor, C. M. (2019). Sustainability and Indicators of Newly Formed World-Class Universities (NFWCUs) between 2010 and 2018: Empirical Analysis from the Rankings of ARWU, QSWUR and THEWUR. *Sustainability*, 11(10), 2745. <https://doi.org/10.3390/su11102745>
- Luomi, M., Crist, J. T., Alam, B., & Shakir, M. B. (2014). Environmental sustainability in Qatar's Education City: Strategies, initiatives and education. *QScience Connect*, 2013(1), 41. <https://doi.org/10.5339/connect.2013.41>
- Oxford Business Group (2023). Patented innovation: Developments in higher education aim to boost patent filing – analysis. In *The Report: Saudi Arabia 2023*. Oxford Business Group. Retrieved May 3, 2025, from <https://oxfordbusinessgroup.com/reports/saudi-arabia/2023-report/innovation/patented-innovation-developments-in-higher-education-aim-to-boost-patent-filing-analysis/>.
- Payumo, J., Moore, D., Evans, M., & Arasu, P. (2019). An evaluation of researcher motivations and productivity

outcomes in international collaboration and partnerships at a US research-intensive university. *Interdisciplinary Journal of Partnership Studies*, 6(2), 4-4. <https://doi.org/10.24926/ijps.v6i2.2012>

- PwC Middle East (2024). Advancing research and innovation capabilities across the GCC. PwC. Retrieved April 19, 2025, from <https://www.pwc.com/m1/en/publications/advancing-research-and-innovation-capabilities-across-the-gcc.html>.
- QS Quacquarelli Symonds. (2025). QS World University Rankings 2025. Top Universities. Retrieved April 14, 2025, from <https://www.topuniversities.com/world-university-rankings>.
- Research, Development and Innovation Authority - RDIA (2024). Assessment of academic-corporate partnerships in Saudi Arabia. RDIA. Retrieved May 1, 2025, from <https://rdia.gov.sa/media/0sgd3gd4/assessment-of-academic-corporate-partnerships-in-saudi-arabia.pdf>.
- Rybnicek, R., & Königsgruber, R. (2019). What makes industry–university collaboration succeed? A systematic review of the literature. *Journal of Business Economics*, 89(2), 221–250. <https://doi.org/10.1007/S11573-018-0916-6/FIGURES/4>
- Tijssen, R. J., Van Leeuwen, T. N., & Van Wijk, E. (2009). Benchmarking university-industry research cooperation worldwide: performance measurements and indicators based on co-authorship data for the world's largest universities. *Research Evaluation*, 18(1), 13-24. <https://doi.org/10.3152/095820209X393145>
- Times Higher Education (2025). World University Rankings 2025. Retrieved April 14, 2025, from <https://www.timeshighereducation.com/world-university-rankings/latest/world-ranking>.
- United Arab Emirates University - UAEU (2022). UAE University is Funding 56 Research Projects Addressing the Sustainable Development Goals. Retrieved April 22, 2025, from <https://www.uaeu.ac.ae/en/news/2021/dec/sdgs.shtml>.
- United Arab Emirates University - UAEU (2024). The UAE University launches green research projects to promote sustainability and combat climate change. Retrieved April 22, 2025, from <https://www.uaeu.ac.ae/en/news/2024/january/the-uae-university-launches-green-research-projects-to-promote-sustainability-and-combat-climate-change.shtml>.
- Uyar, A., Ramadan, A., & Nimer, K. (2019). A critical evaluation of sustainability reporting in the Gulf Cooperation Council region. *International Journal of Sustainable Development*, 22(3/4), 158 – 185. <https://doi.org/10.1504/IJSD.2019.105327>.
- Yamen, A., Nimer, K., Ramadan, A. & Abidi, O. (2018). The Impact of National Culture on Sustainability Reporting: A Cross Country Analysis. *Asian Journal of Empirical Research*, 8(3), 110–123. <https://doi.org/10.18488/journal.1007/2018.8.3/1007.3.110.123>

FROM UNIPOLAR TO MULTIPOLAR: A COMPARATIVE ANALYSIS OF GLOBAL UNIVERSITY RANKINGS (2003–2024)

Mehmet BARCA

Social Science University of Ankara, Ankara/Türkiye, mehmet.barca@asbu.edu.tr
<https://orcid.org/0000-0002-1833-9411>

Semih CEYHAN

Ankara Yıldırım Beyazıt University, Ankara/Türkiye, sceyhan@aybu.edu.tr
<https://orcid.org/0000-0001-5721-6855>

Musab Talha AKPINAR

Ankara Yıldırım Beyazıt University, Ankara/Türkiye, mtakpinar@aybu.edu.tr
<https://orcid.org/0000-0003-4651-7788>

Muhammed Fatih ÖZER

Ankara Yıldırım Beyazıt University, Ankara/Türkiye, m.f.ozar@aybu.edu.tr
<https://orcid.org/0000-0002-5769-0204>

Emirhan YAĞCI

Ankara Yıldırım Beyazıt University, Ankara/Türkiye emirhannyagcii@hotmail.com

ABSTRACT

In an era where higher education plays a pivotal role in global competitiveness, university rankings have emerged as powerful tools for assessing and comparing academic performance across countries. This study examines the evolving dynamics of global academic competitiveness by analyzing data from six major international university ranking systems—THE, QS, Shanghai, CWUR, RUR, and Leiden—between 2003 and 2024. Through a comparative analysis of ranking trends and academic output, the study identifies a significant shift in the global academic landscape. Findings indicate a marked decline in the dominance of U.S. and European universities, particularly within the top 100 rankings, while China demonstrates a rapid ascent, driven by strategic investments in education and research. Complementing the ranking analysis, bibliometric data from SCImago (2004–2024) reveals a dramatic increase in China’s share of global scientific output, alongside a gradual decline in the U.S., UK, and Europe. These developments collectively underscore a structural transition from a Western-centric to a multi-centric global academic system, with implications for policy, funding, and international collaboration. In the near future, the balance of academic power may be fundamentally reshaped.

KEYWORDS

University ranking, competitiveness, higher education, academic performance

INTRODUCTION

Today, universities are not only centers of education and research but also important players in international competition. In this context, university rankings have emerged as effective tools for measuring and comparing the performance of higher education institutions. Renowned ranking systems evaluate universities based on various criteria such as research outputs, academic visibility, level of internationalization, and quality of education. These rankings have become an important

reference point not only for the academic community but also for various stakeholders, including students, families, policymakers, and investors.

From a strategic management perspective, global university rankings function not only as external performance indicators but also as internal strategic tools that shape institutional behavior. In the context of the Resource-Based View (Barney, 1991; Wernerfelt, 1984), high rankings are reflections of a university's core competencies, such as research capabilities, academic reputation, and international collaboration networks. These intangible assets are considered key to sustaining long-term competitive advantage in the global higher education market. Conversely, from the lens of New Institutional Theory (DiMaggio & Powell, 1983; Meyer & Rowan, 1977), rankings serve as mechanisms of legitimacy. As universities face growing isomorphic pressures to conform to globally recognized standards, ranking performance becomes a symbolic measure through which institutions demonstrate their alignment with internationally accepted norms, thereby securing legitimacy among peers, policymakers, and funders. Accordingly, this study not only documents the geographic shift in rankings but also highlights how universities utilize rankings as both strategic assets and legitimation instruments in navigating an increasingly competitive and institutionalized global academic environment.

In this study, the competitiveness of universities at a global level will be examined comparatively between countries. When examining the major ranking organizations that rank universities over the last 15 years, we observe that some countries have declined in the rankings, while others have risen. Notably, the rise of China stands out (Shen et.al, 2023). The strong dominance of U.S. and European universities in 2000s and 2010s began to weaken in the mid-2010s, with many Eastern countries, including China, finding their place at the top of the rankings. The rise of Chinese universities in global rankings stems not only from recent adoption of international standards but also from a long-standing state-driven tradition of using performance metrics, competition, and quantification as tools of higher education policy since the 1980s (Ahler & Christmann-Budian, 2023). Recent data from rankings reveal a global shift in academic leadership, with China emerging as a leader in Engineering and Life Sciences, while the USA and Europe maintain strengths in Social Sciences and various specialized fields, reflecting increasing regional diversification in research excellence (Marh et. al, 2025).

Through sustained investments and strategic reforms, China has reached a level where it can compete with Western universities, and even in some cases, has even surpassed the West. Initially, Chinese universities ranked significantly lower than elite university groups in the United States, the United Kingdom, Canada and Australia. However, targeted investments in higher education have helped China narrow this gap over time. This upward trend reflects the success of these initiatives and the broader elite-building strategy pursued by Chinese policymakers. Consequently, China's top universities are now performing well enough in international rankings to be able to compete with their Western rivals (Allen, 2017).

China's rise in global university rankings stems from sustained state-led investments and a strategic alignment with international metrics. Through initiatives like Project 211 and 985, China concentrated funding on elite institutions, forming the C9 League to foster world-class universities (Allen, 2017; Zhang, 2014). The introduction of ARWU in 2003 enabled China to benchmark itself globally, adapting to ranking criteria centered on publication and citation performance (Kang & Mok, 2024; Stichweh, 2023). This alignment was reinforced by targeted investment in STEM fields, which receive the bulk of

research funding and drive China’s visibility in rankings (Marginson, 2022; Han & Appelbaum, 2018). Unlike Western models, China’s centralized approach links academic excellence directly to national priorities, allowing for rapid scaling within a controlled framework (Perry, 2020).

As a response to China’s rise, Europe has emphasized de-risking through frameworks such as the suspended EU-China Comprehensive Agreement on Investment and Horizon Europe. These frameworks restrict collaboration in sensitive areas while promoting exchange in non-strategic fields (Cai, Pinna, & van der Wende, 2025). These framework-level limitations further highlight the structural challenges Western countries face in competing with China. Unlike China's unified system, Western responses suffer from fragmentation — the US's federal-state divide and Europe's national variations lead to inconsistent implementation (Zha & Wang, 2025). Budget constraints (e.g., EU's Horizon funding at €95 billion vs. China's trillions in equivalent R&D) and political polarization slow progress, while China's state subsidies enable faster scaling (Agasisti, Yang, Song, & Tran, 2021). Moreover, Western openness to global talent is now curtailed by security concerns, potentially stifling innovation, whereas China benefits from "reverse brain drain" incentives (Yeh, 2024). Studies highlight that Europe's productivity lags due to slower efficiency gains, exacerbating the competitive gap (Agasisti, Yang, Song, & Tran, 2021).

In this study, the data of six ranking organizations (THE, CWUR, QS, Shanghai, RUR, Leiden) will be analyzed historically to sketch a portrait of this change, and whether there has been a shift from West to East in the academic world will be discussed based on these secondary data.

METHODOLOGY

The study utilizes annual reports and datasets from six internationally recognized and highly reliable university ranking organizations. These include *Times Higher Education* (Times Higher Education, 2024), *QS World University Rankings* (QS Top Universities, 2024), *Academic Ranking of World Universities* (Shanghai Ranking Consultancy, 2024), *Center for World University Rankings* (Center for World University Rankings, 2024), *Round University Ranking* (Round University Ranking, 2024), and *CWTS Leiden Ranking* (Centre for Science and Technology Studies – CWTS, 2024). Each of these organizations employs distinct methodological frameworks and indicator sets to assess universities (Table 1). These rankings are already discussed in the literature, illustrating their central position (e.g., Aguillo, Bar-Ilan, Levene, & Ortega, 2010; Shehatta & Mahmood, 2016; Moskovkin, Saranskaya, & Baranov, 2022).

Table 2 Evaluation Indicators of Indexes

THE	QS	URAP
Citations - Research Influence %30	Employability and Outcomes %20	Citations %21
Citations impact (normalized average citations per paper)	Employer Reputation 15% Employment Outcomes 5%	Counts total citations received by university publications, indicating research impact.
Teaching - The Learning Environment %30	Global Engagement %15	International Collaboration %15
Income per academic Reputational survey – teaching PhD awards per academic PhD awards / bachelor’s awards Undergraduates admitted per academic	International Faculty Ratio 5% International Research Network 5% International Student Ratio 5%	Assesses international collaboration by counting co-authored publications with foreign institutions.

Research – Volume, Income and Reputation %30	Research and Discovery %50	Citation Impact Total (CIT) %15
Papers academic and research staff Research income (scaled) Reputation survey – research	Academic Reputation 30% Citations per Faculty. 20%	Measures the impact of research by adjusting citation rates relative to global standards.
International Mix – Staff and Students %7,5	Learning Experience %10	Article Impact Total (AIT) %18
Ratio of international to domestic student and staff Proportion of internationally co-authored research papers	Faculty Student Ratio 10%	Evaluates research quality by comparing citation-per-publication to the world average.
Industry Income - Innovation %2,5	Sustainability %5	Total Documents & Number of Articles %31
Research income from industry (per academic staff)	Sustainability 5%	Includes all scholarly literature such as articles, reviews etc.(&21) Measures current scientific productivity based on published journal articles. (%10)

SHANGAI	CWUR	RUR
Per Capita Performance %10	Employability %25	International Diversity %10
Per capita academic performance of an institution	Based on the professional success of a university's alumni, measured relative to the university's size	Share of international academic staff, students, co-authored papers (%6) Regional reputation outside home country (%2) International level (%2)
Quality of Education %10	Education %25	Teaching %40
Alumni of an institution winning Nobel Prizes and Fields Medals	Based on the academic success of a university's alumni, measured relative to the university's size	Academic staff per student (%8) Academic staff per bachelor's degree awarded (%8) Doctoral degrees per academic staff (%8) Doctoral degrees per bachelor's degree awarded (%8) World teaching reputation (%8)
Research Output %40	Research %40	Research %40
Number of articles published in Nature and Science. Papers indexed in Science Citation Index-Expanded and Social Science Citation Index	Research Output High-Quality Publications Influence Citations	Citations per academic and research staff (%8) Doctoral degrees per admitted PhD student (%8) Normalized citation impact (%8) Papers per academic and research staff (%8) World research reputation (%8)
Quality of Faculty %40	Faculty %10	Financial Sustainability %10
Staff of an institution winning Nobel Prizes and Fields Medals Highly Cited Researchers	Measured by the number of faculty members who have received top academic distinctions	Institutional income per academic staff (%2) Institutional income per student (%2) Papers per research income (%2) Research income per academic and research staff (%2) Research income per institutional income (%2)

The data collection process involved compiling publicly available ranking reports published between 2003 and 2024. (Starting date of ranking vary across different rankings) Within each ranking system, the positions of universities across different ranking ranges (0-100, 101–500, 501–1000) were identified for each year. These data were then visualized to capture temporal trends, providing insights into how the visibility of countries within global rankings has evolved over time. Additionally,

the overall numerical visibility of countries across different ranking systems was comparatively evaluated.

The second dimension of this study focuses on the overall quantity of the scientific works. Numbers of citable documents are analyzed at the overall academic productivity level allowing for a comprehensive assessment of competitive positions of countries. This data for this analysis were obtained from the SCImago Journal & Country Rank (SJR) database, a widely used and reliable bibliometric source based on Scopus data.

All collected data were analyzed and visualized using Microsoft Excel. Through these visualizations, both annual trends and inter-system differences were clearly presented. In interpreting these analyses, attention was paid not only to absolute ranking positions but also to the yearly changes in the components influencing these rankings. This approach allowed for a holistic evaluation of the areas where countries have shown relative improvement and those where they have lagged on a global scale.

RESULTS

Table 3 Number of Universities in the Top 100 from 2014-2024

Ranking	USA	Europe	China	UK
LEIDEN	60 → 31	19 → 12	0 → 15	18 → 19
CWUR	53 → 49	18 → 21	2 → 6	7 → 9
QS	31 → 27	18 → 16	6 → 10	18 → 17
RUR	45 → 38	27 → 20	2 → 11	9 → 9
Shanghai	52 → 38	26 → 23	0 → 13	8 → 8
THE	46 → 36	24 → 24	4 → 12	11 → 11

Table 2 illustrates the changes in the number of universities from different countries in the top 100 of the Leiden, CWUR, QS, RUR, Shanghai, and THE rankings between 2014 and 2024.

For the United States, a noticeable decline is observed across all rankings. The most significant drop occurs in the Leiden ranking, where the number of U.S. universities in the top 100 decreases from 60 to 31. Similar reductions are evident in the CWUR, QS, RUR, Shanghai, and THE rankings, highlighting a substantial weakening of the U.S.'s traditional dominance in global higher education rankings.

In contrast, China shows a remarkable strategic rise. The number of Chinese universities in the top 100 has significantly increased across all rankings. In the Leiden ranking, for example, China moves from 0 to 15, while the increase is also evident in other rankings: THE (4 to 12), CWUR (2 to 6), RUR (2 to 11), and Shanghai (0 to 13). This rise reflects China's growing influence and investment in higher education and research.

Europe, on the other hand, shows limited and somewhat stagnant growth. While there is an increase in the CWUR ranking (18 to 21), other rankings either show a decrease (Leiden: 19 to 12, RUR: 27 to 20) or remain stable (THE: 24 to 24). This suggests that while European universities maintain a

presence in the top 100, their overall position is not experiencing the same level of progress seen in the East.

The United Kingdom remains relatively stable, with minor fluctuations in its standing. The country holds a consistent position in most rankings, with slight decreases in Leiden (18 to 19) and CWUR (7 to 9), and limited changes in the others.

Table 4 Number of Universities between 101-500 from 2014-2024

Ranking	USA	Europe	China	UK
LEIDEN	95 → 98	162 → 104	44 → 98	31 → 47
CWUR	160 → 135	158 → 155	23 → 69	44 → 38
QS	69 → 56	135 → 129	14 → 24	36 → 37
RUR	78 → 80	111 → 82	18 → 36	51 → 40
Shanghai	94 → 76	136 → 120	32 → 78	33 → 30
THE	63 → 71	100 → 135	8 → 24	43 → 51

Table 3 illustrates the changes in the number of universities from different countries ranked between 101-500 globally from 2014 to 2024. The United States shows a slight decline across all rankings, indicating a modest reduction in its global academic presence. Europe, on the other hand, experiences a significant decrease in the number of universities in this range, particularly in the Leiden ranking, where the number drops from 162 to 104, suggesting a reduction in European universities' representation in global rankings. In contrast, China sees a remarkable increase, especially in the Shanghai ranking, where its universities rise from 32 to 78, reflecting China's growing academic influence and presence. The United Kingdom maintains a stable position with minor fluctuations, demonstrating consistent but slightly reduced representation in global rankings over the past decade.

Table 5 Number of Universities between 501-1000 from 2014-2024

Ranking	USA	Europe	China	UK
LEIDEN	11 → 90	46 → 153	39 → 109	0 → 4
CWUR	69 → 74	145 → 132	61 → 93	28 → 29
QS	30 → 59	36 → 110	8 → 28	14 → 34
RUR	14 → 30	26 → 89	5 → 39	20 → 29
Shanghai (2017-2024)	55 → 69	82 → 122	46 → 112	14 → 31
THE (2016-2024)	25 → 49	60 → 125	26 → 37	22 → 37

Table 4 shows the number of universities ranked between 501-1000 globally from 2014 to 2024. In the United States, the number of universities in the 501-1000 range has significantly increased, particularly in the Leiden ranking, which rose from 11 to 90. This indicates that more U.S. universities have shifted into this range.

In Europe, there has also been an increase, especially in the Leiden ranking, where the number of universities grew from 46 to 153. This increase may be explained by universities moving down from higher rankings into this range. China has shown a remarkable rise across all rankings, with the number of universities increasing from 39 to 109 in the Leiden ranking and from 46 to 112 in the Shanghai ranking. The United Kingdom has seen modest growth, particularly in the Shanghai and CWUR rankings.

Overall, the increases in Europe and the U.S. can be attributed to universities moving down from higher ranks into the 501-1000 category. This suggests that universities experiencing a decline in the rankings have shifted into this range.

Table 6 Percentage Change in the Number of Universities by Country across Various Global University Rankings, 2014-2024

	USA		Europe		China		UK	
	2014	2024	2014	2024	2014	2024	2014	2024
LEIDEN Top 100	60,0%	31,0%	19,0%	12,0%	0,0%	15,0%	18,0%	19,0%
CWUR Top 100	53,0%	49,0%	18,0%	21,0%	2,0%	6,0%	7,0%	9,0%
QS Top 100	31,0%	27,0%	18,0%	16,0%	6,0%	10,0%	18,0%	17,0%
RUR Top 100	45,0%	38,0%	27,0%	20,0%	2,0%	11,0%	9,0%	9,0%
Shanghai Top 100	52,0%	38,0%	26,0%	23,0%	0,0%	13,0%	8,0%	8,0%
THE Top 100	46,0%	36,0%	24,0%	24,0%	4,0%	12,0%	11,0%	11,0%
LEIDEN 101-500	23,8%	24,5%	40,5%	26,0%	11,0%	24,5%	7,8%	11,8%
CWUR 101-500	40,6%	33,8%	40,1%	38,8%	5,8%	17,3%	11,2%	9,5%
QS 101-500	17,3%	14,0%	33,8%	32,3%	3,5%	6,0%	9,0%	9,3%
RUR 101-500	19,8%	20,1%	28,2%	20,6%	4,6%	9,0%	12,9%	10,0%
Shanghai 101-500	23,5%	19,0%	34,0%	30,0%	8,0%	19,5%	8,3%	7,5%
THE 101-500	21,1%	17,7%	33,4%	33,6%	2,7%	6,0%	14,4%	12,7%
LEIDEN 501-1000	4,4%	18,0%	18,4%	30,6%	15,6%	21,8%	0,0%	0,8%
CWUR 501-1000	13,8%	14,8%	29,0%	26,4%	12,2%	18,6%	5,6%	5,8%
QS 501-1000	15,0%	11,9%	18,0%	22,1%	4,0%	5,6%	7,0%	6,8%
RUR 501-1000	7,6%	6,0%	14,1%	17,8%	2,7%	7,8%	10,9%	5,8%
Shanghai 501-1000	18,3%	13,8%	27,3%	24,4%	15,3%	22,4%	4,7%	6,2%
THE 501-1000	8,3%	9,8%	20,0%	25,1%	8,7%	7,4%	7,3%	7,4%

The table displays the percentage change in the number of universities by country across various global university rankings (Top 100, 101-500, and 501-1000) between 2014-2024. Based on the analysis provided:

- China shows consistent growth across most categories, indicating a significant improvement in its universities' rankings.
- The USA is experiencing a decline, especially within the Top 100 rankings, suggesting a drop in the number of universities in this prestigious group.
- Europe is witnessing a decrease in its share of universities in the Top 100, but a growth in the 101-500 and 501-1000 groups, reflecting a shift where European institutions are moving out of the Top 100 but still maintaining strong representation further down the rankings.

This shift might indicate a broader trend of emerging economies like China gaining ground in the higher education rankings, while traditional powerhouses like the USA and some European countries experience relative stagnation or decline at the very top. These findings are in line with the previous findings claiming that American universities are declining at a faster speed than those in Britain and the European continent (Huang, 2023).

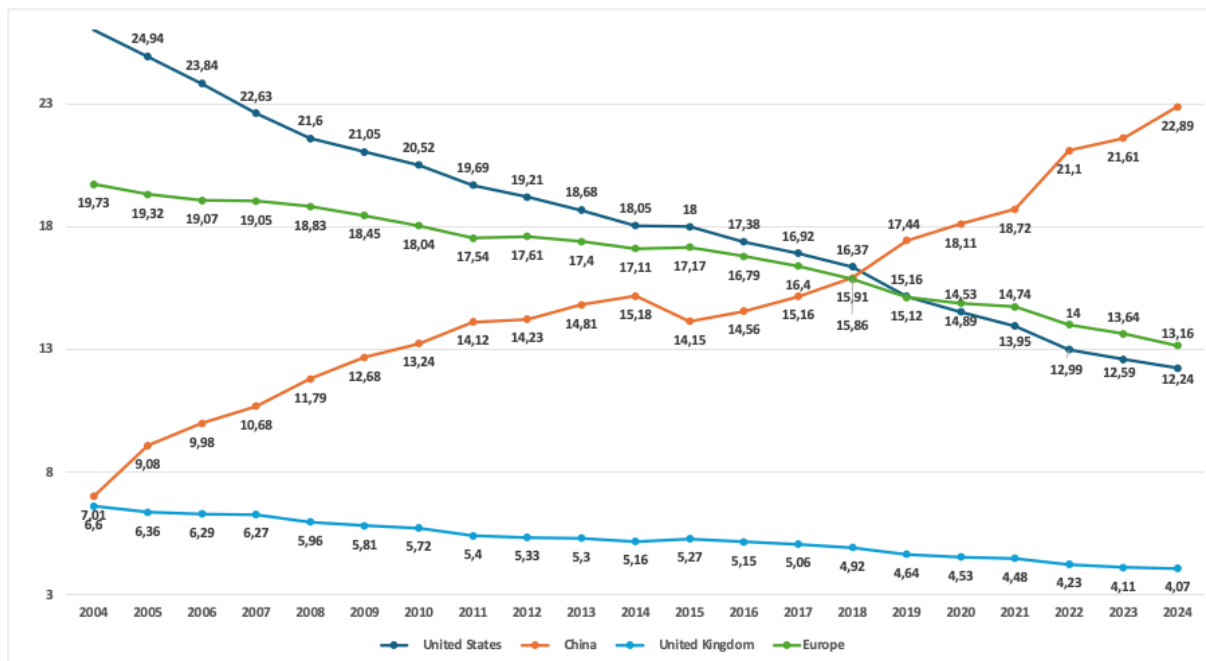


Figure 2 Change in the Percentage of 'Citable Documents' by Year According to SCIMAGO Data, 2004-2024

Figure 1 illustrates the percentage change in the production of "Citable Documents" (such as articles, conference papers, and journal articles) by selected countries between 2004 and 2024, based on SCIMAGO data. Citable documents serve as a key metric for academic productivity. The graph highlights significant shifts in global academic output, revealing notable trends in the rise of China's share, while the United States and the United Kingdom show a gradual decline in their contribution to global academic publications. Europe's share also decreases over time, reflecting a broader reallocation of academic productivity, with China experiencing the most substantial increase in its output.

The graph shows a significant rise in China's share of global academic publications, increasing from 9.08% in 2004 to 22.89% in 2024. Meanwhile, the United States and the United Kingdom have seen gradual declines in their contributions, with the U.S. dropping from 24.94% to 12.24%, and the UK from 19.73% to 13.16%. Europe's share has also decreased, from 19.32% to 12.24%, indicating a shift in global academic productivity toward China.

CONCLUSION

The findings of this study clearly demonstrate that the global landscape of higher education is undergoing a fundamental transformation. While the United States remains the dominant force in global university rankings and academic output, its relative decline—particularly in the top-tier (Top 100) categories—is undeniable. At the same time, China has rapidly emerged as a major academic power, with an extraordinary rate of growth in both ranking positions and scholarly output. This rise is not accidental but rather the result of deliberate national strategies, including targeted investments in research funding, education infrastructure, and international visibility (Kang & Mok, 2023).

What is increasingly evident is the transition from a unipolar or even bipolar model—once defined by U.S. and European dominance—to a multipolar academic world. A new landscape is emerging where China, the United States, and Europe constitute distinct and competitive centers of academic

excellence. This “multi-centric” reality suggests a more distributed balance of academic influence, in contrast to the previously Western-centric paradigm.

Beyond these three leading actors, countries such as India, Pakistan, Saudi Arabia, the United Arab Emirates, and Qatar are also accelerating their investments in higher education, suggesting that future shifts in the global academic order may be even more dynamic.

Taken together, these trends indicate that by the 2040s, the current dominance structure may be substantially reconfigured. The rise of new academic powers, combined with the relative decline of traditional leaders, heralds a future where global academic excellence is more equitably distributed across regions. In such a context, strategic policymaking, sustained investment, and international collaboration will be crucial for any nation aiming to maintain or enhance its position in the global knowledge economy.

From a Resource-Based View perspective, the ability of universities—particularly in China—to climb the rankings reflects their strategic accumulation of core competencies, including research infrastructure, international networks, and human capital. These institutions are leveraging such capabilities as sources of sustained competitive advantage in the global knowledge economy. At the same time, drawing on New Institutional Theory, global rankings act as instruments of organizational legitimacy. Universities increasingly adopt globally recognized performance indicators and conform to international norms to secure their standing and funding. Thus, the rankings are not just evaluative tools but also normative pressures shaping institutional behavior. The rise of new academic powers, the relative repositioning of established ones, and the intensification of competition suggest that the future of global higher education will be defined not by dominance, but by dynamic strategic adaptation and legitimacy-seeking behavior in an ever-globalizing world.

REFERENCES

- Agasisti, T., Yang, G. L., Song, Y. Y., & Tran, C. T. T. D. (2021). Evaluating the higher education productivity of Chinese and European “elite” universities using a meta-frontier approach. *Scientometrics*, 126(7), 5819–5853.
- Aguillo, I., Bar-Ilan, J., Levene, M., & Ortega, J. (2010). Comparing university rankings. *Scientometrics*, 85(1), 243–256.
- Ahlers, A. L., & Christmann-Budian, S. (2023). The politics of university rankings in China. *Higher Education*, 86(4), 751–770. <https://doi.org/10.1007/s10734-023-01014-y>
- Allen, R. M. (2017). A comparison of China’s “Ivy League” to other peer groupings through global university rankings. *Journal of Studies in International Education*, 21(5), 395–411.
- Barney, J. B. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
- Cai, Y., Pinna, C., & van der Wende, M. (2025). Rethinking EU-China Higher Education Cooperation in a Dynamic Global Environment. *Journal of Studies in International Education*, 29(2), 167–176.
- Center for World University Rankings. (2024). World University Rankings 2023. Retrieved January 30, 2025, from <https://cwur.org/2024.php>
- Centre for Science and Technology Studies – CWTS. (2024). CWTS Leiden Ranking. Retrieved January 22, 2025, from <https://www.universityrankings.ch/results/Leiden/2024>
- DiMaggio, P. J., & Powell, W. W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review*, 48(2), 147–160.
- Han, X., & Appelbaum, R. P. (2018). China’s science, technology, engineering, and mathematics (STEM)

- research environment: A snapshot. *PloS one*, 13(4), e0195347.
- Huang, J. (2023). Notes on the declining American institutions in university rankings: a trend against the Germany–Britain–America shift? *Innovation: The European Journal of Social Science Research*, 36(3), 549–561. <https://doi.org/10.1080/13511610.2022.2163623>
- Kang, Y., & Mok, K. H. (2023). China's policy responses to university ranking: changes and new challenges. *Scandinavian Journal of Educational Research*, 68(1), 67–78. <https://doi.org/10.1080/00313831.2023.2211987>
- Marginson, S. (2022). 'All things are in flux': China in global science. *Higher Education*, 83(4), 881–910.
- Marhl, M., Markovič, R., Grubelnik, V., & Perc, M. (2025). The changing world dynamics of research performance. *Scientometrics*, 130(1), 469–488. <https://doi.org/10.1007/s11192-024-05199-6>
- Meyer, J. W., & Rowan, B. (1977). Institutionalized Organizations : Formal Structure as Myth and Ceremony. *American Journal of Sociology*, 83(2), 340–363. <https://doi.org/10.1086/226550>
- Moskovkin, V. M., Zhang, H., Sadovski, M. V., & Serkina, O. V. (2022). Comprehensive quantitative analysis of TOP-100s of ARWU, QS and THE World University Rankings for 2014–2018. *Education for Information*, 38(2), 133–169.
- QS Top Universities. (2024). QS World University Rankings. Retrieved February 3, 2025, from <https://www.universityrankings.ch/results/QS/2025>
- Perry, E. J. (2020). Educated acquiescence: How academia sustains authoritarianism in China. *Theory and Society*, 49(1), 1–22.
- Round University Ranking. (2024). World University Rankings. Retrieved February 7, 2025, from <https://roundranking.com/>
- SCIMAGO. (2024). SCIMAGO Journal & Country Rank. Retrieved from <https://www.scimagojr.com>
- Shanghai Ranking Consultancy. (2024). Academic Ranking of World Universities. Retrieved January 27, 2025, from <https://www.universityrankings.ch/results/Shanghai/2024>
- Shehatta, I., & Mahmood, K. (2016). Correlation among top 100 universities in the major six global rankings: Policy implications. *Scientometrics*, 109, 1231–1254.
- Shen, W., Zha, Q., & Liu, C. (2023). From rejection to acceptance: the institutionalization of adopting university ranking outcomes as policy and strategic tools in China since the 1980s. *Policy Reviews in Higher Education*, 7(2), 229–248. <https://doi.org/10.1080/23322969.2023.2209655>
- Stichweh, R. (2023). The university as a world organization. In *The Oxford Handbook of Education and Globalization* (pp. 424–442). Oxford University Press.
- Times Higher Education. (2024). World University Rankings. Retrieved February 5, 2025, from <https://www.universityrankings.ch/results/Times/2025>
- Wernerfelt, B. (1984). A Resource-Based View of the Firm. *Strategic Management Journal*, 5(2), 171–180.
- Yeh, W. H. (2024). Chinese universities on the global stage: Perspectives from the recent past. *Daedalus*, 153(2), 83–97.
- Zhang, X. (2014). Factors that motivate academic staff to conduct research and influence research productivity in Chinese Project 211 universities (Doctoral dissertation, University of Canberra).
- Zha, Q., & Wang, Y. X. (2025). North America and European Union Policy Changes Towards Higher Education Relations with China: A Comparative Study. *Journal of Studies in International Education*, 10283153251315264.

FROM UTILITY TO DEPENDENCY: GENDERED PATTERNS OF TECHNOLOGY ADDICTION AND THEIR IMPACT ON LEARNING ENGAGEMENT IN HIGHER EDUCATION

Şehnaz Okkiran

*Gaziantep University, Gaziantep, Türkiye, sehnazokkiran@gmail.com
<https://orcid.org/0000-0002-3026-7836>*

Can Demirel

Gaziantep University, Gaziantep, Türkiye, cdemirel27@gmail.com

ABSTRACT

In today's higher education landscape, digital technologies serve as both essential tools for academic engagement and potential sources of behavioral risk. While online platforms, mobile apps, and communication tools offer flexibility and connectivity, their excessive use may disrupt students' focus, motivation, and time management—especially within classroom settings. This study investigates the relationship between technology addiction and academic difficulties among university students, with particular attention to gender-based patterns of digital engagement. The research was conducted with 104 undergraduate students at Gaziantep University, of whom 66% identified as female. Data were collected using a validated Technology Addiction Scale and a self-report questionnaire that captured students' academic behaviors, including attention loss, motivation decline, and procrastination. Descriptive statistics revealed that the majority of participants reported more than three hours of daily internet use, primarily for non-academic purposes. Female students and learners were overrepresented among those exhibiting behavioral disengagement. Pearson correlation analysis demonstrated statistically significant and moderately strong relationships between technology addiction and classroom-related learning problems. Notably, procrastination showed the highest correlation with digital dependency, suggesting that compulsive digital use may interfere with students' ability to manage academic responsibilities effectively. These findings contribute to the literature on digital well-being and behavioral learning outcomes by emphasizing the need for gender-sensitive strategies in educational planning. In particular, they highlight that female students in higher education may face distinct challenges in regulating technology use, underscoring the importance of targeted interventions that promote balanced digital habits and academic self-regulation.

KEYWORDS

Technology addiction, Digital behavior, Academic engagement, Attention and motivation, Gender-sensitive education

INTRODUCTION

Technology addiction—defined as the compulsive and uncontrolled use of digital devices that interferes with daily functioning—has emerged as a significant behavioral concern in higher education. While digital tools are indispensable for academic activities such as communication, research, and learning management, their excessive and unregulated use can impair students'

attention, emotional regulation, and academic motivation (Kuss & Griffiths, 2017; Elhai et al., 2017). These effects are particularly pronounced in classroom settings, where students are expected to maintain sustained focus, manage time effectively, and self-regulate learning tasks (Samaha & Hawi, 2016). As higher education increasingly adopts blended and online formats, the line between purposeful academic engagement and digital overuse has become blurred.

Theoretical models of self-regulation and digital behavior suggest that excessive technology use may compromise executive functions such as task planning, inhibition control, and emotional discipline (Chen, Sun, & Feng, 2021). In technology-mediated learning environments, students are often required to manage multiple digital platforms simultaneously—ranging from learning management systems to messaging apps and social media. This multitasking environment may lead to fragmented attention, increased procrastination, and diminished academic engagement, particularly among students who lack strong self-regulation skills (Ferguson, 2021; Rosen et al., 2013).

Emerging literature further suggests that digital behaviors are not only cognitively demanding but also socially and emotionally conditioned. Notably, gender plays a crucial moderating role in how students engage with technology. Studies have shown that female learners tend to use digital platforms more frequently for emotional expression, communication, and social validation—patterns that may expose them to greater risk of digital dependency and associated academic challenges (Suhail & Bargees, 2006; Andreassen et al., 2017). Moreover, women in higher education often encounter layered expectations of performance, discipline, and multitasking, making them particularly vulnerable to the negative impacts of technology addiction in academic contexts (Palaščáková, Liadskyi, & Diachkov, 2024).

In addition to these behavioral dynamics, entrepreneurial and educational psychology perspectives point to the importance of intrinsic motivation and emotional resilience as buffers against digital overload. Monica and Anuradha (2024) emphasize that traits such as passion and creativity mediate the relationship between technology use and academic persistence, especially among female students. This suggests that interventions aimed at building self-awareness, emotional intelligence, and future orientation may help mitigate the risks of compulsive digital behaviors.

Although global literature has explored various dimensions of technology addiction, studies explicitly linking it to classroom-level academic problems—such as attention loss, motivational decline, and procrastination—are still limited, particularly in Turkish higher education contexts. Even fewer studies have examined the gendered patterns of these effects within localized learning environments. This gap in the literature restricts the development of culturally sensitive and gender-responsive educational strategies aimed at promoting healthy digital habits and sustained academic engagement.

This study addresses this gap by empirically examining the impact of technology addiction on students' learning behaviors within the classroom. It focuses on the relationship between digital dependency and academic difficulties, and pays specific attention to how these patterns may differ across genders. The objectives of the study are threefold:

1. To assess the general level of technology addiction among undergraduate students.
2. To investigate the frequency and nature of classroom-related learning problems associated with technology use, including attention loss, motivation decline, and procrastination.

3. To explore whether gender moderates the relationship between technology addiction and academic disengagement.

The inclusion of 66% female participants allows for a gender-sensitive analysis, offering valuable insights for educational policy-makers, instructors, and support staff concerned with equitable and effective digital learning strategies.

This study builds upon behavioral learning theory, digital literacy models, and gender-based educational frameworks. It situates technology addiction not merely as an individual issue, but as a socio-cognitive phenomenon influenced by gender norms, academic pressures, and technological design. In doing so, the research contributes to broader discourses on digital well-being, student autonomy, and inclusive educational design—issues that are central to both strategic education planning and the evolving digital economy.

By clarifying how compulsive technology use correlates with classroom behavior, and by highlighting gender-specific risks, the study advances our understanding of how digital engagement must be actively managed—not only at the student level, but also through systemic and institutional interventions. As higher education continues to digitize, these insights will be crucial in designing learning environments that support academic resilience, gender equity, and digital responsibility.

METHODOLOGY

This study employed a descriptive correlational research design, which is appropriate for examining relationships between naturally occurring variables without manipulating the study environment. Correlational designs are widely used in behavioral sciences when the goal is to explore how one variable (e.g., technology addiction) statistically relates to another (e.g., academic behavior) in real-world settings (Fraenkel, Wallen, & Hyun, 2012). In this study, technology addiction is conceptualized as a predictor variable, while classroom-related learning problems—specifically attention loss, lack of motivation, and procrastination—are treated as outcome variables.

Participants and Sampling

The participants were 104 undergraduate students from the Faculty of Medicine at Gaziantep University, enrolled in the first, second, and third years of study. Convenience sampling was used due to accessibility and time constraints, a method commonly accepted in educational field studies when working with naturally assembled groups. Of the participants, 66% identified as female, making the study suitable for gender-sensitive analysis. While this sampling strategy may limit generalizability, it enabled access to a real-world, contextually embedded population relevant to the research questions.

Ethical Considerations

Ethical approval for the study was obtained from the Gaziantep University Clinical Research Ethics Committee (Approval No: 2017/137). Participation was strictly voluntary, and students were informed of the purpose and procedures of the research before completing the instruments. No personally identifying information was collected. Data were gathered and stored in accordance with university data protection protocols, maintaining participants' confidentiality and anonymity.

Instruments

Data were collected through a structured, two-part questionnaire administered in Turkish. The first part consisted of a demographic data form capturing participants' gender, academic year, and daily digital usage patterns (e.g., time spent online, most used platforms). This allowed for the identification of subgroup trends based on usage behavior.

The second part employed the 48-item Technology Addiction Scale, developed and validated in prior Turkish educational research contexts. The scale measures four key dimensions: (1) compulsive use, (2) emotional withdrawal, (3) overreliance on devices for non-academic needs, and (4) avoidance of academic responsibilities due to digital distractions. The instrument uses a 5-point Likert-type response format (1 = strongly disagree to 5 = strongly agree). In the present study, the scale demonstrated high internal reliability, with a Cronbach's alpha of .89, indicating strong internal consistency across items. Data were collected using a Likert-type instrument adapted from validated digital addiction scales used in prior studies (Young, 1998; Andreassen et al., 2012; Rosen et al., 2013).

Data Collection

Data collection occurred face-to-face in classroom settings during the spring semester of 2024. Students were approached at the end of scheduled lecture hours and asked to complete the paper-based instruments. The average time required for completion was approximately 20 minutes. The environment was structured to ensure that responses were completed independently, without peer influence. All procedures adhered to ethical standards for voluntary and informed participation.

Data Analysis

All statistical analyses were conducted using IBM SPSS Statistics Version 26.0. Descriptive statistics (means, frequencies, percentages) were used to summarize the demographic characteristics and digital engagement patterns of the participants. These statistics helped establish usage trends (e.g., most common platforms, average daily screen time) and academic self-perceptions.

To explore the relationships between technology addiction and academic outcomes, Pearson's correlation coefficient (r) was calculated. This analysis was used to assess the strength and direction of association between total addiction scores and students' self-reported classroom learning difficulties—specifically attention loss, motivation decline, and procrastination. Correlation was deemed significant at $p < .01$, and all assumptions for parametric correlation analysis (e.g., linearity, interval-level data, homoscedasticity) were tested and met.

The results revealed statistically significant and moderately strong positive correlations between addiction levels and all three classroom problem areas. The highest correlation was found between technology addiction and procrastination ($r = 0.43$), suggesting that digital overuse most strongly affects students' time management and task initiation skills.

Conceptual Model

As illustrated in Figure 1, the conceptual model guiding this research is based on the hypothesis that technology addiction functions as a primary predictor of behavioral challenges in academic environments. The model includes three specific learning problems—attention loss, motivational decline, and procrastination—as outcome variables. Demographic variables such as gender and academic year are included as moderating or contextual factors, offering a nuanced view of how different student characteristics may influence the dynamics of digital behavior. The model is

directional in nature, assuming that increasing levels of digital dependency lead to greater behavioral disengagement and learning inefficiencies. It aligns with previous studies that view digital overuse not merely as a by-product of student lifestyle but as a behaviorally consequential pattern affecting academic outcomes (Rosen et al., 2013).

Figure 1. Conceptual Model of the Study



This model presented as Figure 1 assumes that technology addiction acts as a key predictor of classroom learning problems such as attention loss, lack of motivation, and procrastination. Demographic characteristics are included to explore whether they influence addiction levels or moderate their impact on academic engagement. The structure reflects a directional hypothesis, where increased digital dependency contributes to the emergence of behavioral challenges in educational settings.

RESULTS

The final sample consisted of 104 undergraduate students from the Faculty of Medicine at Gaziantep University. The majority were first-year students (81%), with 66% identifying as female. Most participants (59%) reported daily internet use of more than 3 hours, primarily for communication and entertainment purposes. The most frequently used platforms were WhatsApp (82.1%), Instagram (70.4%), and YouTube (68.5%).

Table 1. Distribution of Daily Internet Usage Time among Participants

Usage Time	Percentage
0–1 hour	8%
1–2 hours	15%
2–3 hours	18%
More than 3 hours	59%

Table 1 shows that the majority of students (59%) spend more than 3 hours online per day, suggesting a high potential for digital dependency in daily academic life. Such prolonged exposure to digital content—especially for non-academic purposes such as social interaction and passive entertainment—has been associated with declines in attention and cognitive efficiency (Ifenthaler & Yau, 2020; Chen et al., 2021). These patterns align with research identifying screen time exceeding two hours as a critical threshold beyond which academic outcomes begin to decline.

The Technology Addiction Scale revealed moderate to high levels of addiction across several subdimensions. Students scored particularly high in areas related to compulsive checking, emotional withdrawal, and avoidance of academic tasks. The mean total addiction score was 3.2 on a 5-point Likert scale, indicating that a significant proportion of students experience behavioral tendencies consistent with problematic digital use. These findings also align with literature that emphasizes how

a lack of meta-skills, such as social intelligence and digital self-regulation, can diminish academic engagement in technology-mediated environments (Palaščáková et al., 2024).

Table 2. Correlation between Technology Addiction and Classroom Learning Problems

Variable Pair	Pearson r	p-value
Technology Addiction – Attention Loss	0.39	< .01
Technology Addiction – Motivation Decline	0.36	< .01
Technology Addiction – Procrastination	0.43	< .01

Note: All correlations are significant at the 0.01 level (2-tailed).

A substantial number of students reported classroom learning difficulties, including problems maintaining attention during lectures (62%), low motivation to complete assignments (58%), and frequent procrastination (54%), as presented in Table 2, which outlines the correlation coefficients among key variables.

Pearson correlation analysis indicated statistically significant and moderately strong relationships between technology addiction and all three problem areas (r values ranging from .36 to .43, $p < .01$). These findings suggest that students who exhibit higher levels of digital dependency are more likely to experience disruptions in cognitive control and academic task management. The strongest correlation was observed between technology addiction and procrastination ($r = 0.43$), consistent with recent findings indicating that digital overuse particularly impairs executive functioning and time regulation in young adults (Yu, Kang, & Lee, 2025), and with prior research linking emotional withdrawal and compulsive digital behaviors to reduced academic discipline in digitally saturated environments (Palaščáková et al., 2024).

Table 3. Frequency of Classroom Learning Problems Reported by Students

Type of Problem	Percentage of Students Reporting (%)
Attention loss during lectures	62%
Low motivation to complete tasks	58%
Frequent procrastination	54%

As illustrated in Table 3, attention loss emerged as the most commonly reported academic difficulty. These patterns are consistent with symptoms of digital overstimulation and cognitive disengagement, particularly in settings where students simultaneously navigate multiple digital demands. The clustering of these difficulties supports recent behavioral models suggesting that technology addiction functions as both a cognitive and emotional barrier to sustained academic effort (Ifenthaler & Yau, 2020). In line with previous research, female students—who made up two-thirds of the study’s sample—reported more frequent academic disengagement, reflecting broader patterns of how emotional and social pressures may exacerbate technology’s behavioral effects on learning (Monica & Anuradha, 2024).

In summary, the results support the hypothesis that digital dependency contributes to classroom-related learning difficulties. Female students—who made up two-thirds of the sample—were more likely to report these challenges, which aligns with studies indicating that women may experience

greater academic strain from emotional and attentional disruptions in digitally mediated environments.

CONCLUSION

This study examined the behavioral impact of technology addiction on academic functioning among university students, with a particular emphasis on gendered patterns. The findings revealed that a substantial proportion of students—especially female students and learners—reported moderate to high levels of digital dependency and classroom-related learning difficulties, including attention loss, low motivation, and procrastination.

Pearson correlation analysis confirmed that higher levels of technology addiction were significantly associated with increased academic disruption. Among the three behavioral domains assessed, procrastination demonstrated the strongest correlation with digital overuse, highlighting the negative impact of compulsive technology habits on time management and academic discipline. These patterns align with emerging literature that links emotional withdrawal, cognitive overload, and executive function impairment to excessive digital consumption in higher education contexts (Yu, Kang, & Lee, 2025; Palašćáková et al., 2024).

Importantly, the overrepresentation of female students among those reporting digital-related academic challenges suggests the presence of gender-specific vulnerabilities in how students engage with and are affected by digital technologies. This finding emphasizes the need for more gender-sensitive approaches in both academic support systems and institutional digital strategies.

In sum, the study contributes to the ongoing discourse on digital well-being and educational equity by highlighting the strategic importance of recognizing and addressing the behavioral consequences of technology addiction—particularly for young women navigating digitally intensive learning environments.

Theoretical Implications

This study reinforces the conceptualization of self-directed learning (SDL) as a multidimensional construct encompassing both metacognitive and behavioral regulation in digital environments. The negative correlation between SDL and excessive digital engagement supports prior theoretical models that link self-regulation to reduced impulsive behaviors and increased task focus (Brockett & Hiemstra, 1991; Garrison, 1997). Moreover, the study extends these frameworks by illustrating that SDL not only moderates digital consumption, but also promotes intentional engagement with educational technologies—particularly in relation to lifelong learning tendencies.

The inclusion of digital behavior as a predictive variable highlights the behavioral ecology of modern learners, where screen time and cognitive control are interdependent. This contributes to emerging theories in digital pedagogy, suggesting that technology use is not neutral but behaviorally mediated through skills like goal-setting, attention control, and reflective monitoring (Chen, Sun, & Feng, 2021). Importantly, the findings offer theoretical grounding for interdisciplinary models that situate SDL at the intersection of learning science, digital behavior, and career readiness in fields such as business and marketing.

Practical Implications

The findings of this study have clear implications for how universities design digital engagement strategies and support self-regulated learning among students. Given that students with higher self-

directed learning (SDL) and lifelong learning (LLL) scores reported lower levels of compulsive digital use, academic institutions should develop structured learning environments that reinforce metacognitive skills such as goal-setting, time management, and self-monitoring.

First-year students, who may struggle to establish academic routines in tech-driven learning settings, would particularly benefit from digital literacy programs that emphasize intentional rather than reactive technology use. Workshops and mentoring sessions that promote reflection on screen time, academic task planning, and digital boundary-setting could serve as preventive tools—especially for female students, who represented 66% of the study’s participants and often face higher multitasking and emotional labor burdens in academic life.

Furthermore, instructional design practices should integrate lifelong learning principles into digital learning environments. Embedding open-ended inquiry, student autonomy, and purpose-driven digital tools (e.g., research databases, adaptive learning platforms) into course structures may encourage more strategic digital behaviors and reduce passive consumption. Research suggests that when digital tools are integrated intentionally within specific disciplinary contexts, students are more likely to engage in goal-oriented and academically aligned behaviors (Ifenthaler & Yau, 2020).

Ultimately, these insights call for a shift in digital education—from simple access provision to guided digital engagement—ensuring that students, especially women, are empowered to manage their learning processes proactively within complex and overstimulating digital ecosystems.

Acknowledgment

The authors gratefully acknowledge the support and participation of the undergraduate students Aleyna Polat, İrem Gülmez, Melike Alan, Tasneem Kaakeh, and Zehra Eman, all first-year medical students at Gaziantep University. This research was approved by the Gaziantep University Clinical Research Ethics Committee (Protocol No: 2017/137). Additionally, the authors would like to thank TÜBİTAK for funding part of the research through the 2209-A University Students Research Projects Support Program.

REFERENCES

- Andreassen, C. S., Pallesen, S., & Griffiths, M. D. (2017). The relationship between addictive use of social media, narcissism, and self-esteem: Findings from a large national survey. *Addictive Behaviors, 64*, 287–293. <https://doi.org/10.1016/j.addbeh.2016.03.006>
- Andreassen, C. S., Torsheim, T., Brunborg, G. S., & Pallesen, S. (2012). Development of a Facebook Addiction Scale. *Psychological Reports, 110*(2), 501–517. <https://doi.org/10.2466/02.09.18.PR0.110.2.501-517>
- Chen, B., Sun, J., & Feng, Y. (2021). How have smartphone addiction and academic procrastination affected academic achievement? *Technology in Society, 64*, 101503. <https://doi.org/10.1016/j.techsoc.2020.101503>
- Elhai, J. D., Dvorak, R. D., Levine, J. C., & Hall, B. J. (2017). Problematic smartphone use: A conceptual overview and systematic review of relations with anxiety and depression psychopathology. *Journal of Affective Disorders, 207*, 251–259. <https://doi.org/10.1016/j.jad.2016.08.030>
- Ferguson, C. J. (2021). Social media use and academic performance: A meta-analysis. *Computers in Human Behavior Reports, 4*, 100121. <https://doi.org/10.1016/j.chbr.2021.100121>
- Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). *How to design and evaluate research in education* (8th ed.). McGraw-Hill Education.
- Ifenthaler, D., & Yau, J. Y.-K. (2020). Utilization of learning analytics to support study success in higher education: A systematic review. *Educational Technology Research and Development, 68*(4), 1961–1990.

<https://doi.org/10.1007/s11423-020-09753-z>

- Kuss, D. J., & Griffiths, M. D. (2017). Social networking sites and addiction: Ten lessons learned. *International Journal of Environmental Research and Public Health*, 14(3), 311. <https://doi.org/10.3390/ijerph14030311>
- Monica, J., & Anuradha, P. S. (2024). Entrepreneurial attitude and entrepreneurial intentions of female engineering students: Mediating roles of passion and creativity. *Journal of Women's Entrepreneurship and Education*, (1–2), 19–39. <https://doi.org/10.28934/jwee24.12.pp19-39>
- Palaščáková, D., Liadskyi, I., & Diachkov, D. (2024). Social intelligence management in the context of promoting professional self-education: Gender aspects. *Journal of Women's Entrepreneurship and Education*, (3–4), 160–179. <https://doi.org/10.28934/jwee24.34.pp160-179>
- Rosen, L. D., Carrier, L. M., & Cheever, N. A. (2013). Facebook and texting made me do it: Media-induced task-switching while studying. *Computers in Human Behavior*, 29(3), 948–958. <https://doi.org/10.1016/j.chb.2012.12.001>
- Samaha, M., & Hawi, N. S. (2016). Relationships among smartphone addiction, stress, academic performance, and satisfaction with life. *Computers in Human Behavior*, 57, 321–325. <https://doi.org/10.1016/j.chb.2015.12.045>
- Suhail, K., & Bargees, Z. (2006). Effects of excessive Internet use on undergraduate students in Pakistan. *CyberPsychology & Behavior*, 9(3), 297–307. <https://doi.org/10.1089/cpb.2006.9.297>
- Young, K. S. (1998). Internet addiction: The emergence of a new clinical disorder. *CyberPsychology & Behavior*, 1(3), 237–244. <https://doi.org/10.1089/cpb.1998.1.237>

MARKET DRIVEN RISE OF DIGITAL UNIVERSITY IN THE 21ST CENTURY

Ali Eskinat

Netkent University, Lefkosa, Turkish Republic of Northern Cyprus, ali.eskinat@netkentuni.net
<https://orcid.org/0009-0006-1242-9172>

Suat Teker

Isik University, Istanbul, Turkiye, suat.teker@isikun.edu.tr
<https://orcid.org/0000-0002-7981-3121>

ABSTRACT

Since the Medieval age, higher education concept and the evaluation of its main actors universities are highly discussed. Higher education institutions have been recently forced to deliver education services in new ways and operate in a global marketplace. Therefore, universities must rethink and redesign how they provide access to their courses anywhere and at any time. Indeed, higher education institutions have not only to fulfill the increasing digitalized expectations of the Generation Z students but also be ready for the forthcoming storm of the Generation Alpha. This requires a new understanding of strategic management. Over the Covid-19 crises, most universities keep increasing the use of hybrid model at various levels in all disciplines in their education system forced by the market demand. This paper reviews the evolution of university generations from university 1.0 to university 5.0 using a historical point of view. This paper advocates the reasons of digital universities in the era of digital transformation and internationalization of higher education. The analysis foresees that the dynamics of digital transformation era and shift of power from supply driven universities to market driven forces will push the emergence of digital universities what is called University 5.0 with no barriers of language, time and locations, and competing with local and traditional higher education institutions. Digital Universities may become an inevitable fact of higher education after 2030.

KEYWORDS

Digital Transformation, Digital Universities, University 5.0, Industry 4.0, Digital Ecosystems

INTRODUCTION

The first-generation University 1.0 initiated as information transfer centers in the 11th Century. Later, the second-generation University 2.0 appeared as information transfer and research centers in the 19th Century. 1970s brought the third-generation University 3.0 as information transfer, research and application (university-industry) centers. Then, the fourth-generation University 4.0 flourished as a digitalized university depending on the technological and social innovations under the storm of digital transformation age of the 2000s (Eskinat and Teker, 2023).

After these four historical evolutions of universities, one can possibly question “What should be the underlying purpose of university education in the 21st century?” For this reason, one can argue that the future of higher education must significantly consider the unbearable innovations of the digital age. For this reason, the aim of this study is to provide a sight forward to the upcoming fifth-generation University 5.0, which is totally market driven unlike supply driven nature of the previous generations from 1.0 to 3.0 together with the transition period of University 4.0, with its foreseen rise

by the 2030s named as digital university targeting all world as a single market and providing all-education services in a translocal and transtemporal form globally (Sheail, 2018).

It may be strongly argued that today universities are already forced to provide hybrid education over the following years. This is also in line with the perception and demand of generation Z. This transitional, in other words from supply driven to market driven progression period may be identified as the time for University 4.0. Then, the successors such as generation Alpha and Beta and their irresistible digital transformation may reshape the higher education, that is a university fully digital. There is no doubt that Covid-19 Pandemic period became a facilitator for all the universities to provide online or preferably digital education worldwide and its implications will continue to be significant in the future (Sabzalieva et al., 2021). During the post-pandemic era, an organizational, cultural and mental change will likely and permanently lead to the development of digital universities (Davey and Galan-Muros 2020:599–617; Sangster et al., 2020).

Although changing dynamically in recent decades, universities are organizations with centuries of tradition, a strong identity, and professional ethos. Along with social and cultural transformations, the mission of universities is evolving, leading to a diversification of higher education institutions, which, although referring to the same root of values, take very different organizational forms (Sułkowski, 2023).

The concept of digital transformation and digital maturity as sine qua non conditions for the development of educational institutions in the era of automation of production and service processes, artificial intelligence and the integration of digital tools for better effectiveness. Indeed, digital transformation and achieving digital maturity as a tangible sign of this transformation in the broader context of the 4th Industrial Revolution are not limited only to the implementation of new technologies in organizations, both in business and education. It is also not merely about the dissemination of digital goods and services among various consumers, including students. Poszytek, P. (2024)

After breakthroughs such as Virtual Reality (VR), Augmented Reality (AR), "Blockchain Technology, and Web 3.0, the phenomena of Metaverse emerged as a post-reality cosmos, a continuous and permanent multiuser ecosystem combining physical reality with digital virtuality. Metaverse offers the ability to address the basic limitations of web-based 2D e-learning technologies regarding online distance education (Mystakidis, 2022). Although virtual and augmented reality technologies are currently mostly used in the gaming and entertainment industries, it is predicted that an important digital transformation will be experienced especially in the field of education with metaverse (Egliston and Carter, 2022 ; Kraus et al., 2022). Concerning digital ecosystems in higher education, the use of Artificial Intelligence (AI) has great potential to improve teaching and learning (Rojas and Chiappe, 2024). Eventually, digital transformation has been a significant subject in education during the last decades.

One could even say that a kind of e-internationalization is also emerging, which precisely corresponds to the development of a new formation of the digital university (Altbach and De Wit, 2020; Finardi and Guimaraes, 2020; Mok and Montgomery, 2021; Mok et al., 2021). Pandemic thus becomes a catalyst for the digitalization and networking of all internationalization processes in universities (Abdulrahim and Mabrouk, 2020; Nurhas et al., 2021; García-Peñalvo et al., 2021).

Indeed, the shift from supply driven program development towards demand orientation is the logical consequence of the new focus on external requirements (Rohs and Marks, 2015) providing a basis for digital universities due to increasing market forces of students, employers and social environment.

METHODOLOGY

The study employs a literature review aiming not only to reflect the development of higher education concept and its main actors universities from a perspective of historical background, but also to provide forward looking inferences beside a presentation of a 20-year perspective from 2030 to 2050. At this point, a comparative analysis of contemporary university in parallel to the facts of digital transformation era was considered. The aim was to analyze coming digital universities, changing demands of new generation students, families, social environment and employers as well as the impact of digital ecosystem storm in higher education to reach a projection after 2030s.

RESULTS

The analysis reveals that universities should adapt themselves to the realities of digital transformation era in terms of their strategies and future projections. Notably, it is clearly seen that digital transformation of 21st Century has affected higher education sector beside the others. Indeed, demand of market forces have to be redefined. The priorities of the new age students have changed as flexible timing for attending the courses, much less tuition and fees, lower cost of food, less cost of accommodation, less cost for books and learning materials, better skills for knowledge management, more focus on value creation for a good employment opportunity. Moreover, research opportunities are no longer only in university libraries and the demand for physical gatherings for socializing is decreasing. On the other side of the coin, employers of 2020s demand practice-oriented competencies instead of only diplomas and increase pre-graduate internship opportunities. Specifically, their demand is not only technical but also social-communication competencies more strongly for employed new graduates. The common point of all of them is the power of technology and digital transformation. For this reason, the results address that following to a period of transition during University 4.0, power shifted from supply driven to market driven forces in time of University 5.0. While traditional universities have to support their educational and managerial affairs with digitalization strategies, digital universities, namely University 5.0, will probably be significantly efficient the internationalized higher education sector. As a matter of the fact, over the Covid-19 crisis most universities already keep increasing the use of hybrid model in all disciplines in their education system forced by the market demand. Under these circumstances, the results reveal that digital universities are next step in the life of higher education system and will be main competitors of those of traditional after 2030s.

CONCLUSION

Higher education sector is characterized by longevity. The core values and missions of universities have lasted for centuries. However, they are not immune to the changes of digital transformation era. Recent decades, particularly the time of the COVID-19 pandemic, have also seen an acceleration of the transformation toward the digital university (Mosteanu, 2020; Sobral et al., 2021).

University 5.0 paradigm is on the way to flourish depending on technological innovations and digital transformation. As digitalized traditional universities have lived an era of glory in the 2020s, the winds of change towards completely digital universities are not so far. Indeed, the transition towards

networking and computerization is significantly driving the revolution to the next level formation of the digital university.

There is a clear change in the formation of universities in the digital direction, which seems to be one of the most important megatrends. From the beginning of University 1.0 to the end of entrepreneurial University 3.0 model supply driven forces of higher education institutions were effective in the market. However, University 4.0 was the transition period started with digital transformation era and finally the market driven forces of students, families, social environment and surely employers came to the scene in the atmosphere of University 5.0 model. For this reason, The future university is probably the digital university, characterized by several distinctive features. It is based on a network organization, combining data analytics with advanced controlling and accountability methods, allowing evidence-based and data-driven decision-making.

Digital transformation, which is arguably the most critical social, economic, and cultural trend in recent decades, also leads to a permanent organizational change in the higher education sector. Digital universities will develop the professionalization of management through the application of increasingly sophisticated organizational methods using network and digital orientation. This will be done through implementing communication and creating network communities, developing digital management methods based on the Internet of Things, crowdsourcing, big data processing, and artificial intelligence. However, machines and technology will augment people's capabilities and not replace them (Harvard Business Review, 2019). Therefore, progressive internationalization and accepting the idea of all the world as a campus will probably be a fact mainly after 2030s in the case of digital universities in their way to inevitable growth. In fact, with the rapid pace of digital transformation, digital education may eventually replace traditional universities entirely after 2050.

REFERENCES

- Abdulrahim, H., Mabrouk, F. (2020). COVID-19 and the digital transformation of Saudi higher education. *Asian Journal of Distance Education*, 15(1), pp. 291–306.
- Altbach, P., & de Wit, H. (2020). COVID-19: The internationalization revolution that isn't. *International Higher Education*, (102), 16-18.
- Davey, T., & Galan-Muros, V. (2020). Understanding entrepreneurial academics – how they perceive their environment differently. *Journal of Management Development*, 39(5), 599–617.
- Egliston, B., & Carter, M. (2022). Oculus imaginaries: The promises and perils of Facebook's virtual reality. *New Media & Society*, 24(1), 70-89.
- Eskinat, A., & Teker, S. (2023). Digital era for universities: soon or far. *PressAcademia Procedia*, 17(1), 46-52.
- Finardi, K. R., & Guimarães, F. F. (2020). Internationalization and the Covid-19 pandemic: challenges and opportunities for the global south. *Journal of Education, Teaching and Social Studies*, 2(4), 1-15.
- García-Peñalvo, F. J., Corell, A., Rivero-Ortega, R., Rodríguez-Conde, M. J., & Rodríguez-García, N. (2021). Impact of the COVID-19 on higher education: an experience-based approach. In *Information technology trends for a global and interdisciplinary research community* (pp. 1-18). IGI Global.
- Harvard Business Review. (2019). Artificial intelligence. Harvard Business Review Press.
- Kraus, S., Kanbach, D. K., Krysta, P. M., Steinhoff, M. M., & Tomini, N. (2022). Facebook and the creation of the metaverse: radical business model innovation or incremental transformation?. *International Journal of Entrepreneurial Behavior & Research*, 28(9), 52-77.
- Mok, K. H., & Montgomery, C. (2021). Remaking higher education for the post-COVID-19 era: Critical reflections on marketization, internationalization and graduate employment. *Higher Education Quarterly*, 75(3), 373-380.

- Mok, K. H., Xiong, W., Ke, G., & Cheung, J. O. W. (2021). Impact of COVID-19 pandemic on international higher education and student mobility: Student perspectives from mainland China and Hong Kong. *International journal of educational research*, 105, 101718.
- Mosteanu, N. R. (2020). Digital university campus—change the education system approach to meet the 21st century needs. *European Journal of Human Resource Management Studies*, 4(4).
- Mystakidis, S. (2022). Metaverse. *Encyclopedia*, 2(1), 486-497.
- Nurhas, I., Aditya, B. R., Jacob, D. W., & Pawlowski, J. M. (2022). Understanding the challenges of rapid digital transformation: the case of COVID-19 pandemic in higher education. *Behaviour & Information Technology*, 41(13), 2924-2940.
- Poszytek, P. (2024). *Digital Transformation in Educational Organizations: Leadership, Innovation and Industry 4.0* (p. 253). Taylor & Francis.
- Rohs, M., Vogel, C., & Marks, S. (2015). From supply-driven to demand-oriented academic education. Evidence-based development of study courses to match regional skill shortage with new student groups.
- Rojas, M. P., & Chiappe, A. (2024). Artificial intelligence and digital ecosystems in education: A review. *Technology, Knowledge and Learning*, 29(4), 2153-2170.
- Sabzalieva, E., Chacon, E., & Liu, B. L. (2021). Thinking higher and beyond: perspectives on the futures of higher education to 2050.
- Sangster, A., Stoner, G., & Flood, B. (2020). Insights into accounting education in a COVID-19 world. *Accounting Education*, 29(5), 431–562.
- Sheail, P. (2018). The digital university and the shifting time–space of the campus. *Learning, Media and Technology*, 43(1), 56-69.
- Sobral, S. R., Jesus-Silva, N., Cardoso, A., & Moreira, F. (2021). EU27 higher education institutions and COVID-19, year 2020. *International Journal of Environmental Research and Public Health*, 18(11), 5963.
- Sułkowski, Ł. (2023). *Managing the digital university: paradigms, leadership, and organization* (p. 299). Taylor & Francis.

***ORGANIZATIONAL
BEHAVIOR
AND TECHNOLOGY***

STRATEGIC COLLABORATION AS DYNAMIC CAPABILITY: A MECHANISM-BASED FRAMEWORK FOR HYBRID ORGANIZATIONS

Cihan Tınaztepe Çağlar

Beykoz University, Istanbul, Türkiye, cihantınaztepecaglar@beykoz.edu.tr

<https://orcid.org/0000-0002-9614-7298>

ABSTRACT

Following the COVID-19 epidemic, numerous firms swiftly implemented hybrid work models, significantly altering collaboration dynamics among teams and departments. This transformation provides increased flexibility and reach, but it has also presented intricate behavioral and structural issues. This conceptual study employs an integrated literature review methodology, utilizing insights from organizational behavior and strategic management to investigate how firms might formulate collaborative strategies appropriate for hybrid work settings. The suggested paradigm highlights essential facilitators of cooperation, such as psychological safety, digital communication standards, distributed leadership, and the congruence between autonomy and control. This study elucidates how strategic collaboration operates as a dynamic skill, intending to enhance both academic dialogue and management practice by emphasizing its significance in promoting organizational continuity and adaptation within the digital economy.

KEYWORDS

Hybrid Work, Strategic Collaboration, Organizational Behavior, Digital Economy, Dynamic Capabilities

INTRODUCTION

The COVID-19 pandemic has markedly expedited the evolution of organizational work structures, leading to a pervasive transition towards hybrid work models that integrate remote and in-office arrangements. Although hybrid collaboration is not a recent concept in organizational studies (Gillett et al., 2019; Stadtler et al., 2019; Buyukguzel & Balaman, 2023), its swift and worldwide institutionalization in the post-pandemic era has rekindled academic and managerial interest in the effective maintenance and utilization of collaboration in hybrid environments. The expanding work structures prompt essential inquiries regarding the strategic design and governance of cooperation to sustain competitiveness, adaptability, and innovation, especially in digitally intensive and uncertain contexts.

This conceptual study seeks to examine the strategic, structural, and behavioral facilitators of collaboration within hybrid companies. It presents a mechanism-based paradigm that amalgamates insights from strategic management and organizational behavior to redefine collaboration as a dynamic capability. Effective collaboration is regarded not just as a practical necessity but also as an adaptive, reconfigurable organizational capability that facilitates learning, coordination, and strategy alignment across boundaries.

While collaboration has historically been a focal point of management study, the hybrid work environment presents novel issues for both theoretical and practical reevaluation. Contemporary hybrid collaboration occurs across varied geographies, time zones, platforms, and organizational frameworks. It frequently arises in situations characterized by resource disparity, role uncertainty, and technological intervention—factors that exacerbate the intricacies of coordination and trust establishment (van der Velden & Deprez, 2023). Consequently, comprehending the multi-tiered

mechanisms—both structural and behavioral—that promote collaboration in these circumstances has become increasingly essential.

From an organizational behavior standpoint, psychological safety has become a fundamental enabler of collaborative efficacy. Psychological safety is characterized by a collective conviction that team members can articulate their thoughts without apprehension of interpersonal repercussions, hence promoting open communication, inclusivity, and innovation (Edmondson & Lei, 2014). These characteristics are particularly significant in hybrid settings because informal signals and impromptu interactions are reduced. Leaders are essential in fostering this safety by establishing explicit standards for interaction, guaranteeing equal participation, and facilitating expression even in digital environments.

As firms progressively depend on digital communication tools, novel opportunities and concerns arise. Although these tools improve connectedness and flexibility, they also present coordination difficulties stemming from diminished media richness, asynchronous workflows, and ambiguous expectations (Marlow et al., 2017). In virtual teams, communication difficulties are frequently attributed not to technical malfunctions but to implicit assumptions and behavioral discrepancies (Jarvenpaa & Leidner, 1999). Establishing common digital norms for responsiveness, tone, and channel utilization helps alleviate such disruptions and foster trust.

These changes necessitate an evolution in leadership. Conventional hierarchical or co-located leadership approaches are inadequate in hybrid environments. E-leadership, characterized by digital literacy, empathy, empowerment, and virtual presence, has become indispensable (Contreras et al., 2020). Effective hybrid leaders not only offer guidance but also facilitate cooperation across time zones and cultures, mediate disputes, and uphold responsibility through transparent and adaptable policies.

A significant strategic conflict arises between autonomy and control. Although hybrid employment offers increased flexibility, excessive surveillance or stringent monitoring can undermine motivation and a sense of responsibility. Choudhury and his colleagues (2021) contend that productivity in dispersed environments relies on outcome-oriented assessment, clarity of objectives, and reciprocal accountability, rather than monitoring based on physical presence.

This study integrates various interconnected insights—strategic collaboration, psychological safety, digital norms, distributed leadership, and adaptable structures—into a conceptual framework that regards cooperation as a dynamic capability. The concept enhances the strategic management literature by elucidating how collaborative mechanisms facilitate sensing, learning, and adaptation in hybrid contexts. It simultaneously enhances organizational behavior by elucidating the psychological and interactional principles that underpin effective collaboration. The concept provides a framework for developing inclusive, resilient, and high-performing hybrid work cultures capable of flourishing amidst continuous digital transition and organizational complexity.

METHODOLOGY

This study utilizes a conceptual research design, appropriate for nascent theory formation and situations where empirical generalizations are either premature or inadequate (Gilson & Goldberg, 2015). Conceptual frameworks are especially suitable for nascent fields like hybrid cooperation, where practical significance is substantial, yet the scholarly literature is disjointed and devoid of cohesive models to guide organizational strategy. According to Meredith (1993), conceptual theory-building aims to "articulate ideas, clarify relationships, and propose new constructs" instead of testing established hypotheses. This study adheres to that legacy by integrating interdisciplinary research to provide a mechanism-based strategic collaboration framework designed for hybrid organizational situations.

The methodology employed in this study is an integrated literature review (Torraco, 2005), which distinguishes itself from conventional narrative or systematic reviews by prioritizing conceptual

synthesis and theoretical contribution rather than comprehensive coverage. The objective is to harmonize conflicting results, connect distinct disciplines, and produce innovative theoretical connections. Consequently, literature was obtained from prominent academic databases, including Scopus, Web of Science, JSTOR, and Google Scholar, utilizing keyword combinations such as “hybrid work,” “psychological safety,” “e-leadership,” “organizational behavior,” “remote communication,” and “strategic collaboration.” The search period encompassed 2010–2024, emphasizing high-impact journals in organizational studies, management, leadership, and information systems.

During this assessment process, four primary conceptual domains were discovered, each embodying a mechanism that facilitates strategic collaboration in hybrid work environments:

- **Establishing Trust and Psychological Safety:** Psychological safety has been continuously recognized as a vital factor in fostering productive collaboration. In hybrid environments, where informal social signals and spontaneous interactions are reduced, trust must be intentionally fostered. Organized communication, inclusive leadership methodologies, and views of equity collectively enhance psychological safety (Edmondson & Lei, 2014; Newman et al., 2017). Jarvenpaa and Leidner (1999) underscore that the continuous and reliable utilization of communication technology is crucial for fostering trust in virtual teams. Gillett and his colleagues (2019) assert that shared norms in hybrid environments improve relational coordination and diminish ambiguity.
- **Establishing Communication Standards in Digital Contexts:** Digital communication tools provide flexibility but may also result in information overload, uncertainty, and separation. Successful cooperation relies on both media richness (Daft & Lengel, 1986) and well-defined, mutual norms for digital contact, including tone, responsiveness, and participation (Marlow et al., 2017). Organizations that deliberately formalize these norms via onboarding, team rituals, or digital charters are more likely to promote alignment, reduce miscommunication, and maintain team cohesion.
- **Cultivating E-Leadership and Distributed Leadership Competencies:** Leadership in hybrid companies involves more than just technical proficiency; it demands a unique array of abilities that empower leaders to effectively maneuver within distributed settings. These encompass transparency, empowerment, empathy, and the capacity to communicate strategic direction through digital media (Avolio et al., 2014; Contreras et al., 2020). Hybrid leaders must not only manage communication and performance but also cultivate a sense of belonging, traverse cultural and temporal diversity, and transcend organizational borders (Hoch & Kozlowski, 2014).
- **Reconciling Autonomy with Organizational Oversight:** Conventional hierarchical control mechanisms frequently conflict with the adaptability of hybrid work arrangements. Choudhury and his colleagues (2021) advocate for firms to implement results-oriented performance frameworks that enhance clarity and accountability without necessitating continuous supervision. Strategic coherence necessitates a governance framework that permits individual autonomy while ensuring collective alignment with common objectives and outcomes.

The four areas are included into a holistic conceptual framework of strategic collaboration within hybrid enterprises. The concept posits that effective cooperation arises from the dynamic interaction of psychological enablers (trust and safety), digital communication standards, adaptive leadership, and flexible control frameworks. The framework, although theoretical, is designed to direct subsequent empirical study. Future research may implement its dimensions and investigate their predicted correlations with outcomes including team performance, innovation, engagement, and resilience. Mixed-method research is very effective in capturing contextual variances among industries, organizational cultures, and national contexts.

Moreover, the integrative technique utilized in this context corresponds with increasing demands for multilevel and multidisciplinary research in organizational behavior, especially studies that connect individual, team, and organizational levels of analysis (Johns, 2018). This work tackles the necessity for practical and theoretically sound models in the post-pandemic environment by explicitly connecting micro-level behaviors (e.g., psychological safety) with macro-level structures (e.g., assessment and accountability systems).

This methodology facilitates the creation of a strategic, multidimensional, and behaviorally informed conceptual framework. It enhances the burgeoning literature on hybrid work and strategic cooperation while offering a theoretical basis for diagnostic tools and therapies relevant to firms shifting towards sustainable digital operations.

A systematic approach to literature retrieval and synthesis was employed to guarantee methodological transparency. The review concentrated on peer-reviewed journal publications published from 2010 to 2024, sourced from Scopus, Web of Science, JSTOR, and Google Scholar. Search terms encompassed combinations of: “hybrid work,” “psychological safety,” “e-leadership,” “digital collaboration norms,” “distributed teams,” and “organizational trust.”

The searches produced over 180 academic sources, from which 74 principal publications were chosen based on their intellectual contribution, relevance to hybrid collaboration, and methodological rigor. The inclusion criteria emphasized papers in premier journals within organizational behavior, strategic management, and information systems. Articles exclusively addressing technological systems, engineering, or conventional co-located collaboration were omitted. The chosen material was subsequently thematically coded and classified into four principal conceptual domains:

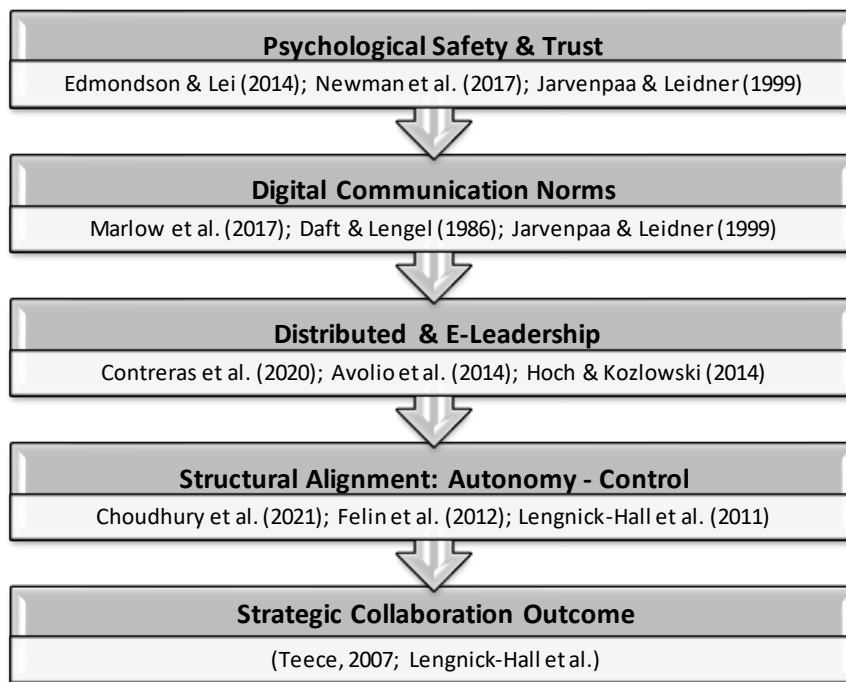
- Cognitive facilitators
- Communication methodologies
- Leadership conduct
- Structural mechanisms

This methodology adheres to Torraco’s (2005) ideas of integrative conceptual synthesis, which seeks to amalgamate disparate discoveries and create cohesive theoretical frameworks. The objective was not to conduct a comprehensive literature review or quantitative citation analysis, but to identify recurring mechanisms and interconnections across disciplines that elucidate the functioning of collaboration in hybrid situations. The mechanisms guided the formulation of the process-oriented conceptual model presented in this work.

Conceptual Framework

Figure 1 depicts the conceptual model established in this work, which delineates four interconnected domains that collectively facilitate strategic cooperation as a dynamic competence within hybrid organizational contexts. The paradigm incorporates behavioral and structural mechanisms spanning psychological, communication, leadership, and governance dimensions. The domains are: (1) psychological safety and trust, (2) digital communication norms, (3) distributed and e-leadership, and (4) structural alignment between autonomy and control. It is hypothesized that they function both sequentially and interactively, creating a dynamic and mutually reinforcing system.

Figure 1. Conceptual Model for Strategic Collaboration in Hybrid Work Settings



- Psychological safety underpins inclusive discourse and candid communication (Edmondson & Lei, 2014). In hybrid environments, this enables the collaborative establishment of common interaction rules, diminishing ambiguity and enhancing expression across digital platforms (Jarvenpaa & Leidner, 1999).
- Digital communication standards facilitate efficient cooperation across time zones and technological barriers. Organizations that formalize expectations for response, tone, and platform utilization diminish ambiguity and enhance coherence in virtual cooperation (Marlow et al., 2017). These rules establish a communication framework that enables effective leadership.
- Distributed and e-leadership are crucial in orchestrating efforts, maintaining engagement, and aligning individuals with shared objectives in hybrid environments. Leaders possessing digital fluency, emotional intelligence, and empowering approaches (Avolio et al., 2014; Contreras et al., 2020) are more adept at managing cultural and temporal diversity while ensuring team cohesion.
- The structural alignment of autonomy and control constitutes the ultimate enabling mechanism. Unlike rigid hierarchical supervision, adaptive governance models prioritize goal clarity and accountability for results. Organizations can achieve coherence and responsiveness by creating flexible systems that allow for individual discretion while aligning with strategy objectives (Choudhury et al., 2021; Felin et al., 2012).

Collectively, these four areas constitute the behavioral and structural framework of strategic collaboration within hybrid companies. They jointly facilitate the cultivation of a dynamic capability, which is characterized as the organization's capacity to integrate, reconfigure, and rejuvenate internal and external competences in reaction to evolving surroundings (Teece, 2007; Lengnick-Hall et al., 2011). This skill allows hybrid businesses to innovate, adapt, and maintain performance under uncertainty. This conceptual framework delineates the theoretical assertions that elucidate the causal and interaction links among the four facilitators of strategic cooperation in hybrid organizations.

Psychological safety enhances the establishment of collective digital communication norms in hybrid teams. When individuals experience psychological safety, they are more inclined to engage candidly and contribute to the co-creation of rules that regulate digital interactions. In hybrid environments, psychological safety fosters courteous, inclusive, and organized communication behaviors (Edmondson & Lei, 2014; Jarvenpaa & Leidner, 1999).

Established digital communication standards provide efficient distributed and electronic leadership. Mutual expectations concerning communication improve leaders' capacity to coordinate, direct, and assist geographically distributed teams. They diminish uncertainty, allowing leaders to function with emotional presence and clarity (Marlow et al., 2017; Contreras et al., 2020).

E-leadership competencies enhance the congruence between autonomy and organizational oversight. Digitally proficient and empowering leaders can create performance systems that harmonize accountability with personal flexibility. By emphasizing outcomes and trust-based coordination, they facilitate structures that are flexible and aligned with strategic objectives (Avolio et al., 2014; Choudhury et al., 2021).

The interplay of psychological safety, communication norms, leadership conduct, and structural alignment facilitates strategic cooperation as a dynamic competence. When these four enablers coexist and mutually reinforce one another, collaboration is ingrained as a capability that fosters creativity, resilience, and organizational agility in hybrid environments (Teece, 2007; Felin et al., 2012).

RESULTS

This conceptual investigation produces theoretically grounded and practically pertinent expectations based on a synthesis of the literature and the creation of an integrated framework. The primary outcome is a multidimensional conceptual model elucidating how strategic collaboration in hybrid work environments can be facilitated through the interplay of four critical mechanisms: psychological safety, digital communication norms, distributed leadership, and structural alignment between autonomy and control.

Psychological safety promotes innovation and participation. Organizations that effectively foster psychological safety in hybrid environments are anticipated to achieve elevated levels of team learning, innovative output, and proactive problem-solving. Psychological safety enables team members to express concerns, acknowledge errors, and propose innovative ideas without fear of adverse repercussions (Edmondson & Lei, 2014). This is particularly crucial in hybrid situations because unplanned reinforcement and informal interactions are constrained. Newman et al. (2017) underscore its significance as a fundamental prerequisite for innovation and information exchange—crucial results in dynamic, digital work environments. Van der Velden and Deprez (2023) illustrate that power sensitivity and open leadership are essential for maintaining psychological safety in remote, technologically facilitated collaboration.

Collective communication standards improve collaboration and diminish uncertainty. Clear and consistent communication standards are vital for reducing coordination failures across geographically and temporally scattered teams. Without physical co-location, misunderstandings frequently occur due to asynchronous communication, varying tastes, or excessive fragmentation of tools. Organizations that intentionally create and uphold norms around preferred platforms, tone, response time expectations, and participation regulations are more adept at minimizing friction and enhancing efficiency (Marlow et al., 2017; Daft & Lengel, 1986). Such conventions serve as behavioral anchors, fostering predictability and reducing the cognitive demands of hybrid employment.

E-leadership behaviors promote trust, delineate responsibilities, and enhance team identification. The approach highlights the unequal impact of leadership quality in hybrid teams. Leaders who are accessible, emotionally astute, and technologically adept foster inclusive workplaces that diminish the psychological distance inherent in remote settings (Contreras et al., 2020; Avolio et al., 2014).

When leadership endorses individual autonomy alongside a common purpose, employees are more inclined to experience trust, role clarity, and team cohesion—essential factors for enduring collaboration and discretionary effort. Stadtler et al. (2019) underscore the significance of boundary-spanning leadership and collaborative governance as essential for facilitating enduring cross-functional collaboration in hybrid networks.

Structural alignment fosters accountability, autonomy, and enduring performance. Performance management approaches that prioritize outcomes and explicitly articulated expectations—rather than direct oversight—are more appropriate for hybrid settings. Organizations that use transparent, outcome-oriented frameworks can improve autonomy while ensuring group coherence. Choudhury et al. (2021) contend that these structural adjustments are crucial for maintaining productivity and accountability in distant work environments, especially when physical supervision is constrained.

The interplay of these four enablers—psychological, communicational, leadership-oriented, and structural—enhances an organization's capacity to adapt, coordinate, and maintain performance in volatile and complicated circumstances. Instead of operating autonomously, these systems engage in synergistic interaction. The paradigm asserts that psychological safety fosters open discourse and trust, hence promoting the establishment of collective digital communication standards. These standards facilitate distributed leadership by improving coordination, thereby establishing structural systems that reconcile autonomy with strategic alignment. Collectively, these interrelated forces form a dynamic organizational capability (Teece, 2007), augmenting the organization's resilience, learning capacity, and responsiveness to external pressures.

Although this is a theoretical framework, anecdotal evidence from organizations that have adopted communication charters, inclusive leadership training, or systematic digital onboarding supports the model's premises. These firms frequently demonstrate increased employee engagement, heightened team cohesion, and enhanced retention—results that correspond with the anticipated theoretical consequences.

This study's principal contribution is its mechanism-based redefinition of hybrid collaboration. The paradigm posits a causal sequence that elucidates how cooperation develops as a dynamic competence, rather than treating psychological safety, communication norms, e-leadership, and structural alignment as independent aspects. This progressive framework initiates at the micro-level (e.g., trust and voice), progresses through meso-level norms and leadership behaviors, and concludes with macro-level systems of responsibility and coordination.

This comprehensive approach offers a new synthesis that enhances and surpasses previous research. While previous research has analyzed these components separately (e.g., Edmondson & Lei, 2014; Contreras et al., 2020; Choudhury et al., 2021), there is a scarcity of studies that have delineated their interaction within a cohesive process framework tailored for hybrid work environments. This study transcends topic aggregation and offers a testable theoretical framework for subsequent empirical investigation.

The model provides a theoretically sound and practically applicable framework for comprehending and improving collaboration in hybrid companies. Future study should empirically confirm the framework, investigate contextual factors (e.g., industry type, country culture), and evaluate long-term outcomes like as performance, innovation, and sustainability.

CONCLUSION

This conceptual study enhances the domain of strategic organizational behavior by introducing a theoretically robust and practically viable model for maintaining collaboration in hybrid work environments. The study fundamentally redefines collaboration as a dynamic capability facilitated by interdependent mechanisms within psychological, communicative, structural, and leadership domains (Teece, 2007).

This study incorporates these enablers into a sequential, mechanism-based model associated with hybrid work realities, rather than studying them in isolation as previous literature generally did (Johns, 2018). This micro-to-macro integration illustrates how individual trust and voice can evolve into communication norms, leadership behaviors, and scalable governance systems, culminating in a sustainable collaborative infrastructure.

This work reconceptualizes collaboration as a dynamic, cross-level process, addressing scholarly requests to view organizational skills as emerging rather than static (Felin et al., 2012; Hedström & Ylikoski, 2010). The model offers a process-oriented approach to the disjointed perspectives on distant work and team coordination, integrating psychological science with system design principles.

The framework serves as an effective diagnostic instrument. Managers and HR experts can evaluate organizational alignment across four areas, including the identification of deficient communication standards, uneven leadership styles, or performance tracking systems that either micromanage or lack clarity. These results can inform onboarding programs, leadership development pipelines, and team rituals that institutionalize collaborative behaviors.

The model's adaptability facilitates alignment with sectoral and cultural contexts. For example, high-autonomy teams in technological settings may find toolkits and asynchronous norms advantageous, whereas regulated industries such as healthcare or manufacturing may prefer shift-based coordination protocols. In hierarchical or high power-distance societies, establishing psychological safety may necessitate more intentional rituals of inclusion and feedback processes.

This conceptual framework provides a solid basis for empirical testing. Future study may investigate the interactions of the four enablers across many industries, analyze causal pathways through multilevel modeling, and monitor the evolution of collaborative systems during significant disruptions. Longitudinal and qualitative investigations could elucidate the facilitating conditions that render hybrid collaboration a catalyst for creativity and resilience.

This framework delineates a definitive agenda for forthcoming study. Empirical validation is required to evaluate the model's assertions and examine the linkages among the four enablers and outcomes, including collaboration quality, employee engagement, innovation, and organizational performance. Multilevel modeling may elucidate the interaction between team-level dynamics and organizational structures, whilst qualitative investigations could unveil sector-specific adaptations or cultural modifications. Longitudinal studies could monitor the evolution of hybrid collaboration over time and in reaction to environmental shocks.

Subsequent study may investigate border factors like generational diversity, psychological contract expectations, and organizational maturity. This study conceptualizes hybrid collaboration as a system shaped by trust, technology, leadership, and governance, providing scholars and practitioners with guidance for enhancing organizational resilience. It emphasizes how enterprises can not only endure in the digital economy but also cultivate inclusive, adaptive, and inventive ecosystems that prosper in the face of persistent uncertainty.

REFERENCES

- Avolio, B. J., Sosik, J. J., Kahai, S. S., & Baker, B. (2014). E-leadership: Re-examining transformations in leadership source and transmission. *The Leadership Quarterly*, 25(1), 105–131. DOI: 10.1016/j.leaqua.2013.11.003
- Buyukguzel, S., & Balaman, S. Y. (2023). Designing collaborative frameworks for hybrid teams: Insights from socio-technical systems theory. *European Management Review*. Advance online publication. <https://doi.org/10.1111/emre.12567>
- Choudhury, P., Foroughi, C., & Larson, B. Z. (2021). Work-from-anywhere: The productivity effects of geographic flexibility. *Strategic Management Journal*, 42(4), 655–683. <https://doi.org/10.1002/smj.3251>
- Contreras, F., Baykal, E., & Abid, G. (2020). E-Leadership and teleworking in times of COVID-19 and beyond:

- What we know and where do we go. *Frontiers in Psychology*, 11, 590271. <https://doi.org/10.3389/fpsyg.2020.590271>
- Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness, and structural design. *Management Science*, 32(5), 554–571. <https://doi.org/10.1287/mnsc.32.5.554>
- Edmondson, A. C., & Lei, Z. (2014). Psychological safety: The history, renaissance, and future of an interpersonal construct. *Annual Review of Organizational Psychology and Organizational Behavior*, 1(1), 23–43. <https://doi.org/10.1146/annurev-orgpsych-031413-091305>
- Felin, T., Foss, N. J., Heimeriks, K. H., & Madsen, T. L. (2012). Microfoundations of routines and capabilities: Individuals, processes, and structure. *Journal of Management Studies*, 49(8), 1351–1374. <https://doi.org/10.1111/j.1467-6486.2012.01052.x>
- Gillett, A., Loader, K., Doherty, B. et al. (2019). An Examination of Tensions in a Hybrid Collaboration: A Longitudinal Study of an Empty Homes Project. *J Bus Ethics* 157, 949–967. <https://doi.org/10.1007/s10551-018-3962-7>
- Gilson, L. L., & Goldberg, C. B. (2015). Editors' commentary: So, what is a conceptual paper? *Group & Organization Management*, 40(2), 127–130. DOI: 10.1177/1059601115576425
- Hedström, Peter & Ylikoski, Petri. (2010). Causal Mechanisms in the Social Sciences. *Annual Review of Sociology*. 36. 10.1146/annurev.soc.012809.102632.
- Hoch, J. E., & Kozlowski, S. W. (2014). Leading virtual teams: Hierarchical leadership, structural supports, and shared team leadership. *Journal of Applied Psychology*, 99(3), 390–403. DOI: 10.1037/a003026
- Jarvenpaa, S. L., & Leidner, D. E. (1999). Communication and trust in global virtual teams. *Organization Science*, 10(6), 791–815. <https://doi.org/10.1287/orsc.10.6.791>
- Johns, G. (2018). Advances in the treatment of context in organizational research. *Annual Review of Organizational Psychology and Organizational Behavior*, 5, 21–46. <https://doi.org/10.1146/annurev-orgpsych-032117-104406>
- Lengnick-Hall, C. A., Beck, T. E., & Lengnick-Hall, M. L. (2011). Developing a capacity for organizational resilience through strategic human resource management. *Human Resource Management Review*, 21(3), 243–255. <https://doi.org/10.1016/j.hrmr.2010.07.001>
- Marlow, S. L., Lacerenza, C. N., & Salas, E. (2017). Communication in virtual teams: A conceptual framework and research agenda. *Human Resource Management Review*, 27(4), 575–589. <https://doi.org/10.1016/j.hrmr.2016.12.005>
- Meredith, J. (1993). Theory building through conceptual methods. *International Journal of Operations & Production Management*, 13(5), 3–11. <https://doi.org/10.1108/01443579310028120>
- Newman, A., Donohue, R., & Eva, N. (2017). Psychological safety: A systematic review of the literature. *Human Resource Management Review*, 27(3), 521–535. DOI: 10.1016/j.hrmr.2017.01.001
- Stadtler, L. and Karakulak, O. 2019: A Helping Hand? Intermediary Structures for Hybrid Collaboration. *Proceedings*, 2019, <https://doi.org/10.5465/AMBPP.2019.36>
- Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319–1350. <https://doi.org/10.1002/smj.640>
- Torraco, R. J. (2005). Writing integrative literature reviews: Guidelines and examples. *Human Resource Development Review*, 4(3), 356–367. <https://doi.org/10.1177/1534484305278283>
- Van der Velden, Jeroen & Deprez, Frank. (2023). Shaping Hybrid Collaborating Organizations. 10.1007/978-3-031-06813-3_3.

THE SITUATION OF ARTIFICIAL INTELLIGENCE USAGE AMONG MANAGEMENT INFORMATION SYSTEMS STUDENTS ACCORDING TO DEMOGRAPHIC INDICATORS

Adnan Kalkan

Burdur Mehmet Akif Ersoy University, Burdur, Türkiye, adnankalkan@mehmetakif.edu.tr
<https://orcid.org/0000-0002-2270-4100>

Simge oşkun

Burdur Mehmet Akif Ersoy University, Burdur, Türkiye, scoskun@mehmetakif.edu.tr
<https://orcid.org/0009-0002-7806-1340>

Kaan Hasan Kalkan

Ankara Yıldırım Beyazıt University, Ankara, Türkiye, kalkankaanhasan@gmail.com
<https://orcid.org/0009-0006-2419-4163>

ABSTRACT

The aim of this study is to determine the current situation of Artificial Intelligence (AI) usage among Management Information Systems (MIS) students and to examine whether this situation differ according to demographic variables. A descriptive survey model, one of the quantitative research methods, was used in the study. Data were collected through online and face-to-face surveys using a survey form developed by the researcher. The sample consisted of 188 MIS students studying at Burdur Mehmet Akif Ersoy University and Ankara Yıldırım Beyazıt University in Türkiye during the 2024–2025 academic year. Descriptive statistics and Mann-Whitney U test were used to analyze the data. The findings revealed that there is a significant difference in the duration of AI usage by gender and university. In addition, there is a significant difference in the frequency of AI usage by gender and there is a significant difference in the situation of AI usage by university. However, there isn't any significant difference in the knowledge of AI by university and gender. Also, there is no any significant difference in the situation of AI usage by gender. Moreover, statistically significant differences were found in AI usage situation based on gender and the university attended. The results indicate that MIS students have a high awareness regarding AI and actively use this technology for research. In this context, it is recommended that MIS curricula include course content to enhance AI literacy.

KEYWORDS

Artificial intelligence, AI usage, MIS students

INTRODUCTION

Today, the rapid advancement of technological developments has brought about changes in many areas, from individuals' daily lives to the way they do business. One of the most striking examples of this change is the effective use of Artificial Intelligence (AI) technologies in daily life and educational processes. AI is not limited to technical fields, but affects many disciplines from education to health, finance to management.

Artificial Intelligence (AI) is a branch of science that aims to develop algorithms and systems that think similarly to humans and imitate human intelligence. It is used to solve complex problems and analyze large data sets with its sub-disciplines such as image and speech recognition, deep learning, natural language processing and machine learning. Machine learning algorithms that learn on their own based on experience without requiring reprogramming with various problem-solving techniques form the basis of AI applications. In this direction, AI systems are designed to operate autonomously at different levels (Telli & Aydın, 2025:139).

Artificial Intelligence (AI) refers to the simulation of human intelligence processes by machines, especially computer systems, that involve learning, reasoning, and self-correction. These processes allow machines to acquire knowledge, apply rules to reach conclusions, and improve performance through feedback and correction. In the context of education, AI technologies contribute significantly to creating personalized and dynamic learning experiences. For example, AI can adapt education to student needs and provide individualized support and feedback (Meylani, 2024:601).

Although AI has produced productive results, its impact on education and especially higher education is a subject worth investigating. While delegating cognitive tasks to AI is not a big deal for educated adults, the use of AI for basic tasks such as critical thinking, summarizing and logic by university students also raises some concerns (Sublime and Renna, 2024: 2-3). Today, AI, especially ChatGPT, is widely used by students in universities. While the controlled use of AI for educational purposes and customized programs offer some opportunities for students with learning disabilities and education, they also carry some risks: Unsupervised and extensive use of these tools can lead to a decrease in basic cognitive skills or a weakness in basic knowledge.

Artificial intelligence (AI) has become one of the most effective digital transformation tools of our time. The use of these technologies is rapidly increasing in many areas, from education to health, from public administration to the finance sector (Russell & Norvig, 2021). Education has also evolved with the innovations brought by technology; with the information technologies that have developed over time, educational resources have become easily reproduced, distributed and accessible (Kurt, 2015: 223). The integration of AI into education has been a transformative force that is reshaping traditional learning paradigms and providing innovative solutions to enhance the educational experience. As technology evolves, university students find themselves at the forefront of a dynamic era where AI applications are increasingly becoming an integral part of the learning process. Understanding the situations of these students regarding the use of AI applications in education is crucial to measuring the impact and effectiveness of these tools in shaping the future of university education (Almeqdadi and Shadifat, 2024:62).

AI has emerged as a growing resource in education. Advances in large language models (LLMs) have improved the ability of AI technology to understand and answer academic queries, increasing their adoption in educational settings and generating more research interest. Open online models such as OpenAI's ChatGPT, Google's Gemini, and Microsoft's Copilot have become widely used among students due to their free access and ease of use. Nearly a third of students (35.4%) reported using AI regularly, while 47% expressed concerns about the impact of AI in education. Additionally, 60% reported that their instructors or schools have not yet provided guidelines for ethical or responsible AI tool use (Pitts et. al., 2025:1-2). In late fall 2022, the emergence of ChatGPT (*generative pre-trained transformer*) introduced by OpenAI has attracted great attention in society and education. The use of ChatGPT in education will be a potential tool to support students' personalized learning and increase students' engagement in the blended learning environment (Park & Doo, 2024:165).

The Management Information Systems (MIS) department aims to train professionals who are in line with the requirements of the age with its interdisciplinary structure that combines business and information technologies. In this context, the interest of MIS students in AI technologies, the usage situation and the usage purpose of these technologies have become important elements that directly affect student's professional competence. MIS departments play an important role in this transformation with their structures that bridge technology and business. In this context, determining the situation of AI usage among MIS students is critical importance for both student's individual professional development and the digital transformation of institutions.

There are many accepted theories and models in the literature regarding the use and adoption of technologies. These include the *Technology Acceptance Model* (Fred D. Davis, 1985), the *Information Systems Success Model* (De Lone & McLean, 1992), the *Theory of Reasoned Action* (Icek Ajzen & Martin Fishbein, 1980), the *Theory of Planned Behavior* (Ajzen, 1985), the *Diffusion of Innovation*

Theory (Everett Rogers, 1962), the *Social Cognitive Theory* (Compeau & Higgins, 1995), the *Motivation Model* (Vallerand, 1997), and the *Unified Theory of Acceptance and Use of Technology* (Venkatesh et al., 2003). Among these models and theories, the TAM has been recognized in the literature as the most effective and robust in explaining information technology adoption behavior (Kurt, 2015: 224-225).

The *Technology Acceptance Model (TAM)* was first proposed by Fred D. Davis in 1985 as a model for testing and developing user acceptance in computer-based information systems. Previous researches have suggested especially two important determinants that may influence technology use. One is *Perceived usefulness* and the other is *Perceived ease of use*. People tend to use or not use an application to the extent they believe it will help them perform their job better. This is referred as *Perceived usefulness*. Moreover, even if potential users have believed that a given application is useful; they have, at the same time believed that the systems is too hard to use and that the performance benefits of usage are outweighed by the effort of using the application. That is, in addition to usefulness, usage is theorized to be influenced by *Perceived ease of use*. *Perceived usefulness* is defined as “the degree to which a person believes that using a particular system would enhance his or her job performance”. A system high in perceived usefulness, in turn, is one for which a user believes in the existence of a positive use-performance relationship. *Perceived ease of use*, in contrast, refers to “the degree to which a person believes that using a particular system would be free of effort”. All else being equal, Davis claim, an application perceived to be easier to use than another is more likely to be accepted by users (Davis, 1989: 320).

Although there are many studies in the literature on the areas of AI usage, the extent to which MIS students use this technology, how often and for how long they use it, and the differences in usage according to their demographic characteristics have still not been sufficiently clarified. This research aims to fill this gap and examines the situation of AI usage for MIS students studying at two different universities in Türkiye in terms of gender and university variables.

The main purpose of this study is to determine the usage situation of AI tools of MIS students and to reveal whether there is a significant difference in the context of various demographic variables. In this context, answers were sought to the following sub-problems:

1. What is the situation of AI usage among MIS students?
2. Does the use of AI show a significant difference according to gender?
3. Does the use of AI show a significant difference according to the university where they study?

The findings of this study are expected to guide both the development of educational policies and the practices aimed at increasing the digital competencies of students.

METHODOLOGY

In this study, a survey was used to determine the situation of AI usage for MIS students and to examine whether this usage situation differs according to demographic variables. The study group consists of a total of 188 undergraduate MIS students studying at Ankara Yıldırım Beyazıt University (AYBU) and Burdur Mehmet Akif Ersoy University (MAKU) (77 students at MAKU and 111 students at AYBU) in Türkiye in the 2024–2025 academic year. The number of students registered to MIS at AYBU is 240 and the number of students registered to MIS at MAKU is 398 in 2025. The rate of randomly selected sampling is 46.3% (111 students) for AYBU, 19.3% (77 students) for MAKU and totally 29.5% (188 students in 638 students). The participants were selected using the simple random sampling method, and data were collected by using online and face-to-face survey forms, thus ensuring diversity. The students from each class were chosen for the survey. While the survey forms were applied face to face to AYBU students, they were applied to MAKU students using the Google survey form. The survey form used in the research consists of two main sections. Demographic information, and current situation of using AI by students. The survey forms consisted of 35 items belonging to

two sets of questions. The first set measured the demographic information about students. The second set of questions measured the current situation of students' AI usage. For a total of 188 views respondents were asked, on a five-point Likert type scale rating from "1: never use" to "5: use a lot" to determine their situation of AI usage.

The obtained data were analyzed using the IBM SPSS Statistics 30.0 statistical package program. Before starting the test, it was checked whether there were any extreme values and missing data; no extreme values were found, but the missing data detected were completed with the "nearby points" method. The reliability analysis was performed and Cronbach's Alpha coefficient of the scale was calculated as 0.696. The descriptive statistics test was applied to data in order to obtain descriptive information about the participants. The descriptive information values of students obtained from the test results are given in Table 1, Table 2, Table 3 and Table 4.

When the distribution of participants according to gender and university groups were examined (Table 1), it was seen that 51.6% of the participants are female, 48.4% are male, and 41.0% of the participants are MAKU students, 59.0% of the participants are AYBU students.

Table 1. Frequencies about gender and universities of participants

		f	%	Cum. %
Gender	Male	91	48.4	48.4
	Female	97	51.6	100
University	MAKU	77	41.0	41.0
	AYBU	111	59.0	100
Total		188	100	

When the duration of participants' AI usage is taken into account in Table 2; 42.5% of the students stated that they have been using AI for more than 2 years. The rate of those who have been using it for 2 years is 31.4% and the rate of those who have been using it for less than 1 year is 10.1%.

Table 2. Frequencies of AI usage duration

AI usage duration	f	%	Cum. %
Less than 1 year	19	10.1	10.1
1 year	30	16.0	26.1
2 years	59	31.4	57.5
More than 2 years	80	42.5	100
Total	188	100	

When the frequency of participants' AI technologies usage is taken into consideration in Table 3; 46.8% of the students stated that they use AI technologies very often, 30.9% stated that they use them, 19.1% stated that they use them occasionally, and 3.2% stated that they rarely use them.

Table 3. Frequencies of AI usage

Frequency of AI usage	f	%	Cum. %
Rarely use	6	3.2	3.2
Occasionally use	36	19.1	22.3
Use	58	30.9	53.2
Use very often	88	46.8	100
Total	188	100	

When the participants' situation of AI technologies usage is taken into consideration in Table 4; 35.6% of the students stated that they use AI technologies, 30.9% stated that they use them a lot, 25.5% stated that they use them moderately, 7.4% stated that they use them a little, and 0.5% stated that they do not use them at all.

Table 4. Frequencies of AI usage situation

AI usage situation	f	%	Cum. %
Never use	1	0.5	0.5
Somewhat use	14	7.4	8
Moderate use	48	25.5	33.5
Use	67	35.6	69.1
Use a lot	58	30.9	100
Total	188	100	

RESULTS

In order to determine whether there is a significant difference between the AI usage of MIS students according to various demographic variables, 8 hypotheses were developed. In this context, the following hypotheses were tested.

H1: Is there a significant difference in the duration of AI usage by gender?

H2: Is there a significant difference in the duration of AI usage by university?

H3: Is there a significant difference in the knowledge of AI by university?

H4: Is there a significant difference in the knowledge of AI by gender?

H5: Is there a significant difference in the frequency of AI usage by gender?

H6: Is there a significant difference in the frequency of AI usage by university?

H7: Is there a significant difference in the level of AI usage by gender?

H8: Is there a significant difference in the level of AI usage by university?

In order to determine which statistical test to use, the Normality test was first performed as a prerequisite test. Since our sample size is $n > 30$, the Kolmogorov-Smirnov test was used. In the Kolmogorov-Smirnov test, if the Sig. value is $p > .05$, the data is normally distributed and in this case the Independent Samples t-test should be used; if the Sig. value is $p < .05$, the data is not normally distributed and in this case the Mann-Whitney U test was used.

Table 5. Test of Normality

			Kolmogorov-Smirnov ^a			Shapiro-Wilk		
			Statistic	df	Sig.	Statistic	df	Sig.
Duration of AI Usage	Gender	Male	.298	91	<.001	.766	91	<.001
		Female	.217	97	<.001	.842	97	<.001
	University	MAKU	.216	77	<.001	.848	77	<.001
		AYBU	.277	111	<.001	.766	111	<.001
Knowledge about AI	Gender	Male	.252	91	<.001	.888	91	<.001
		Female	.273	97	<.001	.852	97	<.001
	University	MAKU	.221	77	<.001	.876	77	<.001
		AYBU	.297	111	<.001	.855	111	<.001
Frequency of AI usage	Gender	Male	.256	91	<.001	.818	91	<.001
		Female	.316	97	<.001	.756	97	<.001
	University	MAKU	.215	77	<.001	.843	77	<.001
		AYBU	.336	111	<.001	.749	111	<.001
Level of AI usage	Gender	Male	.202	91	<.001	.874	91	<.001
		Female	.219	97	<.001	.850	97	<.001
	University	MAKU	.207	77	<.001	.876	77	<.001
		AYBU	.224	111	<.001	.830	111	<.001

a. Lilliefors Significance Correction

Since the Sig. values in the Kolmogorov-Smirnov test ($n > 30$) were $p < .05$, the data were not normally distributed in Table 5. Therefore, Mann-Whitney U test was applied to test the hypotheses. Mann-Whitney U test results showed that there is a significant difference between the duration of AI usage by gender ($U = 3599.50$, $Z = -2.318$, $p = .020$) in Table 6. This finding reveals that *there is a difference between male and female students in terms of duration of AI usage*.

H_{01} : There is no significant difference in the duration of AI usage by gender.

H_{a1} : There is a significant difference in the duration of AI usage by gender.

Table 6. Test Statistics of AI usage duration

	Duration of AI usage
Mann-Whitney U	3599.500
Wilcoxon W	8352.500
Z	-2.318
p: Asymp. Sig. (2-tailed)	.020

a. Grouping Variable: Gender

If Asymp. Sig. (2-tailed) value is < 0.05 , there is a significant difference in the duration of AI usage according to gender. If Asymp. Sig. (2-tailed) value is ≥ 0.05 , there is no significant difference. Since Asymp. Sig. (2-tailed) value is ($p = .020$) $< .05$, it is statistically significant and shows that there is a significant difference in terms of duration of AI usage according to gender. Therefore, H_{01} hypothesis is rejected and H_{a1} hypothesis is accepted.

Table 7. AI usage duration ranks

	Gender	N	Mean Rank	Sum of Ranks
Duration of AI Usage	Male	91	103.45	9413.50
	Female	97	86.11	8352.50
	Total	188		

In the next stage, it was tried to determine whether the duration of AI usage was longer in male or female students. Mann-Whitney U test results revealed that there was a significant difference between male (*Mean Rank = 103.45*) and female (*Mean Rank = 86.11*) students in terms of duration of AI usage ($U = 3599.50, Z = -2.318, p = .020$). As seen in Table 7, the average rank of male students (103.45) was higher than that of female students (86.11). The group with a higher average rank value in Mann-Whitney U test shows a higher tendency in the relevant variable (*here: duration of AI usage*). Therefore, the obtained finding showed that *male students used AI for a longer time compared to female students*.

H_{02} : There is no significant difference in duration of AI usage according to university.

H_{a2} : There is a significant difference in duration of AI usage according to university.

Mann-Whitney U test results showed that there is a significant difference between the duration of AI usage according to university ($U = 3445.500, Z = -2.396, p = .017$) in Table 8. This finding reveals that there is a difference between MAKU and AYBU students in terms of duration of AI usage. Since Asymp. Sig. (2-tailed) value is ($p = .017$) < .05, it is statistically significant and shows that *there is a significant difference in terms of duration of AI usage according to university*. Therefore, H_{02} hypothesis is rejected and H_{a2} hypothesis is accepted.

Table 8. Test Statistics of AI usage duration

Duration of AI Usage	
Mann-Whitney U	3445.500
Wilcoxon W	6448.500
Z	-2.396
p: Asymp. Sig. (2-tailed)	.017

a. Grouping Variable: Universities

In the next stage, it was tried to determine whether the duration of AI usage was longer in MAKU or AYBU students. Mann-Whitney U test results revealed that there was a significant difference in terms of duration of AI usage between MAKU (*Mean Rank = 83.75*) and AYBU (*Mean Rank = 101.96*) students ($U = 3445.500, Z = -2.396, p = .017$). The mean rank of AYBU students (101.96) was higher than MAKU students (83.75) in Table 9. Therefore, the findings obtained in the Mann-Whitney U test showed that *AYBU students used AI longer than MAKU students*.

Table 9. AI usage duration ranks

	Universities	N	Mean Rank	Sum of Ranks
Duration of AI Usage	MAKU	77	83.75	6448.50
	AYBU	111	101.96	11317.50
	Total	188		

H_{03} : There is no significant difference in terms of knowledge about AI according to university.

H_{a3} : There is a significant difference in terms of knowledge about AI according to university.

Mann-Whitney U test results showed that there is no significant difference between knowledge about AI according to university ($U = 3998.000, Z = -.813, p = .416$) in Table 10. This finding revealed that there is no significant difference between MAKU and AYBU students in terms of knowledge about AI. Since Asymp. Sig. (2-tailed) value ($p = .416$) is > .05, it is statistically significant and shows that *there is no significant difference in terms of knowledge about AI according to university*. Therefore, H_{03} hypothesis is accepted and H_{a3} hypothesis is rejected.

Table 10. Test Statistics of AI knowledge

Knowledge about AI	
Mann-Whitney U	3998.000
Wilcoxon W	7001.000
Z	-.813
p: Asymp. Sig. (2-tailed)	.416

a. Grouping Variable: Universities

In the next stage, it was tried to determine whether MAKU students or AYBU students have more knowledge about AI. Mann-Whitney U test results revealed that there was no significant difference between MAKU (*Mean Rank = 90.92*) and AYBU (*Mean Rank = 96.98*) students in terms of knowledge about AI ($U = 3998.000$, $Z = -.813$, $p = .416$). While the mean rank of AYBU students was (96.98), the mean rank of MAKU students (90.92) was close to each other in Table 11. Therefore, the findings obtained in Mann-Whitney U test showed that *there was no significant difference between AYBU students and MAKU students in terms of knowledge about AI.*

Table 11. Ranks of AI knowledge

	Universities	N	Mean Rank	Sum of Ranks
Knowledge about AI	MAKU	77	90.92	7001.00
	AYBU	111	96.98	10765.00
	Total	188		

H_{04} : *There is no significant difference in terms of knowledge about AI according to gender.*

H_{a4} : *There is a significant difference in terms of knowledge about AI according to gender.*

Mann-Whitney U test was applied to determine whether there is a significant difference between the knowledge about AI and the gender of the students. The results showed that there is no significant difference between the knowledge about AI according to gender ($U = 3914.500$, $Z = -1.448$, $p = .148$) in Table 12. This finding revealed that there is no significant difference between the knowledge about AI between female and male students. Since Asymp. Sig. (2-tailed) value ($p = .148$) $> .05$, it is statistically significant and shows that *there is no significant difference in terms of knowledge about AI according to gender.* Therefore, H_{04} hypothesis was accepted and H_{a4} hypothesis was rejected.

Table 12. Test Statistics of AI knowledge

Knowledge about AI	
Mann-Whitney U	3914.500
Wilcoxon W	8667.500
Z	-1.448
p: Asymp. Sig. (2-tailed)	.148

a. Grouping Variable: Gender

It was attempted to determine whether female or male students have more knowledge about AI. Mann-Whitney U test results revealed that there was no significant difference between Male (*Mean Rank = 99.98*) and Female (*Mean Rank = 89.36*) students in terms of knowledge about AI ($U = 3914.500$, $Z = -1.448$, $p = .148$). While the mean rank of male students was (99.98), the mean rank of female students was (89.36) close to each other (Table 13). The findings obtained in Mann-Whitney U test showed that *there was no significant difference between male and female students in terms of knowledge about AI.*

Table 13. Ranks of AI knowledge

	Gender	N	Mean Rank	Sum of Ranks
Knowledge about AI	Male	91	99.98	9098.50
	Female	97	89.36	8667.50
	Total	188		

H_{05} : There is no significant difference in terms of AI usage frequency by gender.

H_{a5} : There is a significant difference in terms of AI usage frequency by gender.

Mann-Whitney U test was applied to determine whether there is a significant difference between AI usage frequency and gender of students. As seen in Table 14, the results showed that there is a significant difference in terms of AI usage frequency by gender ($U = 3642.500$, $Z = -2.228$, $p = .026$). This finding reveals that there is a significant difference in terms of AI usage frequency between female and male students. Since Asymp. Sig. (2-tailed) value is ($p = .026$) $< .050$, it is statistically significant and shows that *there is a significant difference in terms of AI usage frequency by gender*. Therefore, H_{05} hypothesis is rejected and H_{a5} hypothesis is accepted.

Table 14. Test Statistics of AI usage frequency

	Frequency of AI usage
Mann-Whitney U	3642.500
Wilcoxon W	7828.500
Z	-2.228
p: Asymp. Sig. (2-tailed)	.026

a. Grouping Variable: Gender

It was tried to determine whether the frequency of AI usage is higher in female or male students. Mann-Whitney U test results revealed that there is a significant difference in terms of the frequency of AI usage between male ($Mean Rank = 86.03$) and female ($Mean Rank = 102.45$) students ($U = 3642.500$, $Z = -2.228$, $p = .026$).

While the average rank of male students was (86.03), it was lower than the average rank of female students (102.45) in Table 15. In Mann-Whitney U test, the group with a higher average rank value shows a higher tendency in the relevant variable (*here: frequency of AI usage*). Therefore, the finding obtained from Mann-Whitney U test showed that *the frequency of AI usage of female students is higher than that of male students*.

Table 15. Frequency of AI usage ranks

	Gender	N	Mean Rank	Sum of Ranks
Frequency of AI usage	Male	91	86,03	7828,50
	Female	97	102,45	9937,50
	Total	188		

H_{06} : There is no significant difference in terms of AI usage frequency by university.

H_{a6} : There is a significant difference in terms of AI usage frequency by university.

Mann-Whitney U test was applied to determine whether there is a significant difference between AI usage frequency and university. As seen in Table 16, the results showed that there is a significant difference in terms of AI usage frequency by university ($U = 3355.500$, $Z = -2.696$, $p = .007$). This finding reveals that there is a significant difference in terms of AI usage frequency between MAKU and AYBU students. Since Asymp. Sig. (2-tailed) value is ($p = .007$) $< .050$, it is statistically significant

and shows that *there is a significant difference in terms of AI usage frequency by university*. Therefore, H_{06} hypothesis is rejected and H_{a6} hypothesis is accepted.

Table 16. Test Statistics of AU usage frequency

	Frequency of AI usage
Mann-Whitney U	3355.500
Wilcoxon W	6358.500
Z	-2.696
p: Asymp. Sig. (2-tailed)	.007

a. Grouping Variable: University

It was tried to determine whether the frequency of AI usage is higher in MAKU or AYBU students. Mann-Whitney U test results revealed that there is a significant difference in terms of the frequency of AI usage between MAKU (*Mean Rank = 82.58*) and AYBU (*Mean Rank = 102.77*) students ($U = 3355.500$, $Z = -2.696$, $p = .007$).

While the average rank of MAKU students was (82.58), it was lower than the average rank of AYBU students (102.77) in Table 17. In Mann-Whitney U test, the group with a higher average rank value shows a higher tendency in the relevant variable (*here: frequency of AI usage*). Therefore, the finding obtained from Mann-Whitney U test showed that *the frequency of AI usage of AYBU students is higher than that of MAKU students*.

Table 17. Frequency of AI usage ranks

	Gender	N	Mean Rank	Sum of Ranks
Frequency of AI usage	MAKU	77	82.58	6358.50
	AYBU	111	102.77	11407.50
	Total	188		

H_{07} : There is no significant difference in terms of AI usage level by gender.

H_{a7} : There is a significant difference in terms of AI usage level by gender.

Mann-Whitney U test was applied to determine whether there is a significant difference between AI usage level and gender. The results showed that there is no significant difference between AI usage level by gender ($U = 4055.500$, $Z = -1.007$, $p = .314$) in Table 18. This finding revealed that there is no significant difference between female and male students in terms of AI usage level. Since Asymp. Sig. (2-tailed) value ($p = .314$) is $> .05$, it is statistically significant and shows that *there is no significant difference in terms of AI usage level by gender*. Therefore, H_{07} hypothesis was accepted and H_{a7} hypothesis was rejected.

Table 18. Test Statistics of AI usage level

	Level of AI usage
Mann-Whitney U	4055.500
Wilcoxon W	8241.500
Z	-1.007
p: Asymp. Sig. (2-tailed)	.314

a. Grouping Variable: Gender

It was tried to determine whether the level of AI usage is higher in female or male students. Mann-Whitney U test results revealed that there is no significant difference between male (*Mean Rank = 90.57*) and female (*Mean Rank = 98.19*) students in terms of the level of AI usage ($U = 4055.500$, $Z = -$

1.007, $p = .314$). The average rank of male students (90.57) and the average rank of female students (98.19) were close to each other in Table 19. Therefore, the findings obtained in Mann-Whitney U test showed that *there is no significant difference between male and female students in terms of the level of AI usage*.

Table 19. Level of AI usage ranks

	Gender	N	Mean Rank	Sum of Ranks
Level of AI usage	Male	91	90,57	8241,50
	Female	97	98,19	9524,50
	Total	188		

H_{08} : *There is no significant difference in terms of the level of AI usage according to university.*

H_{a8} : *There is a significant difference in terms of the level of AI usage according to university.*

Mann-Whitney U test was applied to determine whether there is a significant difference between the level of AI usage and university. The results showed that there is a significant difference between the level of AI usage according to the university ($U = 3060.000$, $Z = -3.470$, $p = .001$) in Table 20. This finding reveals that there is a significant difference between the level of AI usage between MAKU and AYBU students. Since the Asymp. Sig. (2-tailed) value is ($p = .001$) $< .05$, it is statistically significant and shows that *there is a significant difference in terms of the level of AI usage according to university*. Therefore, the H_{08} hypothesis was rejected and the H_{a8} hypothesis was accepted.

Table 20. Test Statistics of AI usage level

	Level of AI usage
Mann-Whitney U	3060.000
Wilcoxon W	606.000
Z	-3.470
p: Asymp. Sig. (2-tailed)	<.001

a. Grouping Variable: Universities

In the next stage, it was tried to determine whether the level of AI usage was higher in MAKU students or AYBU students. As seen in Table 21, Mann-Whitney U test results revealed that there was a significant difference between MAKU (Mean Rank = 78.74) and AYBU (Mean Rank = 105.43) students in terms of the level of AI usage ($U = 3060.000$, $Z = -3.470$, $p = .001$). The mean rank of AYBU students (105.43) was higher than the mean rank of MAKU students (78.74). Therefore, the findings obtained in Mann-Whitney U test showed that *AYBU students had higher levels of AI usage compared to MAKU students*.

Table 21. Level of AI usage ranks

	Universities	N	Mean Rank	Sum of Ranks
Level of AI usage	MAKU	77	78.74	6063.00
	AYBU	111	105.43	11703.00
	Total	188		

As seen in Table 22, the results regarding the hypotheses are shown and totally 8 hypotheses are listed. Mann-Whitney U and Z coefficients, Significance (p) and Acceptance/Rejection (A/R) situations of hypotheses are also given in the table. According to these results; just 5 hypotheses were accepted and 3 hypotheses were rejected at .05 significance level.

Table 22. The Results Belonging to Hypotheses

No	Hypothesis	Mann-Whitney U	Z	(p)	A/R
H ₁	<i>There is a significant difference in the duration of AI usage by gender</i>	3599.50	-2.318	.020	A
H ₂	<i>There is a significant difference in the duration of AI usage by university</i>	3445.50	-2.396	.017	A
H ₃	<i>There is a significant difference in the knowledge of AI by university</i>	3998.00	-.813	.416	R
H ₄	<i>There is a significant difference in the knowledge of AI by gender</i>	3914.50	-1.448	.14	R
H ₅	<i>There is a significant difference in the frequency of AI usage by gender</i>	3642.50	-2.228	.026	A
H ₆	<i>There is a significant difference in the frequency of AI usage by university</i>	3355.50	-2.696	.007	A
H ₇	<i>There is a significant difference in the level of AI usage by gender</i>	4055.50	-1.007	.314	R
H ₈	<i>There is a significant difference in the level of AI usage by university</i>	3060.00	-3.470	.001	A

According to Acceptance/Rejection situations of hypotheses, the results of current situation are shown in the Table 23.

Table 23. The Results of Current Situation

No	Hypothesis	Mean Rank for Male	Mean Rank for Female	Mean Rank for AYBU	Mean Rank for MAKU	A/R
1	<i>Male students used AI for a longer time compared to Female students.</i>	103.45	86.11			A
2	<i>AYBU students used AI longer than MAKU students.</i>			101.96	83.75	A
3	<i>There was no significant difference between AYBU students and MAKU students in terms of knowledge about AI.</i>			96.98	90.92	R
4	<i>There was no significant difference between Male and Female students in terms of knowledge about AI.</i>	99.98	89.36			R
5	<i>Frequency of AI usage for Female students is higher than that of Male students.</i>	86.03	102.45			A
6	<i>Frequency of AI usage of AYBU students is higher than that of MAKU students.</i>			102.77	82.58	A
7	<i>There was no significant difference between Male and Female students in terms of the level of AI usage.</i>	90.57	98.19			R
8	<i>AYBU students have higher levels of AI usage compared to MAKU students.</i>			105.43	78.74	A

This study examined whether students' AI usage situations differed according to gender and university. Since the data did not show a normal distribution, the nonparametric Mann-Whitney U test was used. According to the findings obtained from Mann-Whitney U tests, there is a significant difference in duration of AI usage by gender and university. In addition, there is a significant difference in frequency of AI usage by gender and university. Moreover, there is a significant difference in level of AI usage by university. However, there isn't any significant difference in knowledge of AI by university and gender. Also, there is no any significant difference in level of AI usage by gender.

CONCLUSION

In today's world, Artificial Intelligence (AI) has become an integral part of education and higher education. The impact of AI usage on academic performance among university students is becoming an increasingly interesting topic in educational research. Therefore, understanding the impact of AI on university student performance is of great importance. The current situations of AI usage among university students also reveals significant differences that are influenced by demographic and educational factors (Moosa et al., 2024: 164).

A study conducted in Sweden by Andersson & Karlsson analyzed how students of different genders and academic fields use AI chatbots and their perceptions of these technologies. The results showed that engineering students have a more positive approach to these tools, with male students having higher usage rates (Andersson & Karlsson, 2024).

Keuning et al. (2024) found that computer science students frequently used AI tools in programming tasks and that this use developed over time. Almeqdadi and Al Shadifat (2024) found that science students in Jordan used AI applications to provide benefits such as personalized learning, but also had concerns such as data privacy and algorithmic biases. Moosa et al. (2025) showed that AI literacy in the Maldives had positive effects on students' perceptions of academic performance.

The aim of this study was to examine the situation, frequency, and duration of AI usage among MIS students in Türkiye and to evaluate whether there are significant differences in these variables based on gender and university. The findings revealed the following:

1. *Male students use AI tools significantly longer than female students.*
2. *AYBU students use AI longer and at higher levels than MAKU students.*
3. *Although male students use AI longer, female students use AI more frequently than male students.*
4. *No significant difference was found in students' AI knowledge levels in terms of gender or university of study.*
5. *There is a significant difference in frequency of AI usage by gender and university. The frequency of AI usage of female students is higher than that of male students and also the frequency of AI usage of AYBU students is higher than that of MAKU students.*
6. *Similarly, AI usage levels did not differ significantly by gender, but they did show a significant difference between the two universities.*

These results suggest that while gender and university play a role in shaping students' engagement with AI technologies, the difference is more pronounced in usage patterns than in knowledge levels. These identified differences may be attributed to institutional factors, curricular emphasis, or access to technological resources.

Based on the research findings, the following recommendations are presented for policy makers, university administrators, and curriculum developers:

1. **The curriculum should be updated:** Adding more applied and interactive AI-based courses to the MIS curricula of both universities will provide equal learning opportunities for all students.
2. **Gender-sensitive educational practices:** Although female students use AI tools more frequently, male students are exposed to these tools for longer periods of time. In order to reduce gender differences, AI workshops and training programs that include both groups should be organized.
3. **Awareness and educational activities should be increased:** Although there is no significant difference in the level of knowledge among students, AI awareness seminars and technical training should be organized to increase the depth of knowledge and ensure more effective use.
4. **Inter-university cooperation should be developed:** By organizing joint AI competitions, symposiums, or workshops in which students from all universities can participate, knowledge sharing can be increased and digital competencies can be improved.
5. **Qualitative research should be included:** In future studies, other factors affecting students' AI usage situation (*socio-economic status, motivation, technological access, etc.*) should be

investigated in more depth using qualitative research methods (*such as interviews, focus group discussions*).

To address students' concerns about academic integrity and information reliability, universities should set policies regarding the use of AI. Universities can effectively develop and implement educational systems by leveraging the potential of AI. In addition to these, it should not be ignored that the direct use of the outputs obtained through the use of AI in the academic world can cause plagiarism and this can lead to ethical problems, and students should be taught how to review literature studies and type correct bibliography notation on this subject and students should be given ethical awareness. Thus, universities can enhance the quality of students' educational experiences while preserving the integrity and accuracy of the learning process with AI.

As a result it may be recommended to implement more comprehensive AI literacy programs, integrate AI-focused curricula into teaching plans, and establish support systems for the effective use of AI in universities, to increase the number of AI and data science-based applied courses in the curriculum, to direct students to open source projects, to increase internship and project opportunities through university-industry collaborations, and to support individual AI projects with academic consultancy.

REFERENCES

- Almeqdadi, F. & Al Shadifat, T. (2024). The perceptions of science students on artificial intelligence applications: Benefits and concerns. Brill Academic Publishers.
- Almeqdadi, F. & Shadifat, K. A. (2024). Perceptions of scientific college students about using AI applications in Education. *J. of Science of Learning and Innovations*, (1), p.61-89.
- Andersson, P. & Karlsson, T. (2024). Gender and academic field differences in the usage of AI chatbots in Sweden. *Nordic Educational Review*, 8 (4), p. 33–50.
- Bećirović, S., Polz, E. & Tinkel, I. (2025). Exploring students' AI literacy and its effects on their AI output quality, self-efficacy, and academic performance. *Smart Learning Environments*, 2025, 12 (29), p.1-25. <https://doi.org/10.1186/s40561-025-00384-3>
- Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*. DOI: 10.2307/249008, 13 (3), p. 319-340.
- Doe, J. & Smith, A. (2025). Perceptions of artificial intelligence among university students in Slovenia. *J. of Educational Technology*, 12 (3), p. 45–67.
- Kurt, Ö. E. (2015). Defining university students' perspectives on distance learning with integration of TAM and IS Success Model. *International Journal of Alanya Faculty of Business*, 7 (3), p. 223-234.
- Meylani, R. (2024). Artificial intelligence in the education of teachers: A qualitative synthesis of the cutting-edge research literature. *J. of Computer and Education Research*, 12 (24), ISSN: 2148-2896. Oct. 2024, p.600-637. <https://doi.org/10.18009/jcer.1477709>
- Moosa, D., Bozkurt, V., Reesha, A. & Shina, A. (2024). The effects of artificial intelligence (AI) literacy and use on students' perceptions of academic performance in the Maldives. *J. of Information Economics and Man. (Bilgi Ekonomisi ve Yönetimi Dergisi-BEYDER)*, V.19, No.2, p.163-174. Doi: 10.54860/beyder.1606467.
- Moosa, F., Nasheed, A. & Shareef, R. (2025). The impact of AI literacy on students' academic performance perceptions. Home Academic Press.
- Park, Y. & Doo, M. Y. (2024). Role of AI in blended learning: A systematic literature review. *Int. Review of Research in Open and Distributed Learning*, Feb. 2024, 25 (1), p. 164-196.
- Pitts, G., Marcus, V. & Motamedi, S. (2025). Student perspectives on the benefits and risks of AI in education. *May*, 4, 2025. <https://doi.org/10.48550/arXiv.2505.02198>, arXiv:2505.02198v1
- Pitts, D., Morrison, J. & Carter, A. (2025). Student concerns about academic integrity and AI chatbots. *Educational Psychology Review*, 37 (1), p. 22-39.

Russell, S. & Norvig, P. (2021). Artificial intelligence: A modern approach. (4th ed.). Pearson.

Sublime, J. & Renna, I. (2024). Is ChatGPT massively used by students nowadays? A survey on the use of large language models such as ChatGPT in educational settings. Dec23, 2024. DOI:10.48550/arXiv.2412.17486. arXiv:2412.17486v1

Sublime, J. & Renna, M. (2024). The use of large language models by young students: A cross-national survey in France and Italy. *J. of Digital Learning*, 18 (3), p. 112-128.

Telli, S. G. & Aydın, S. (2025). The use of artificial intelligence in universities: Transformations, returns and preparation for the future (Üniversitelerde yapay zekânın kullanımı: Dönüşümler, getiriler ve geleceğe hazırlık). *J. of University Research*, 2025, 8 (1), p. 139-148. <https://doi.org/10.32329/uad.1609305>

Statements & Declarations

The authors declare that no funds, grants, or other support were received during the preparation of this manuscript. The authors have no relevant financial or non-financial interests to disclose.

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by [Adnan Kalkan], [Kaan Hasan Kalkan] and [Simge Çoşkun]. The first draft of the manuscript was written by [Adnan Kalkan] and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

A BIBLIOMETRIC PERSPECTIVE ON TECHNOSTRESS RESEARCH: TRENDS, THEMES, AND COLLABORATION NETWORKS

Mert Temur

*Yildiz Technical University, Istanbul, Turkey, Istanbul Topkapi University mert.temur@std.yildiz.edu.tr /
merttemur@topkapi.edu.tr*

<https://orcid.org/0000-0001-8483-0113>

Esin Can

Yildiz Technical University, Istanbul, Turkey, eesincan@gmail.com

<https://orcid.org/0000-0003-1754-4867>

ABSTRACT

This study examines the concept of technostress and provides a detailed bibliometric analysis of related research. The study aims to reveal the intellectual structure, theoretical development, thematic evolution, and leading researchers in the field. To this end, 1,297 English-language academic publications obtained from the Web of Science database were analyzed using the R programming language and the Biblioshiny and Bibliometrix packages. To ensure linguistic consistency, only studies published in English were examined. Findings from these studies reveal that academic interest in technostress has increased significantly since 2012 and accelerated further with the digital transformation triggered by the pandemic. The field's leading academics include Riedl, Tarafdar, and Maier, and its leading journals include *Computers in Human Behavior* and *Frontiers in Psychology*. Co-occurrence and co-citation analyses reveal that the literature is concentrated in three main theoretical areas: The primary areas of focus in the technostress literature are information systems and stress theory, technology acceptance models, and organizational psychology. Key themes include technology-induced overload, role stress, and productivity. New concepts, such as positive stress (techno-eustress) and negative stress (techno-distress), related to technology are also gaining attention. The global collaboration map shows significant academic productivity and collaboration, primarily in the United States, China, and Germany. The findings demonstrate that technostress research spans disciplines and is conducted on a global scale, offering strategic insights into the psychological and organizational effects of digitalization. As one of the few bibliometric studies in this field, this analysis synthesizes the historical development, conceptual priorities, and methodological patterns of technostress literature, offering a structured basis for future research.

KEYWORDS

technostress, bibliometric analysis, productivity, digitalization, information systems

INTRODUCTION

The concept of technostress has been studied since the 1980s (Shu, Tu, & Wang, 2011). The term was first introduced by American scholar Craig Brod, who defined technostress as a disease of adaptation caused by an individual's inability to cope with emerging computer technologies (Salazar-Concha, Ficapal-Cusí, Boada-Grau, & Camacho, 2021). In 1997, the definition of technostress was expanded by Weil and Rosen, who argued that it induces negative changes in attitudes, thoughts, and behaviors (Wang & Shu, 2008).

Technostress was first examined at the organizational level in 2007 (Kot, 2022). In their seminal study, Tarafdar and colleagues proposed that the advancement of information and communication technologies alters the physical, social, and cognitive requirements at both organizational and individual levels (Alam, 2016). These changing demands are perceived by individuals as challenges to be overcome, and such perceptions become the source of stress (Tarafdar, Tu, Ragu-Nathan, & Ragu-

Nathan, 2007). The results of Tarafdar et al.'s 2007 study introduced technostress as an organizational phenomenon (Buzás, Simon, Kiss, & Faragó, 2025). Their research identified several technostress creators—techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty—and suggested that these factors increase role stress and reduce productivity (Zhao, Xia, & Huang, 2020).

In a subsequent study conducted in 2008, Ragu-Nathan, Tarafdar, and colleagues examined both technostress creators and inhibitors (Le Roux & Botha, 2021). They found that stressors negatively affected job satisfaction and subsequently weakened organizational and continuance commitment (Marsh, Vallejos, & Spence, 2022). Conversely, technostress inhibitors—such as technical support, user training, and participatory implementation processes—were shown to enhance job satisfaction and commitment (Ragu-Nathan, Tarafdar, Ragu-Nathan, & Tu, 2008). A 2024 study by Kumar supported these findings and emphasized the importance of stress-reducing strategies, including user education, digital awareness, ergonomic arrangements, and digital detox practices (Kumar, 2024).

Wang and Shu's 2008 study clearly demonstrated the negative effects of technostress on employees (Mishra, 2022). Their findings revealed a significant positive relationship between technostress and both role conflict and role overload, indicating that increasing technological demands amplify employees' experience of role stress (Wang & Shu, 2008). Another important finding was that perceived organizational support significantly moderated the relationship between technostress and role conflict, suggesting that organizational support can act as a buffer in managing stressful work conditions (Hassan, Yaakob, Sumardi, Mat Halif, Ali, Abd Aziz, & Abdul Majid, 2019).

Tarafdar et al.'s 2019 study argued that information systems are not only sources of stress but can also be designed to reduce technological stress and enhance positive outcomes (Salazar-Concha et al., 2021). Accordingly, the authors introduced two key constructs that allow a broader understanding of technostress: techno-eustress and techno-distress. Techno-eustress refers to the perception of information systems as opportunities or challenges that can lead to positive outcomes. For instance, when used appropriately, information systems can enhance work flexibility and efficiency. In contrast, techno-distress arises from excessive workload, insecurity, or uncertainty caused by technology use (Tarafdar, Cooper, & Stich, 2019).

A review of studies on technostress shows that most are grounded in the "Transactional Model of Stress," which conceptualizes stress as a dynamic process in which individuals evaluate their capabilities to cope with environmental demands (Siitonen, Ritonummi, Salo, Pirkkalainen, & Mauno, 2025). Tarafdar (2007) adapted this model to the context of information technologies, demonstrating that technology-induced demands increase perceived stress and negatively affect job performance. These stressors, stemming from technology, contribute to role conflict and ambiguity, ultimately diminishing productivity (Stadin, Nordin, Broström, Magnusson Hanson, Westerlund, & Fransson, 2021). Davis's "Technology Acceptance Model" (1989) also influenced this literature, emphasizing that individuals' perceptions of usefulness, ease of use, and acceptance determine the level of technostress (Wang & Shu, 2008). Additionally, many studies draw on the "Job Demands-Resources" theory to explain the organizational consequences of technostress, such as burnout and low commitment. Technostress is a multidimensional phenomenon involving individuals' psychological evaluations, interactions with technology, and the availability of organizational resources (Hwang & Cha, 2018).

This study aims to provide a comprehensive examination of the scientific output on technostress. Using bibliometric analysis, it analyzes 1,297 English-language academic publications indexed in the Web of Science database. The analysis was conducted using the "Bibliometrix" and "Biblioshiny" packages within the R programming environment, visualizing annual publication trends, prominent authors and journals, thematic development areas, and international academic collaboration

networks. Through this extensive analysis, the study seeks to uncover the intellectual structure of the technostress field and offer a roadmap for future research.

METHODOLOGY

Studies of bibliometric analysis investigate the evolutionary and structural processes of a scientific field (Cobo et al., 2011; Noyons et al., 1999; Börner et al., 2003). In other words, these studies provide a detailed map of a specific field of study (Aria & Cuccurullo, 2017). This study is such a map, created to evaluate the academic standing of the technostress phenomenon.

The data collection process began with entering the keyword "technostress" into the Web of Science (WoS) database search field. A total of 1,334 studies were found. However, to ensure linguistic consistency, only studies published in English were selected for analysis. After filtering, 1,297 academic publications remained, as shown in Table 1 under "Documents." This number indicates a medium-sized literature pool. The dataset obtained from Web of Science was exported in BibTeX format. The exported data were loaded into the Bibliometrix package running in the R programming language environment.

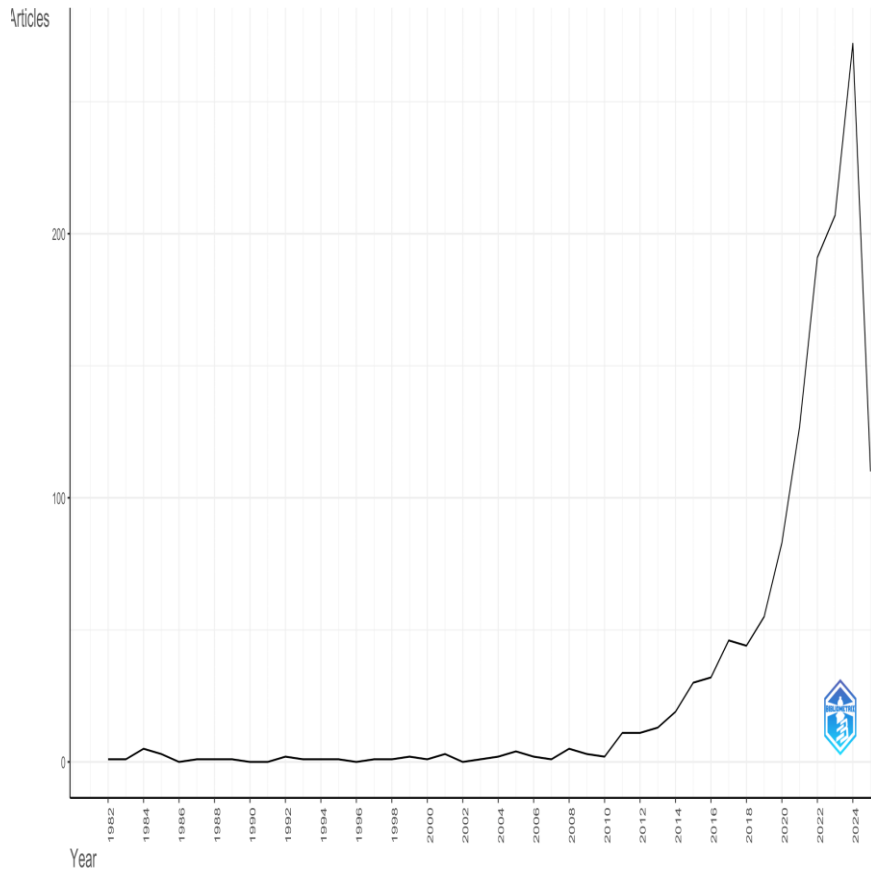
The data was analyzed by year of publication, leading authors, journals, and countries. A map was created by evaluating the field's thematic development and the networks formed by collaborations between authors in different countries. The Bibliometrix and Biblioshiny packages in the R program were used to create the map. The bibliometric analysis obtained from the R program and presented in Table 1 provides basic information about the subject.

Table 1: Main Information about Data

Description	Value
Timespan	1982–2025
Sources (Journals, Books, etc.)	585
Documents	1297
Annual Growth Rate	11.55%
Authors	3371
Authors of single-authored documents	117
International Co-Authorship (%)	25.98%
Co-Authors per Document	3.55
Author's Keywords (DE)	3451
References	52079
Document Average Age	4.38
Average citations per document	26.83

Examining Table 1 reveals that studies related to technostress have steadily increased in the literature. One indicator of this growth is the 1,297 academic studies published in 585 sources, including journals and books, between 1982 and 2025. A total of 3,371 authors contributed to these studies. Of these studies, 117 are single-authored, and the average number of co-authors per study is 3.55. This result undoubtedly indicates a strong culture of collaboration in the technostress literature. Technostress-related production has grown at an annual rate of 11.55%. The rate of international co-authored studies (25.98%) indicates intercultural interaction, diversity, and contributions from different disciplines in the field. The average age of studies in this field is 4.38 years. This data shows that the field remains current. Another indicator of the field's visibility is the number of citations per publication. Table 1 shows that the average number of citations per publication is 26.83.

Figure 1: Annual Scientific Production



Between 2012 and 2018, there was a gradual increase. During this time, the subject began to gain recognition in academia. From 2019 to 2023, the field experienced an explosion. Notably, the number of technostress studies produced annually has exceeded 250 since 2022. Reasons for this increase include increased digitalization during the pandemic and interest in topics such as remote work and artificial intelligence, which were brought about by digitalization.

This study used various bibliometric analysis tools to map the phenomenon of technostress. The Bibliometrix and Biblioshiny packages in the R programming language were used to analyze the dataset obtained from the Web of Science database (Rajendran et al., 2023). These tools helped identify leading authors, journals, and countries in the field and enabled the evaluation of these elements' impact levels using various criteria (Hirsch, 2005).

The analysis tools used in this study do not focus solely on the publication performance of the analyzed publications, journals, authors, and countries. They also enable content-based scientific mapping based on publication content (Hirsch, 2005). To this end, techniques such as keyword co-occurrence, thematic clustering, and visualization of collaboration networks were employed.

Table 2: Most Relevant Authors

Authors	Articles	Articles Fractionalized
RIEDL R	34	14.45
TARAFDAR M	30	8.44
MAIER C	27	7.04
WANG X	20	6.27
LAUMER S	16	3.68
SALO M	14	3.67
WEITZEL T	14	3.68
PIRKKALAINEN H	13	3.33
STANGL FJ	11	4.9
TAMS S	11	4.5

Table 2 shows the distribution of researchers who have published the most academic work in the field of technostress. Examining the distribution reveals that Riedl R is the researcher who has published the most in the field with 34 academic works. Riedl's fractionalized publication value is 14.45. Tarafdar M ranks second with 30 articles, and Maier C ranks third with 27. These leading technostress researchers have made significant contributions to the development of the concept. The lower fractionalized values indicate a tendency toward multi-authored publications and collaboration. Authors such as Laumer S., Salo M., and Weitzel T. have similar fractionalized values. These values suggest that these authors played an active role in studies involving multiple researchers. The field revolves around a core group of researchers. The most fundamental indicator of this is the authors' impact on the literature through collaborative studies.

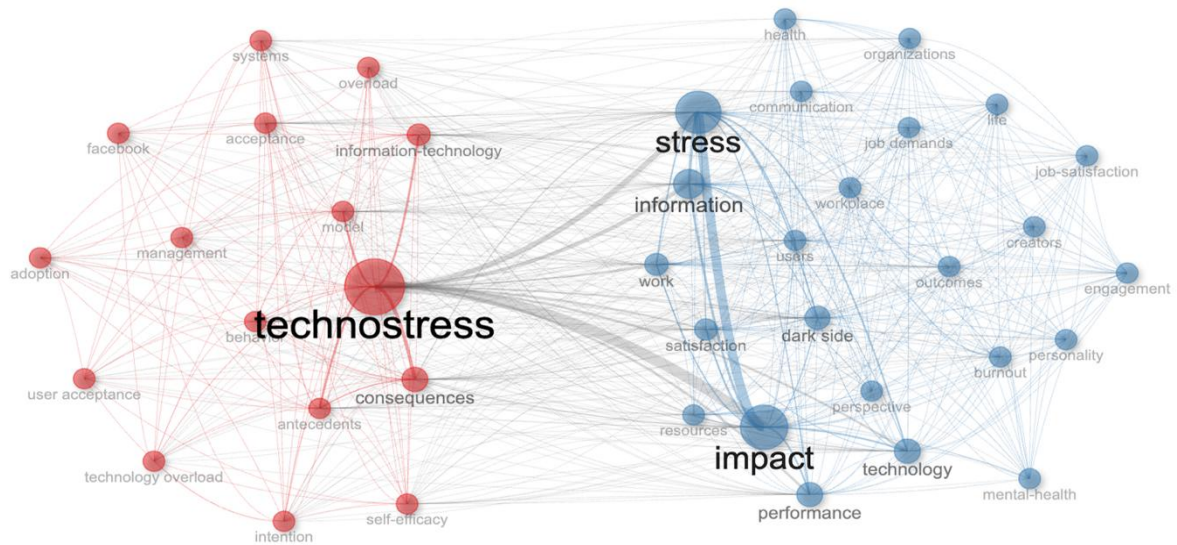
RESULTS

Figure 2: Word Cloud of author keywords



Figure 2 shows the results of a word cloud analysis conducted using keywords to identify prominent trends in technostress literature. The size of each word in the figure represents how frequently it is repeated. The most frequently repeated word is "technostress," and related concepts include "impact," "stress," "information," "performance," "work," "technology," and "consequences." This suggests that technostress is primarily discussed in relation to work performance, information systems, and psychological stress in this field. The figure also shows concepts such as "dark side," "burnout," "job demands," and "mental health." These findings demonstrate that technostress is examined not only in a technological context, but also in an individual context. The data suggest that future research may focus on technostress's effects on individuals, its organizational outcomes, and preventive strategies. Word cloud analysis visually reveals the thematic orientation of the literature. As a result, the direction of future research is illuminated.

Figure 3: Co-occurrence analysis of the author keywords



We analyzed the co-occurrence relationships among author keywords. Figure 3 illustrates the relational structure among key concepts in the field using a co-word network. The size of the keyword nodes represents their total frequency, and the thickness of the lines connecting them indicates how often they co-occur. Keywords in the same color generally represent thematic clusters commonly used together.

Examining the red cluster reveals that technostress is central and connected with terms such as "technology overload," "information technology," "acceptance," "self-efficacy," and "management." This data reveals that technostress research emphasizes individual perceptions of technology and management dimensions.

Another group shedding light on technostress research is visualized in blue. This cluster includes concepts such as "stress," "impact," "satisfaction," "performance," and "burnout." This indicates a focus on the effects of technostress at the individual and organizational levels. Keywords such as "dark side," "mental health," and "job satisfaction" reflect the literature's interest in the negative outcomes of technostress. In conclusion, this network structure reveals that technostress research has evolved along two main axes: cause-effect relationships and individual and organizational impacts.

Figure 4: Co-Citation Network in Technostress Research: Theoretical Clusters of IS, Technology Acceptance, and Occupational Psychology

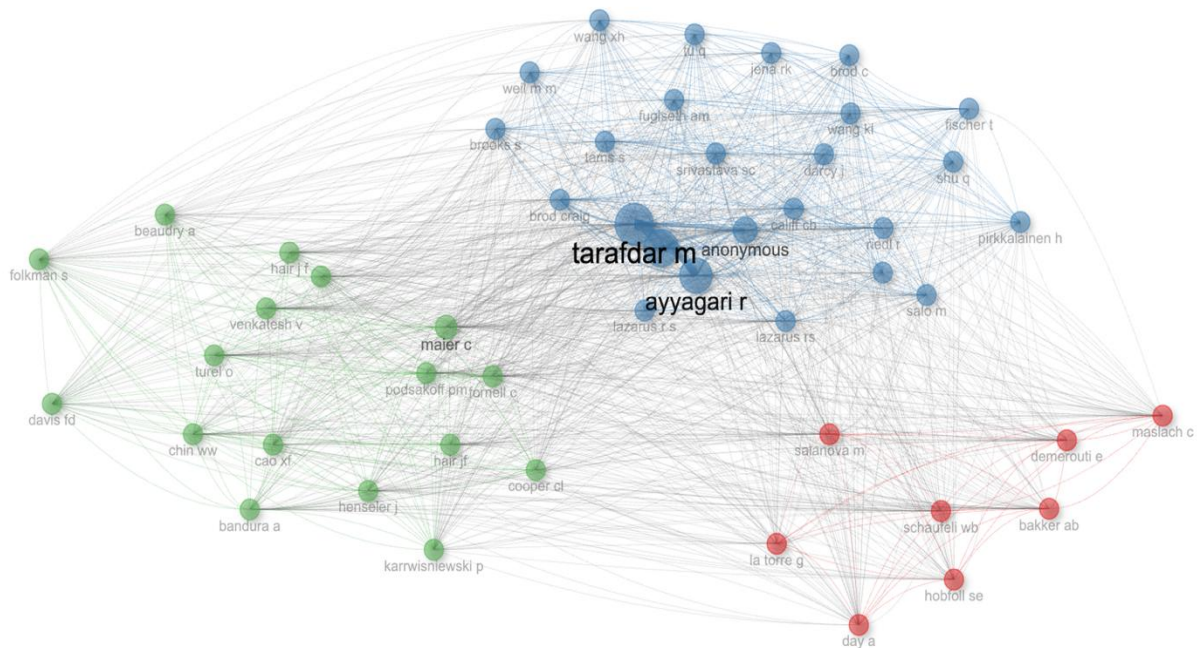


Figure 4 shows the co-citation network visualization. It displays authors who are most frequently cited together, as well as three main theoretical clusters that have emerged around them. One of these clusters, the blue cluster, includes studies that emphasize the definition of technostress, its dimensions, and the impacts of information technologies. Tarafdar M. and Ayyagari R. are at the center of the blue cluster and are considered the leading figures of this group. Many studies in this cluster are based on the transactional model of stress (Tarafdar et al., 2007), which explains stress as an interaction between the individual and the environment.

The green cluster reflects studies developed within the framework of the Technology Acceptance Model. Researchers such as Davis, Venkatesh, and Beaudry are at the center of this cluster. User behavior and technology acceptance form the core of the green cluster. The concepts of self-efficacy and structural equation modeling are commonly employed theoretical and methodological tools, respectively. The red cluster includes studies related to work psychology, burnout, and organizational behavior. Maslach, Demerouti, and Salanova examine the psychological outcomes of technostress within the Job Demands–Resources (JD-R) and Burnout models.

CONCLUSION

This study provides a comprehensive examination of technostress within the contexts of information systems, organizational behavior, and psychological literature. Findings from a bibliometric analysis reveal that technostress has emerged as a form of individual stress and an organizational risk factor that must be managed during digital transformation processes. This statement is supported by multiple findings from our bibliometric analysis. Keyword co-occurrence analysis revealed that technostress is associated with both individual-level constructs, such as burnout and job stress, and organizational-level concepts, including organizational performance, digital transformation, and organizational change. The thematic map showed that stress creators, such as techno-overload, techno-invasion, and techno-insecurity, directly affect organizational structures and processes. Therefore, they require systematic management within digital transformation initiatives. Additionally, citation analysis revealed that influential studies (e.g., Tarafdar et al., 2015; Ayyagari et al., 2011) conceptualize technostress as a strategic organizational issue. Together, these findings demonstrate that technostress emerges as both an individual form of stress and an organizational

risk factor that must be proactively managed during digital transformation processes. The study covered the period from 1982 to 2025, analyzing 1,297 technostress-related publications to examine thematic clusters, theoretical approaches, and collaboration networks. This study's exclusive focus on technostress distinguishes it from previous bibliometric studies. Earlier research examined technostress as a sub-dimension of technology-related stress. This study analyzes technostress in depth, focusing on the thematic and theoretical structure of the field and making emerging concepts, such as techno-eustress and techno-distress, more visible.

The findings indicate that technostress research is concentrated around three main domains: information systems and stress theories; technology acceptance models; and organizational and occupational psychology approaches. Core concepts located at the intersection of these domains include classic stress creators, such as techno-overload, techno-invasion, and techno-insecurity, as well as emerging concepts, such as techno-eustress and techno-distress. The study outlines the evolution of the field over time and identifies the countries and authors that have played a leading role in producing knowledge. In this regard, the study offers strategic insights with both academic and managerial implications.

Upon examination of the findings, it becomes evident that the identified themes can be associated with specific theoretical frameworks. For example, stress creators such as techno-overload and techno-invasion can be linked to various cognitive appraisal processes within the Transactional Model of Stress framework. The Job Demands-Resources (JD-R) model considers technostress to be a job demand and views organizational support systems as resources. The TAM provides a valuable theoretical foundation for understanding technostress's impact on perceived usefulness and ease of use in the technology acceptance process.

This study's academic contribution lies in its systematic examination of technostress research from historical, theoretical, and thematic perspectives. It also offers a conceptual framework to guide future studies. Specifically, it answers questions such as which theoretical foundations underlie research analyzing technostress's workplace implications, which thematic domains have evolved over time, and which areas may become more prominent in future research. From a practical standpoint, the findings highlight key intervention areas for protecting employee well-being during the digitalization process, which is particularly relevant for human resources professionals, information systems designers, and organizational managers.

However, the study has certain limitations. First, the analysis is limited to English-language publications indexed in the Web of Science database. This may result in the exclusion of valuable studies published in other languages. Furthermore, since the bibliometric analysis method relies on publication and citation data rather than content depth, future studies are encouraged to complement these findings with traditional literature reviews. Lastly, the software tools used operate within predefined parameters that may overlook contextual nuances in thematic analysis. Therefore, the thematic clustering results should be critically assessed and integrated with classical systematic reviews.

In terms of future research, techno-eustress is seen as a particularly promising area of study. Future studies may investigate whether techno-eustress enhances innovation and adaptability. The effects of technostress can be examined comparatively across different cultures and sectors. From a practical standpoint, the thematic areas identified in this study could inform the development of employee training programs, digital workplace policies, and user-friendly information system designs. Despite its limitations, this study makes a significant contribution to the field by mapping the current state of knowledge on technostress. The findings provide scholars and practitioners with a strategic foundation for better understanding, managing, and transforming stressors emerging from digitalization. In particular, the results offer valuable guidance for designing employee-centered technology and organizational support systems for sustainable digital transformation. Thus, the study offers a descriptive and directive contribution to the existing body of literature.

REFERENCES

- Alam, M. A. (2016). Techno-stress and productivity: Survey evidence from the aviation industry. *Journal of Air Transport Management*, 50, 62–70. <https://doi.org/10.1016/j.jairtraman.2015.10.003>
- Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, 11(4), 959–975. <https://doi.org/10.1016/j.joi.2017.08.007>
- Ayyagari, R., Grover, V., & Purvis, R. (2011). Technostress: Technological antecedents and implications. *MIS Quarterly*, 35(4), 831–858. <https://doi.org/10.2307/41409963>
- Bondanini, G., Giorgi, G., Ariza-Montes, A., Vega-Muñoz, A., & Andreucci-Annunziata, P. (2020). Technostress: Dark side of technology in the workplace: A scientometric analysis. *International Journal of Environmental Research and Public Health*, 17(21), 8013. <https://doi.org/10.3390/ijerph17218013>
- Börner, K., Chen, C., & Boyack, K. W. (2003). Visualizing knowledge domains. *Annual Review of Information Science and Technology*, 37(1), 179–255. <https://doi.org/10.1002/aris.1440370106>
- Buzás, B., Simon, A. C., Kiss, O. E., & Faragó, K. (2025). Navigating the digital landscape: Unraveling the interplay of challenge and hindrance components of technostress on employee voice behavior. *Frontiers in Psychology*, 16, Article 1434275. <https://doi.org/10.3389/fpsyg.2025.1434275>
- Cobo, M. J., López-Herrera, A. G., Herrera-Viedma, E., & Herrera, F. (2011). An approach for detecting, quantifying, and visualizing the evolution of a research field: A practical application to the fuzzy sets theory field. *Journal of Informetrics*, 5(1), 146–166. <https://doi.org/10.1016/j.joi.2010.10.002>
- Hassan, N., Yaakob, S. A., Sumardi, N. A., Mat Halif, M., Ali, S., Abd Aziz, R., & Abdul Majid, A. (2019). The moderating effects of perceived organizational support on the relationship between technostress creators and organizational commitment among school teachers. *International Journal of Engineering and Advanced Technology (IJEAT)*, 8(3S), 206–210. <https://www.ijeat.org/wp-content/uploads/papers/v8i3S/C10420283S19.pdf>
- Hirsch, J. E. (2005). An index to quantify an individual's scientific research output. *Proceedings of the National Academy of Sciences*, 102(46), 16569–16572. <https://doi.org/10.1073/pnas.0507655102>
- Hwang, I., & Cha, O. (2018). Examining technostress creators and role stress as potential threats to employees' information security compliance. *Computers in Human Behavior*, 81, 282–293. <https://doi.org/10.1016/j.chb.2017.12.022>
- Jain, S., Varma, V., Vijay, T. S., & Cabral, C. (2025). Technostress influence on innovative work behaviour and the mitigating effect of leader-member exchange: A moderated mediation study in the Indian banking industry. *Acta Psychologica*, 255, 104875. <https://doi.org/10.1016/j.actpsy.2025.104875>
- Keshavarz, H., Saeidnia, H. R., & Wang, T. (2025). Navigating technostress: A deep dive into health practitioners' technological challenges in hospital settings. *BMC Health Services Research*, 25(18). <https://doi.org/10.1186/s12913-024-12196-1>
- Kot, P. (2022). Psychometric properties of the Polish adaptation of Technostress Creators and Technostress Inhibitors Scale. *Medycyna Pracy*, 73(4), 277–293. <https://doi.org/10.13075/mp.5893.01236>
- Kumar, P. S. (2024). Technostress: A comprehensive literature review on dimensions, impacts, and management strategies. *Computers in Human Behavior Reports*, 16, 100475. <https://doi.org/10.1016/j.chbr.2024.100475>
- Le Roux, D. J., & Botha, P. A. (2021). Investigating the impact of technostress on productivity and overall life satisfaction of managers working at a South African ferrochrome smelting company. *SA Journal of Human Resource Management/SA Tydskrif vir Menslikehulpbronbestuur*, 19(0), a1649. <https://doi.org/10.4102/sajhrm.v19i0.1649>
- Marsh, E., Vallejos, E. P., & Spence, A. (2022). The digital workplace and its dark side: An integrative review. *Computers in Human Behavior*, 128, 107118. <https://doi.org/10.1016/j.chb.2021.107118>
- Mishra, R. (2022). A study on the relationship between technostress and employee creativity with perceived organizational support. *Information Management and Business Review*, 14(2), 9–14.
- Noyons, E. C. M., Moed, H. F., & Van Raan, A. F. J. (1999). Integrating research performance analysis and

- science mapping. *Scientometrics*, 46(3), 591–604. <https://doi.org/10.1007/BF02459614>
- Ragu-Nathan, T. S., Tarafdar, M., Ragu-Nathan, B. S., & Tu, Q. (2008). The consequences of technostress for end users in organizations: Conceptual development and empirical validation. *Information Systems Research*, 19(4), 417–433. <https://doi.org/10.1287/isre.1070.0165>
- Salazar-Concha, C., Ficapal-Cusí, P., Boada-Grau, J., & Camacho, L. J. (2021). Analyzing the evolution of technostress: A science mapping approach. *Heliyon*, 7(5), e06726. <https://doi.org/10.1016/j.heliyon.2021.e06726>.
- Schubin, K., Seinsche, L., Pfaff, H., & Zeike, S. (2023). A workplace mindfulness training program may affect mindfulness, well-being, health literacy and work performance of upper-level ICT-managers: An exploratory study in times of the COVID-19 pandemic. *Frontiers in Psychology*, 14, 994959. <https://doi.org/10.3389/fpsyg.2023.994959>
- Shu, Q., Tu, Q., & Wang, K. (2011). The Impact of Computer Self-Efficacy and Technology Dependence on Computer-Related Technostress: A Social Cognitive Theory Perspective. *International Journal of Human-Computer Interaction*, 27(10), 923–939. <https://doi.org/10.1080/10447318.2011.555313>
- Siitonen, V., Ritonummi, S., Salo, M., Pirkkalainen, H., & Mauno, S. (2025). Coping with technostress in the software industry: Coping strategies and factors underlying their selection. *The Journal of Systems and Software*, 225, 112341. <https://doi.org/10.1016/j.jss.2025.112341>
- Stadin, M., Nordin, M., Broström, A., Magnusson Hanson, L. L., Westerlund, H., & Fransson, E. I. (2021). Technostress operationalised as information and communication technology (ICT) demands among managers and other occupational groups: Results from the Swedish Longitudinal Occupational Survey of Health (SLOSH). *Computers in Human Behavior*, 114, 106486. <https://doi.org/10.1016/j.chb.2020.106486>
- Tarafdar, M., Cooper, C. L., & Stich, J. F. (2019). The technostress trifecta: Techno-eustress, techno-distress and design: Theoretical directions and an agenda for research. *Information Systems Journal*, 29(1), 6–42. <https://doi.org/10.1111/isj.12169>
- Tarafdar, M., Pullins, E. B., & Ragu-Nathan, T. S. (2015). Technostress: Negative effect on performance and possible mitigations. *Information Systems Journal*, 25(2), 103–132. <https://doi.org/10.1111/isj.12042>
- Tarafdar, M., Tu, Q., Ragu-Nathan, B. S., & Ragu-Nathan, T. S. (2007). The impact of technostress on role stress and productivity. *Journal of Management Information Systems*, 24(1), 301–328. <https://doi.org/10.2753/MIS0742-1222240109>
- Wang, K., & Shu, Q. (2008). The moderating impact of perceived organizational support on the relationship between technostress and role stress. 2008 19th International Workshop on Database and Expert Systems Applications, 420–424. IEEE. <https://doi.org/10.1109/DEXA.2008.67>
- Zhao, X., Xia, Q., & Huang, W. (2020). Impact of technostress on productivity from the theoretical perspective of appraisal and coping processes. *Information & Management*, 57(8), 103265. <https://doi.org/10.1016/j.im.2020.103265>

IS INDIVIDUAL ADAPTING EFFECTIVE IN THE TECHNOLOGY ACCEPTANCE MODEL?

Ceren ÖZKAN

Trakya University, Faculty of Economics and Administrative Sciences, Edirne, Türkiye, cerenozkkn@gmail.com
<https://orcid.org/0009-0000-0219-7909>

Songül YILDIZ

Trakya University, Faculty of Economics and Administrative Sciences, Edirne, Türkiye, songulyildiz@trakya.edu.tr

ABSTRACT

Today, rapid changes in many areas lead to various problems for organizations and employees. One of the most important elements of these changes is technology. While technological innovations shape processes and operations, institutions that cannot keep up with change face risks such as losing competitive advantage and having difficulty in crisis management. Adapting to change is possible not only with organizational arrangements but also with individual performance changes. High individual adaptation performance produces positive results such as success, growth, profit, and customer satisfaction at the organizational level. This study aims to examine the effect of individual adaptation performance on technology acceptance with data obtained from Trakya University academic and administrative staff. The relationship between these two concepts plays a critical role in businesses achieving sustainable competitive advantage. The original value of the research is that it focuses on the relationship between adaptation performance and the technology acceptance model and sheds light on future studies by filling the knowledge gap in this area. Trakya University staff was selected as a sample because they will provide information on the adaptation and acceptance process of academic and administrative staff to the changes that the university has recently made on the student information system (OBS). The Personal Information Form, Individual Adaptation Performance Scale, and Technology Acceptance Model Scales will be used as data collection tools; data will be analyzed with the SPSS program.

KEYWORDS

Individual Adaptive Performance, Technology Acceptance Model, Academicians

INTRODUCTION

In today's rapidly digitalizing world, public institutions and universities, which are fundamentally information-focused organizations, play a central role in the implementation and dissemination of digital transformation processes. The success of such transformations depends not only on the establishment of technological infrastructure but also on the extent to which individuals within the organization can adapt to and accept these technologies. In this *situation, how well people adjust to new technologies and accept them is very important for digital transformation, especially in places where people frequently use digital systems.*

**This study was supported by the 2209-A University Students Research Projects Support Program, conducted by the TÜBİTAK Scientist Support Programs Directorate, with the application number 1919B012412903*

Technological innovations increasingly shape the functioning of organizations, yet the inability to adapt to these changes may result in a loss of competitive advantage and difficulties in institutional effectiveness. While digital transformation is often addressed at the organizational level, success in these efforts is equally dependent on individual-level change and performance. High levels of individual adaptation performance contribute to personal success and productivity and enhance organizational outcomes such as growth, flexibility, innovation, and sustainability. Despite the importance of these concepts, existing literature has not sufficiently addressed the relationship between individual adaptation performance and technology acceptance, particularly among academic and administrative personnel in public universities. However, this relationship constitutes a vital component of institutional digitalization strategies. Individuals' openness to innovation, speed of adaptation, and perceptions of technology directly influence the success of digital systems and the institution's overall digital capacity.

In this context, the Technology Acceptance Model (TAM), developed by Davis (1989), provides a theoretical framework for understanding how individuals accept and use technology. The basic dimensions of the model—perceived usefulness, perceived ease of use, attitude toward use, and behavioral intention toward use—have been widely used in various sectors, including education, public services, and health (Mohd and Mohammad, 2005; Hu et al., 2003). Today, TAM is frequently used in studies aimed at understanding the adoption and usage intentions of users, especially mobile applications (Akdoğan and Yilmaztürk, 2025). Complementing this, the concept of individual adaptation performance proposed by Koopmans (2014) evaluates how effectively and quickly individuals adapt to changes in their work environments. According to Han and Williams (2008), such adaptive behaviors contribute significantly to organizational success.

This study aims to determine whether individual adaptation performance influences technology acceptance among academic and administrative staff at universities. The research is particularly significant in the context of recent updates to the Student Information System (OBS) at Trakya University, creating an opportune moment to explore how staff members adapt to and embrace new technologies.

The research question guiding this study is, *is there a significant relationship between individual adaptation performance and technology acceptance?* By answering this question, the study aims to help us understand how people adjust to digital changes in universities and to assist in making smart management choices that focus on both investing in technology and how individuals adapt to it.

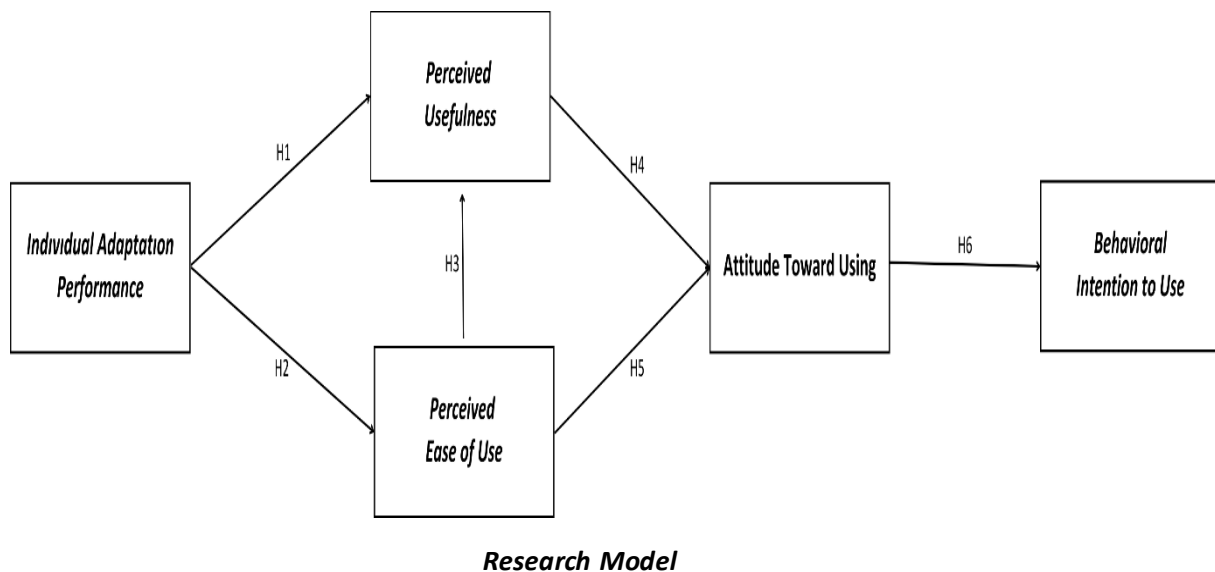
METHODOLOGY

This research, application number 1919B012412903, which was accepted within the scope of 2209–A University Students Research Projects Support Program, was carried out in accordance with the permission of Trakya University Ethics Committee dated 07.05.2025 and numbered E-29563864-050.99-842793.

This research will be conducted with the relational screening model, one of the quantitative research designs (Gürbüz & Şahin, 2018). The sample of the research consists of academic and administrative staff working at Trakya University. In selecting this sample, the digital changes made recently in the university information system at Trakya University provide a suitable context in terms of observing the adaptation of academic and administrative staff to new systems and technology acceptance processes. The convenience sampling method will determine the sample.

We will use a survey consisting of three parts as the data collection tool. The first part will include demographic information; the second part will include the Individual Adaptation Performance Scale developed by Büyükbaş and Üstün (2020); and the third part will include the Technology Acceptance Model scales developed by Davis (1989), Mohd & Mohammad (2005), and Hu et al. (2003).

The data will be analyzed with the SPSS package program. Descriptive statistics, correlation, and regression analyses will be used in the analysis process. In the research, the independent variable is individual adaptation performance; the dependent variables are the four components of the technology acceptance model.



Hypotheses created within the scope of the research model:

- H1:** Individual adaptation performance has a significant effect on perceived usefulness.
- H2:** Individual adaptation performance has a significant effect on perceived ease of use.
- H3:** Perceived ease of use has a significant effect on perceived usefulness.
- H4:** Perceived usefulness has a significant effect on attitude toward using.
- H5:** Perceived ease of use has a significant effect on attitude toward using.
- H6:** Attitude toward using has a significant effect on behavioural intention to use.

RESULTS

Demographic Features

Of the 185 people who participated in the research, 51.9% (96 people) were female and 48.1% (89 people) were male. 4.3% (8 people) lived between 1946 and 1964, 20% (37 people) lived between 1965 and 1976, 64.9% (120 people) lived between 1977 and 1995 and 10.8% (20 people) lived between 1996 and 2015. 4.3% (8 people) had a high school degree, 2.7% (5 people) had an associate degree, 15.7% (29 people) had a bachelor's degree, 24.9% (46 people) had a master's degree and 52.4% (97 people) had a doctorate. 16.8% (31 people) have 1-5 years of experience, 7% (13 people) have 6-10 years of experience, 28.1% (52 people) have 11-15 years of experience, 18.4% (34 people) have 16-20 years of experience and 29.7% (55 people) have over 21 years of experience. 96.8% (179 people) have a personal computer, while 3.2% (6 people) do not have a personal computer. 47.6% (88 people) have taken an information technologies course and 52.4% (97 people) have not taken an information technologies course. 62.2% (115 people) started to use information and communication

technologies actively in their professional lives in 2010 and before, 21.6% (40 people) between 2011-2015, 9.7% (18 people) between 2016-2019, 5.4% (10 people) in 2020-2022 (pandemic period), and 1.1% in 2023 and after. 75.7% (140 people) of the participants were academic staff and 24.3% (45 people) were administrative staff.

Table 1.: Validity and Reliability Analysis

Variables	KMO	Bartlett Ki-Kare	Sig	Factor	Variance Extracted	Cronbach Alpha	Items (53)
1. Individual Adaptive Performance	0,914	1885,7	0,000	One	44,872	0,929	19
2. Perceived Usefulness	0,955	2767,9	0,000	One	71,326	0,968	14
3. Perceived Ease of Use	0,901	1608,9	0,000	One	55,638	0,929	13
4. Attitude Toward Using	0,767	489,2	0,000	One	89,229	0,939	3
5. Behavioral Intention to Use	0,833	495,8	0,000	One	78,687	0,909	4

The structural assessments of the scales employed in the study were performed for exploratory factor analysis (EFA). The Kaiser-Meyer-Olkin (KMO) test for sampling adequacy and the Bartlett test of sphericity were performed to facilitate factor analysis.

The investigation indicated that KMO values for all sub-dimensions varied between 0.767 and 0.955. Kaiser (1974) classifies scores of 0.90 and above as "excellent," 0.80–0.89 as "very good," and 0.70–0.79 as "moderate." Consequently, the derived KMO values and ratios indicate their exceptional appropriateness for factor analysis. The significant values of the Bartlett test of sphericity were $p < 0.001$ for all sub-dimensions. This outcome indicates adequate clarity among the variables, allowing for the execution of factor analysis (Hair et al., 2014).

The factor analysis indicated that all variables were grouped under one factor, with variance ratios ranging from 44.87% to 89.23%. In social sciences, a factor's variance of 40% or above is deemed adequate (Tabachnick & Fidell, 2013). The significant variance ratios seen in the constructs of "Perceived Usefulness" (71.33%), "Attitude Towards Use" (89.23%), and "Behavioral Intention to Use" (78.69%) suggest that these dimensions have undergone some form of assessment. Acquiring single-factor ratios across all scales signifies a favorable indication of overall integrity. The reliability of the scales was evaluated using Cronbach's alpha for the aggregate of the internal components. The results indicated that Cronbach's alpha values for all subscales varied between 0.909 and 0.968. The values significantly above the ≥ 0.70 temperature indicated by Nunnally (1978), showing a high degree of reliability for the employed scales. "Perceived Usefulness" exhibits outstanding internal consistency, with a Cronbach's alpha of 0.968. Moreover, the adequate quantity of items (53 in total) reinforces the robustness of the factor structure.

Consequently, the scales for "Individual Adaptive Performance," "Perceived Usefulness," "Perceived Ease of Use," "Attitude Toward Use," and "Intention to Use" employed in the study exhibit elevated levels of both construct validity and central therapeutic validity.

Table 2: Mean, Standard Deviation and Correlation Analyses

Factors	Mean	Sd	1	2	3	4	5
1. Individual Adaptive Performance	4,101	0,570	-				
2. Perceived Usefulness	4,412	0,645	0,749**	-			
3. Perceived Ease of Use	4,015	0,677	0,654**	0,710**	-		
4. Attitude Toward Using	4,398	0,708	0,620**	0,743**	0,613**	-	
5. Behavioral Intention to Use	4,295	0,753	0,681**	0,782**	0,738**	0,817**	-

** Correlation is significant at the 0.01 level (2-tailed).

Sd= Standard Deviation

A Pearson correlation analysis was performed to investigate the links among the variables included in the study. The analytical results demonstrated statistically significant and positive correlations among the variables. The results indicated that all correlation coefficients were significant at $p < 0.01$, with values ranging from 0.620 to 0.817.

The correlation value between "Perceived Usefulness" and "Behavioral Intention to Use" was $r = 0.782$, signifying a robust positive association between these factors. The correlation coefficient between "Attitude Toward Using" and "Behavioral Intention to Use" was determined to be $r = 0.817$, representing the strongest association in the investigation. This finding illustrates that individuals' favorable dispositions toward technology can significantly impact their intention to utilize it.

Substantial and affirmative correlations were identified between the "Individual Adaptive Performance" component and additional variables. The association of this variable with "Perceived Usefulness" was $r = 0.749$, with "Perceived Ease of Use" $r = 0.654$, with "Attitude Toward Using" $r = 0.620$, and with "Behavioral Intention to Use" $r = 0.681$. The results indicate that a person's ability to adjust to changing conditions is continuously associated with their perception of technology and their intention to utilize it.

As a result, substantial and affirmative correlations were identified among all variables, aligning with the Technology Acceptance Model (TAM), the study's theoretical framework. The robust correlations between perceived usefulness and favorable sentiments, as well as the intention to utilize technology, reinforce the foundational premises of this approach.

In the research model developed for this study, the effects of individual adaptation performance on perceived usefulness and perceived ease of use, the effects of these two variables on attitude, and finally, the effects of attitude on intention to use were analyzed. Regression analyses revealed that all hypotheses exhibited statistically significant and strong relationships.

H₁: Individual adaptation performance has a significant effect on perceived usefulness.

According to the regression analysis, the effect of individual adaptation performance on perceived usefulness is quite strong ($\beta = 0.749$, $p < 0.01$). The model's explanatory power ($R^2 = 0.561$) is high, and the model's significance ($F = 234.025$, $p < 0.01$) is statistically supported. This result suggests that as individuals' adaptation capacity increases, they perceive the system to be more useful. This supports hypothesis H1.

H₂: Individual adaptation performance has a significant effect on perceived ease of use.

The second hypothesis examined the effect of individual adaptation performance on perceived ease of use. According to the analysis findings, this effect is significant and strong ($\beta = 0.654$, $p < 0.01$). The explanatory power of the model is also significant ($R^2 = 0.427$). These findings indicate that as individuals' level of adaptation to the system increases, they perceive greater ease of use. Therefore, hypothesis H2 is supported.

H₃: Perceived ease of use has a significant effect on perceived usefulness.

Table 3: Regression Analysis

Phases	Regression Coefficients			Model Statistics
	B	SH	Beta	
1. Phases Independent: Individual Adaptive Performance Dependent: Perceived Usefulness	0,848	0,055	0,749	$R^2 = 0,561$ $F = 234,025$ $p < .01$
2. Phases Independent: Individual Adaptive Performance Dependent: Perceived Ease of Use	0,776	0,066	0,654	$R^2 = 0,427$ $F = 136,426$ $p < .01$
3. Phases Independent: Perceived Ease of Use Dependent: Perceived Usefulness	0,677	0,05	0,710	$R^2 = 0,505$ $F = 186,351$ $p < .01$
4. Phases Independent: Perceived Usefulness Dependent: Attitude Toward Using	0,815	0,054	0,743	$R^2 = 0,552$ $F = 225,641$ $p < .01$
5. Phases Independent: Perceived Ease of Use Dependent: Attitude Toward Using	0,641	0,061	0,613	$R^2 = 0,375$ $F = 109,945$ $p < .01$
6. Phases Independent: Attitude Toward Using Dependent: Behavioral Intention to Use	0,869	0,045	0,817	$R^2 = 0,667$ $F = 367,364$ $p < .01$

The analysis regarding the third hypothesis shows that perceived ease of use significantly affects perceived usefulness ($\beta = 0.710$, $p < 0.01$). The R^2 value is 0.505, indicating that the model has more than half the explanatory power. This result suggests that perceived ease of use strengthens perceived usefulness, supporting hypothesis H3.

H₄: Perceived usefulness has a significant effect on attitude toward using.

The fourth hypothesis examined the effect of perceived usefulness on attitude towards use, and a very strong effect was found ($\beta = 0.743$, $p < 0.01$). The model has high explanatory power ($R^2 = 0.552$). These findings indicate that individuals find the system more useful and tend to use it more positively. Hypothesis H4 was supported in this respect.

H₅: Perceived ease of use has a significant effect on attitude toward using.

The fifth hypothesis analyzed the effect of perceived ease of use on attitude. The findings indicate that this relationship is significant and moderately strong ($\beta = 0.613$, $p < 0.01$; $R^2 = 0.375$). This suggests that the perception of the system's ease of use positively affects attitude. Hypothesis H5 was supported.

H₆: Attitude toward using has a significant effect on behavioural intention to use.

The final stage of the model tested the effect of attitude on intention to use. The results indicate that this relationship is quite strong ($\beta = 0.817$, $p < 0.01$). The model also has high explanatory power ($R^2 = 0.667$). This finding suggests that individuals' positive attitudes significantly affect their intention to use the system. Thus, hypothesis H6 was strongly supported.

The research model generally contains relationships with a high level of explanatory power. All hypotheses were found to be statistically significant, and the model's internal consistency was established. Individual adaptation performance, in particular, stands out as a key determinant of both perceived usefulness and ease of use. Furthermore, the impact of attitude on behavioral intention

was strongly confirmed, paralleling the technology acceptance model (TAM). In this context, the theoretical validity of the developed model was supported, and its practical applicability was concluded.

CONCLUSIONS

This study investigated the determinants influencing the acceptability and intended utilization of the Student Information System (OBS) among academic and administrative personnel within a university context. The integration of individual adaptive performance into the established Technology Acceptance Model (TAM) yielded significant insights into the influence of personal capabilities on the perception and adoption of institutional technologies.

The findings indicate a strong correlation between proficiency in adapting to digital systems and a more favorable perception of OBS in terms of its perceived benefit, ease of use, and ultimate advantage for professional responsibilities. This underscores the critical importance of individual preparedness and flexibility in technology adoption processes, particularly within structured institutional environments characterized by substantial user diversity and role complexity.

Consistent with the theoretical frameworks proposed by Davis (1989) and Venkatesh and Davis (2000), perceived ease of use and perceived utility emerged as pivotal mediators of user attitude, which demonstrably influenced the behavioral intention to utilize the system. Practically, this suggests that enhancing usability and elucidating the functional advantages of systems such as OBS can foster more favorable user perceptions and subsequently increase system adoption.

This research contributes to both theoretical and practical domains by: (1) augmenting the Technology Acceptance Model (TAM) with an individual performance perspective; (2) validating the significant predictive capacity of user attitude regarding technology acceptance within academic settings; and (3) offering empirical support for the enhancement of digital transformation strategies in universities.

From a practical standpoint, institutions seeking to enhance the adoption of systems like OBS should prioritize improvements in system usability and utility. Concurrently, fostering adaptive capacities through specialized training, digital literacy initiatives, and supportive user environments is crucial. These initiatives can cultivate a more robust and receptive user demographic, thereby facilitating seamless and efficient technology integration within higher education environments.

REFERENCES

- Akdoğan, Ç., & Yılmaztürk, Y. (2025). Investigation of the relationship between the theory of consumption values and consumers' perceptions of mobile food delivery apps in the scope of technology acceptance model. *Journal of Foodservice Business Research*, 1–39. <https://doi.org/10.1080/15378020.2025.2499767>
- Büyükbaş, Ş. M., & Üstün, F. (2020). Uyum performansı ölçeğinin Türkçe uyarlaması: Geçerlik ve güvenilirlik çalışması. *Ahi Evran Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 6(2), 637-656. <http://hdl.handle.net/20.500.11787/2136>
- Davis, F. D. (1989). *Perceived usefulness, perceived ease of use, and user acceptance of information technology*. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
- Davis, F., Bagozzi, R., Warshaw, P. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*, 35(8), 982– 1003. <https://doi.org/10.1287/mnsc.35.8.982>
- Gürbüz, S. & Şahin, F. (2018). *Sosyal Bilimlerde Araştırma Yöntemleri: Felsefe-Yöntem-Analiz* (5.Baskı). Ankara: Seçkin Yayıncılık San. Ve Tic. A.Ş.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate data analysis* (7th ed.). Pearson Education Limited.

- Han, T. Y. and Williams, K. J. (2008). Multilevel investigation of adaptive performance: Individual-and team-level relationships. *Group and Organization Management*, 33(6), 657-684. <https://doi.org/10.1177/1059601108326799>
- Hu, P. J. H., Clark, T. H., & Ma, W. W. (2003). Examining technology acceptance by school teachers: A longitudinal study. *Information & management*, 41(2), 227-241. [https://doi.org/10.1016/S0378-7206\(03\)00050-8](https://doi.org/10.1016/S0378-7206(03)00050-8)
- Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, 39(1), 31–36. <https://doi.org/10.1007/BF02291575>
- Koopmans, L. (2014). Measuring individual work performance. Amsterdam: Department of Public and Occupational Health Vrije Universiteit University Medical Center.
- Marakas, G. M., Yi, M. Y., & Johnson, R. D. (2007). The multilevel and multifaceted character of computer self-efficacy: Toward clarification of the construct and an integrative framework for research. *Information Systems Research*, 9(2), 126–163. <https://doi.org/10.1287/isre.9.2.126>
- Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.
- Occupational Health Vrije Universiteit University Medical Center. Mohd, H., & Syed Mohamad, S. M. (2005). Acceptance model of electronic medical record. *Journal of advancing information and management studies*, 2(1), 75-92. <https://repo.uum.edu.my/id/eprint/2246>
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Pearson Education.
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the Technology Acceptance Model: Four longitudinal field studies. *Management Science*, 46(2), 186–204. <https://doi.org/10.1287/mnsc.46.2.186.11926>

***DIGITAL
TRANSFORMATION IN
EDUCATION,
ENTREPRENEURSHIP,
AND BUSINESS
MANAGEMENT***

EXAMINING DIGITAL METHODS IN HEALTH SCIENCES EDUCATION: A META-ANALYSIS STUDY

Yiğit Kerem YILDIZ

Istanbul Nisantasi University, Istanbul, Turkiye, yigitkerem.yildiz@nisantasi.edu.tr
<https://orcid.org/0000-0002-2976-9169>

Fadime ÇINAR

Istanbul Nisantasi University, Istanbul, Turkiye, fadime.cinar@nisantasi.edu.tr
<https://orcid.org/0000-0002-9017-4105>

Uğur YOZGAT

Istanbul Nisantasi University, Istanbul, Turkiye, ugur.yozgat@nisantasi.edu.tr
<https://orcid.org/0000-0001-9893-3551>

ABSTRACT

The functioning of the education provided in the field of health has changed with the technological developments. Educational institutions are investing in digitalization thanks to the benefits of online education. Various evaluations are made regarding digitalization and the adoption and use of technology in education. One of the first questions about digitalization in education is the comparison of online education methods and classical education methods in certain dimensions. However, comparing online education and face-to-face education in a meaningful way is challenging due to various findings. The purpose of this study is to comparatively examine online education and face-to-face education techniques applied to those receiving education in health sciences and health-related fields through meta-analysis. In order to achieve the determined purpose, studies which written in English were collected between January 2021 and June 2025 using Dergipark, Google Scholar, PubMed, Scopus, ScienceDirect, Ebsco, Web of Science databases. Literature was searched using the keywords "Online Education", "E-Learning", "Health Sciences", "Education". All analyses, including the effect size and publication bias of the studies, were performed using the CMA (Comprehensive Meta-Analysis) 4 program. As a result of the analysis, it was revealed that online education methods were 3.78 times more effective in terms of satisfaction (CI; 2.251-6.372, $p<0.001$), 2.20 times more effective in terms of usability (CI; 1.421-3.434, $p<0.001$), 2.45 times more effective in terms of competence (CI; 1.470-4.097, $p<0.05$), and 1.95 times more effective in terms of teaching and learning (CI; 1.057-3.612, $p<0.05$) than classical methods.

KEY WORDS

Digitalization, Education, Health Sciences, Online Education, E-Learning.

INTRODUCTION

Digitalization encompasses changes that associated with the application of technology to all aspects of society (Rosak-Szyrocka 2024). The fundamental characteristics of digitalization is that it offers advantages by transforming existing products or services into digital variants (Petruševich 2020, Parviainen et al. 2017). The educational institutions have also been affected by the digitalization trend which has become widespread with technological advancements. In particular, the emergence of the Covid-19 has affected the education sector. Innovative education delivery methods have emerged so that students can continue their education with the closure of universities due to the pandemic (Bolotov et al. 2021; Sandhu & de Wolf 2020). Digitalization in education is about the creative use of digital resources during learning (Arisoy 2022).

Online education is becoming one of the most commonly adopted approaches in the digitalization of education (Panigrahi et al. 2018, Baig et al. 2022, Kozak et al. 2023). Online education also known as e-learning or distance learning is an application that provides students with access to information and knowledge whenever they need it without any location or time constraints (Akpen et al. 2024, Bossman & Agyei 2022). This education type offers advantages such as personalized learning tailored to students' needs and the ability to participate from anywhere and on any device. However, problems such as access difficulties and inability to adapt to technology are also encountered without the necessary infrastructure investments and preparation (Akpen et al. 2024). There are still areas where educational institutions, students, and teachers have reservations about using technology in education despite the advantages offered by digitalization in education. One of these points is the difficulty in deciding which of online and traditional education techniques is more effective. Analyzing digitalization in education through a comparison with online and traditional methods helps determine the specific skills emphasized by each and assess the most suitable method for students. Various studies that in the literature emphasize the importance of these dimensions (Forde et al. 2024, Liu 2023).

There is a debate regarding digitalization in health sciences education just as in education in other fields. Some of the people consider that traditional and online education to be synonymous. However, this is incorrect. This is because each educational method has distinct aspects (Elshami et al. 2022). A key aspect of digitalization in health sciences education is developing students' professional skills. Improving educational capabilities is particularly important for low and middle-income countries. Because of limited resources, training skilled healthcare personnel is difficult (Phelan et al. 2022). Digital education methods appear to be a savior in successfully delivering education despite limited resources (Barteit et al. 2020). Online education offers several advantages including flexibility, improved understanding of the topics and opportunities for student self-assessment in the health sciences (Zavala-Cerna et al. 2025, Naciri et al. 2021, Prosen & Ličen 2025). There are also some concerns about such educational techniques in health sciences education. Issues such as reduced interest in the course (Maheshwari et al. 2022), inadequate interaction (Hayat et al. 2021) and inadequate infrastructure (Al Zahrani et al. 2021) have increased doubts and concerns about online education. Although the advantages of educational techniques that emerged with digitalization in health sciences are recognized by students and many other stakeholders, there is a prevailing opinion that there are inadequacies (Berenshtein et al. 2023). Therefore, there are studies in the literature comparing online and traditional education methods in health sciences (Ichikura et al. 2024, Malta et al. 2025, Siddiqui et al. 2024). However, the findings from these studies have implications for the digitalization of health sciences education. The purpose of this study is to conduct a meta-analysis to compare online and face-to-face education techniques, commonly used in the digitalization of health sciences education. This review will explain the role of digitalization in health sciences education through the points where online education is more advantageous and effective or disadvantageous than classical education.

METHODOLOGY

In this study, necessary analyses were made using the meta-analysis method. Meta-analysis is a method that used to analyze and interpret the findings which obtained from studies in the literature, combining all studies on similar subjects by synthesizing them with appropriate methods by expanding the sample size (Cooper 2015). The studies to be included in the meta-analysis were selected according to the criteria determined by the authors and are listed as follows:

- Studies which reflecting specific statistical results
- Studies that are research articles
- Open access
- Published between January 2021 and June 2025

- Studies in English

The study exclusion criteria are as follows:

- Qualitative and case studies
- Studies that are not accessible
- Studies in the form of reviews, theses, books, and letters to the editor
- Studies written in languages other than English

According to the determined criteria, searches were conducted in Dergipark, Google Scholar, PubMed, Scopus, ScienceDirect, Ebsco, Web of Science databases for the studies required for meta-analysis. The keywords “Online Education”, “E-Learning”, “Health Sciences” and “Education” were used when scanning the studies. The PRISMA rule was taken into consideration when classifying studies suitable for meta-analysis. PRISMA is a method that used to critically appraise studies, facilitating the work of authors by helping them improve the presentation of systematic reviews and meta-analyses (Moher et al. 2009). The PRISMA chart will be shared in the full study. Studies which met the inclusion criteria were examined. The remaining studies were independently evaluated by the authors using the study quality assessment criteria.

Studies that were considered suitable for the study were first assessed by reviewing their titles and abstracts during the meta-analysis. Eligible studies were evaluated within the inclusion criteria. Unrelated studies were classified differently. Studies that met the specified inclusion criteria were included in the meta-analysis. Full-text articles were reviewed to prevent bias in eligible publications. The articles which examined were coded based on their descriptive characteristics. The descriptive features taken into consideration during coding are; the names and year of the authors who prepared the study, the sample size and content of the study, the findings which obtained in the study. The table that related to the coding here will be shown in the full study. After reviewing the studies, 12 of the research quality assessment criteria suggested by Polit & Beck (2009) were used for the remaining publications.

Necessary analyses were performed using Comprehensive meta-analysis (CMA) version 4.0. Data for studies that met the inclusion criteria were entered into the CMA software. The criteria outlined by Dinçer (2014) were used to assess the heterogeneity of studies suitable for meta-analysis. According to Dincer (2014), if the p-value is less than 0.05 for the dimension examined to be suitable for heterogeneity or if the Q value is greater than the value corresponding to the df value in the two tables, it is understood that the studies included in the analysis are heterogeneous in terms of meta-analysis. Publication bias was tested using funnel scatter plot; classical fail-safe N, Begg and Mazumdar rank correlation, and Egger's regression intercept in this study. The basic criterion for Egger's regression intercept is that the p value is greater than 0.05. If this value is less than 0.05, it means that the bias rate in the studies is high. This also applies to Begg and Mazumdar rank correlations. If the p-value is less than 0.05, it indicates bias in the studies (Begg & Mazumdar 1994). For fail safe N, the criterion is $N > 5k + 10$ (Rosenthal 1979).

RESULTS

Among the 23 studies selected for meta-analysis, 15 studies deemed appropriate according to quality criteria were selected (Alam et al. 2023, Behmadi et al. 2022, Chang et al. 2021, Gayatri et al. 2022, Grønlien et al. 2021, Hijos & Navarro 2023, Huang et al. 2021, Luginbuehl et al. 2023, Perez et al. 2023, Alfallaj et al. 2021, Jayasinghe et al. 2021, Pradumna et al. 2024, Shaheen et al. 2023, Totlis et al. 2021, Banjo-Ogunnowo & Chisholm 2022). The 15 studies included in the meta-analysis included a total of 2,344 participants. The sample size ranged from 32 to 468. Data which from the selected studies were analyzed using mean, median, and percentage values. Initially, appropriate statements for the topics to be meta-analyzed, along with medians and standard deviations, were compiled. Following a detailed examination of the studies, the findings were presented according to four

dimensions to provide a comparative analysis of digitalization in health sciences education, comparing online education with traditional education methods. These dimensions are explained under subheadings.

Satisfaction

A heterogeneity test was applied to evaluate the role of digitalization in health sciences education through the satisfaction dimension. The heterogeneity test described here was conducted on 14 selected studies and the results revealed that the studies were heterogeneous ($I^2=94,467$, $p<0.001$). The I^2 value was found to be 94,467 and this indicates that the model examining the role of digitalization on satisfaction in health sciences education is highly heterogeneous. A meta-analysis should be conducted using a random effects model. The studies in the analysis are assumed to be a random sample from a universe of potential studies, and this analysis will be used to make an inference to that universe (Borenstein, 2019; Borenstein et al., 2010; Borenstein et al., 2021; Hedges & Vevea, 1998; Higgins & Thomas, 2019). Analysis using a random effects model revealed that online learning techniques were 3,78 times more effective in terms of satisfaction than traditional learning techniques (CI: 2,251-6,372, $p<0.001$). Heterogeneity is summarized in Table 1.

Table 1. Heterogeneity Test Results for Satisfaction

Effect size and 95% interval				
Model	Number of Studies	Point Estimate	Lower Limit	Upper Limit
Fixed	14	3,117	2,774	3,503
Random	14	3,787	2,251	6,372
Test of null (two-tail)				
Model	z Value	p Value		
Fixed	19,118	0,00		
Random	5,015	0,00		
Heterogeneity				
Model	Q value	Df (Q)	p Value	I^2
Fixed	234,934	13	0,00	94,467
Random				
Tau-squared				
Model	Tau Squared	Variance	Tau	
Fixed				
Random	0,892	0,07	0,944	

Figure 1 shows a forest plot that created to examine satisfaction in a comparative manner between online education and traditional education. Figure 1 shows that the effect size of satisfaction which is one of the dimensions included in the comparison between online learning techniques and traditional education techniques in health sciences education, ranges from 1,195 to 171,615. A random effects model analysis of 14 studies yielded a positive mean effect size of 3.787. A funnel distribution chart was then prepared to measure publication bias. The prepared graph is in Figure 2. A significant portion of the 14 studies included in the study are located close to the combined effect

size and peak as seen in Figure 2. Then classic fail-safe N, Begg and Mazumdar rank correlations and Egger's regression intercept criteria were considered. The analysis revealed that all the criteria which mentioned here were met ($p > 0.05$).

Figure 1. Forest Plot of Satisfaction

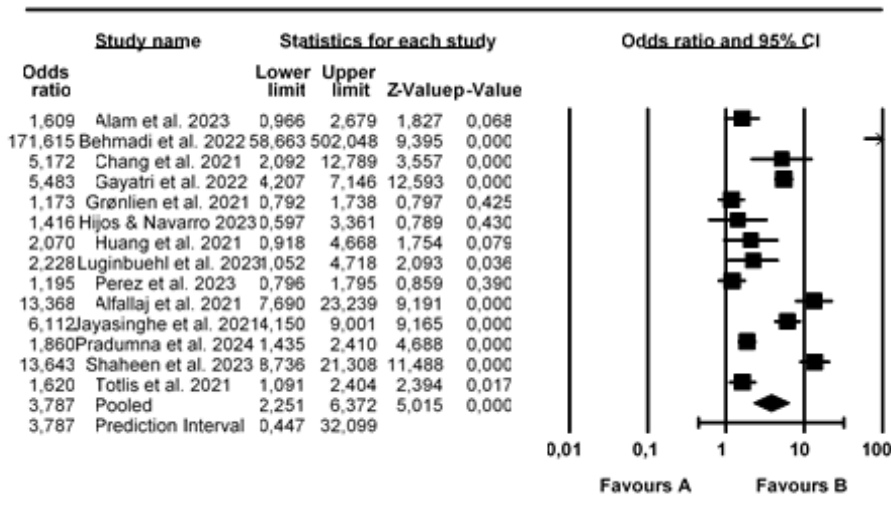
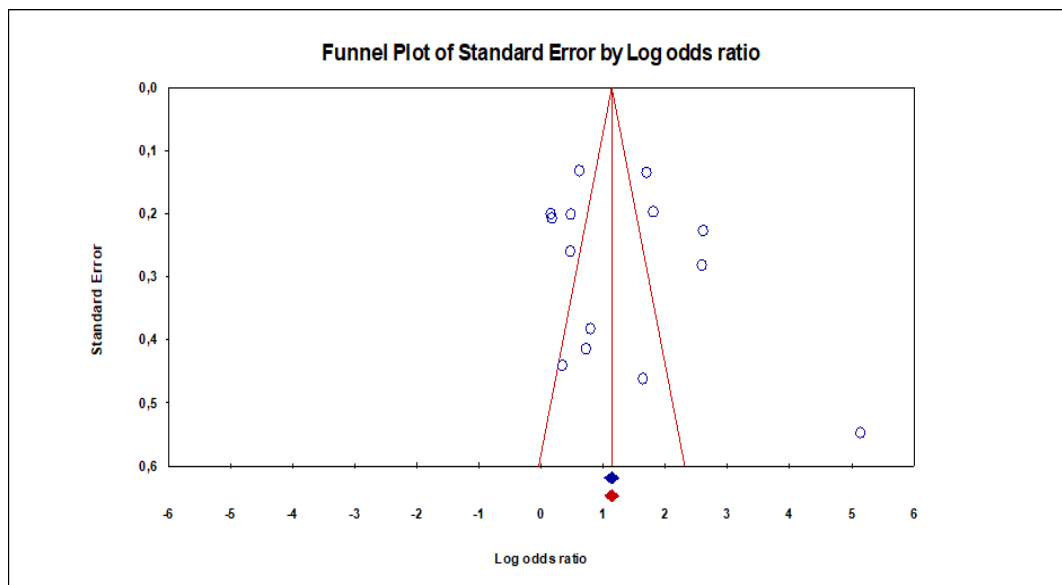


Figure 2. Funnel distribution chart created for satisfaction



Usability

Another dimension that used to explain the role of digitalization in health sciences education by comparing online and traditional education methods is usability. A heterogeneity test was applied to evaluate the usability dimension. The heterogeneity test which described here was conducted on nine selected studies and the results revealed that the studies were heterogeneous ($I^2 = 88,948$, $p < 0.001$). The I^2 value was found be 88,948. This figure indicates that the model which examines the role of digitalization on satisfaction in health sciences education is highly heterogeneous. A meta-analysis should be conducted using a random effects model. Analysis using a random effects model

revealed that online learning techniques were 2.20 times more effective than traditional learning techniques in terms of usability (CI: 1.421-3.434, $p < 0.001$). Heterogeneity is summarized in Table 2.

Table 2. Heterogeneity Test Results for Usability

Effect size and 95% interval				
Model	Number of Studies	Point Estimate	Lower Limit	Upper Limit
Fixed	9	2,297	2,007	2,628
Random	9	2,209	1,421	3,434
Test of null (two-tail)				
Model	z Value	p Value		
Fixed	12,087	0,00		
Random	3,521	0,00		
Heterogeneity				
Model	Q value	Df (Q)	p Value	I ²
Fixed	72,384	8	0,00	88,948
Random				
Tau-squared				
Model	Tau Squared	Variance	Tau	
Fixed				
Random	0,613	0,03	0,376	

Figure 3 shows a forest plot that created to examine the comparative usability of online education and traditional education Figure 3 shows that the effect size for usability that one of the dimensions included in the comparison between online learning techniques and traditional teaching techniques in health sciences education, ranges from 1,000 to 13,368. A random effects model analysis of nine studies yielded a positive mean effect size of 2,209. A funnel distribution chart was then prepared to measure publication bias. The prepared graph is summarized in Figure 4. A significant portion of the nine studies that included in the study are located close to the combined effect size and peak as seen in Figure 4. Then, classic fail-safe N, Begg and Mazumdar rank correlations and Egger's regression intercept criteria were considered. The analysis revealed that all the criteria which mentioned here were met ($p > 0.05$).

Figure 3. Forest Plot of Usability

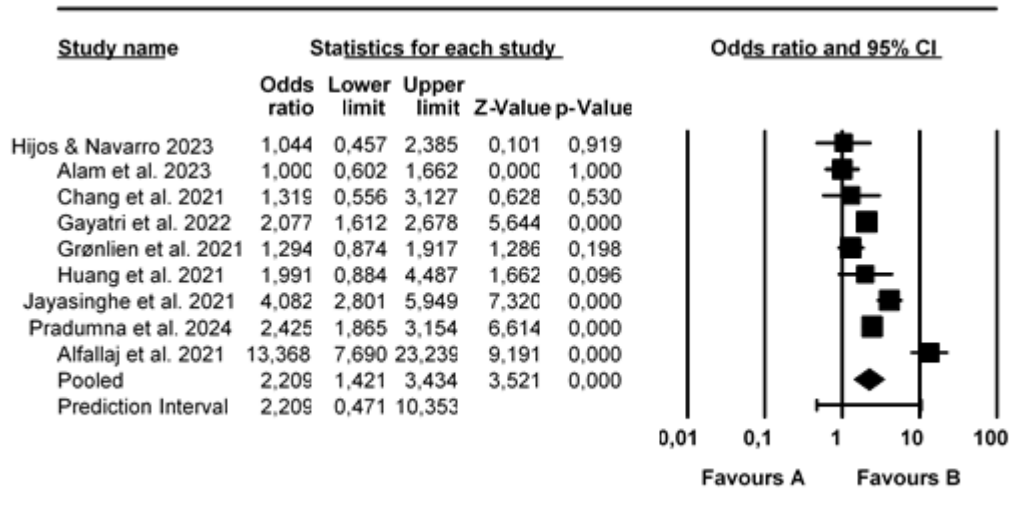
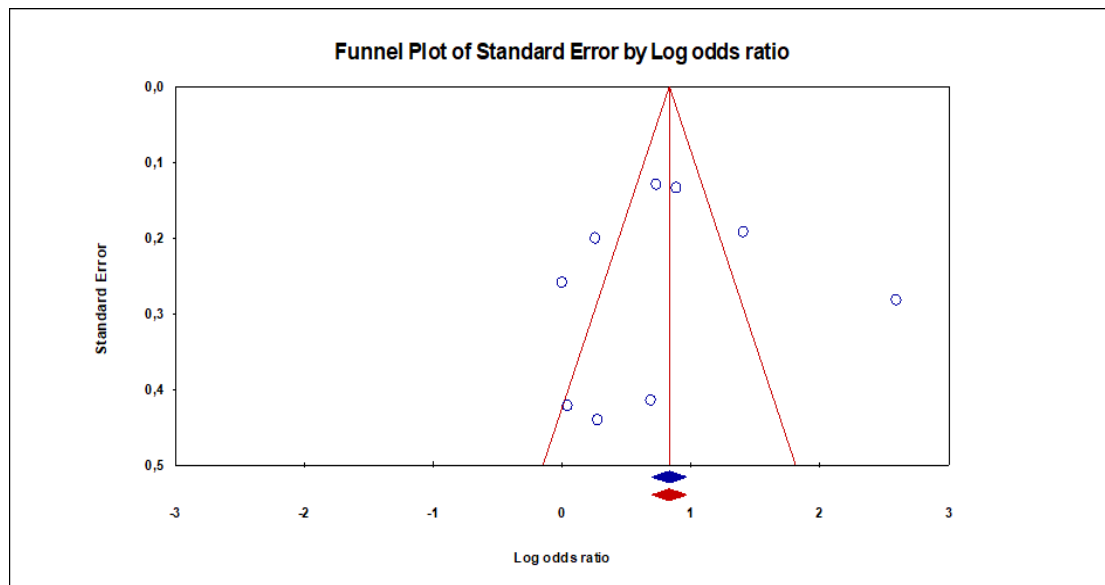


Figure 4. Funnel distribution chart created for usability



Competence

A heterogeneity test was applied to evaluate the role of digitalization in health sciences education using the competence dimension used to compare online and traditional education methods. The heterogeneity test which described here was conducted on 11 selected studies and the results revealed that the studies were heterogeneous ($I^2= 92,895$, $p<0.05$). The I^2 value was found be 92,895. This figure indicates a high degree of heterogeneity in the model examining the role of digitalization on competence in health sciences education. A meta-analysis should be conducted using a random effects model. Analysis using a random effects model revealed that online learning techniques were 2.45 times more effective (CI: 1.470-4.097, $p<0.05$) in terms of competence than traditional learning techniques. The heterogeneity is summarized in Table 3.

Table 3. Heterogeneity Test Results for Competence

Effect size and 95% interval				
Model	Number of Studies	Point Estimate	Lower Limit	Upper Limit
Fixed	11	2,319	2,041	2,634
Random	11	2,454	1,470	4,097
Test of null (two-tail)				
Model	z Value	p Value		
Fixed	12,909	0,00		
Random	3,433	0,001		
Heterogeneity				
Model	Q value	Df (Q)	p Value	I ²
Fixed	140,746	10	0,00	92,895
Random				
Tau-squared				
Model	Tau Squared	Variance	Tau	
Fixed				
Random	0,813	0,05	0,661	

Figure 4 shows a forest plot that created for a comparative examination of online education and traditional education in terms of competence. Figure 4 shows that the effect size for competence which one of the dimensions included in the comparison between online learning techniques and traditional education techniques in health sciences education ranges from 1,023 to 27,127. A random effects model analysis of 11 studies yielded a positive mean effect size of 2,454. A funnel distribution chart was then prepared to measure publication bias. The plot is summarized in Figure 5. A significant portion of the 11 studies included in the study are located close to the combined effect size and peak as seen in Figure 5. Then, classic fail-safe N, Begg and Mazumdar rank correlations and Egger's regression intercept criteria were considered. The analysis revealed that all the criteria which mentioned here were met ($p > 0.05$).

Figure 4. Forest Plot of Competence

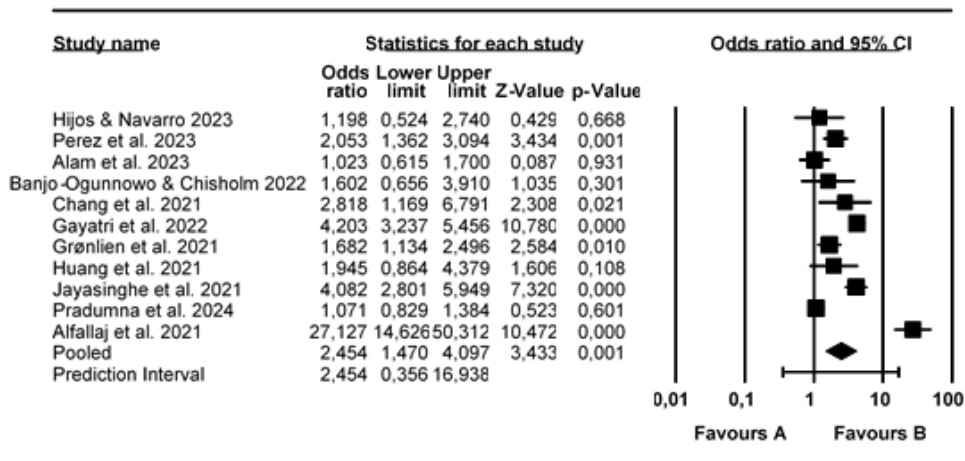
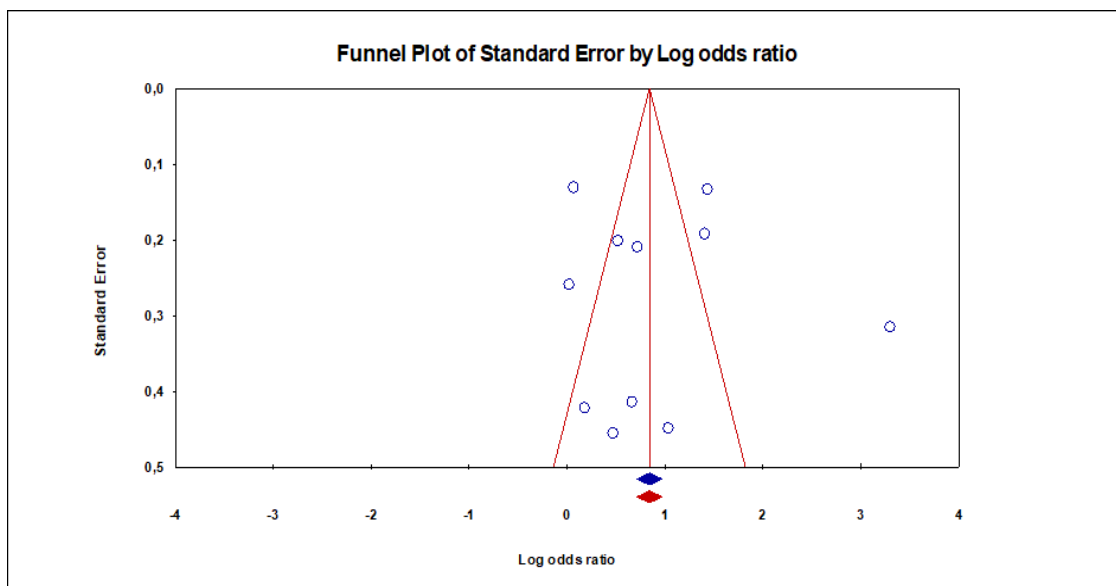


Figure 5. Funnel distribution chart created for competence



Learning-Teaching

A heterogeneity test that was applied to evaluate the role of digitalization in health sciences education through the learning-teaching dimension used to compare online and traditional education methods. The heterogeneity test which described here was conducted on 11 selected studies and the results revealed that the studies were heterogeneous ($I^2 = 95,150$, $p < 0.05$). The I^2 value was found be 95,150. This figure indicates a high degree of heterogeneity in the model examining the role of digitalization on competence in health sciences education. Meta-analysis should be conducted using a random effects model. Analysis using a random effects model revealed that online learning techniques were 1,95 times more effective (CI; 1,057-3,612, $p < 0.05$) in terms of learning-teaching than traditional learning techniques. Heterogeneity is summarized in Table 4.

Table 4. Heterogeneity Test Results for Learning-Teaching

Effect size and 95% interval				
Model	Number of Studies	Point Estimate	Lower Limit	Upper Limit
Fixed	11	1,616	1,422	1,836
Random	11	1,954	1,057	3,612
Test of null (two-tail)				
Model	z Value	p Value		
Fixed	7,368	0,00		
Random	2,138	0,033		
Heterogeneity				
Model	Q value	Df (Q)	p Value	I ²
Fixed	206,187	10	0,00	95,150
Random				
Tau-squared				
Model	Tau Squared	Variance	Tau	
Fixed				
Random	0,994	0,05	0,988	

Figure 6 shows a forest plot that created to examine the learning-teaching effects of online education and traditional education in a comparative manner. Figure 6 shows that the effect size for learning-teaching that one of the dimensions included in the comparison between online learning techniques and traditional education techniques in health sciences education ranges from 0,435 to 13,368. A random effects model analysis of 11 studies found a positive average effect size of 1,954. A funnel distribution chart was then prepared to measure publication bias. The plot is summarized in Figure 7. A significant portion of the 11 studies included in the study are located close to the combined effect size and peak as seen in Figure 7. Then, classic fail-safe N, Begg and Mazumdar rank correlations and Egger's regression intercept criteria were considered. The analysis revealed that all the criteria which mentioned here were met ($p > 0.05$).

Figure 6. Forest Plot of Learning-Teaching

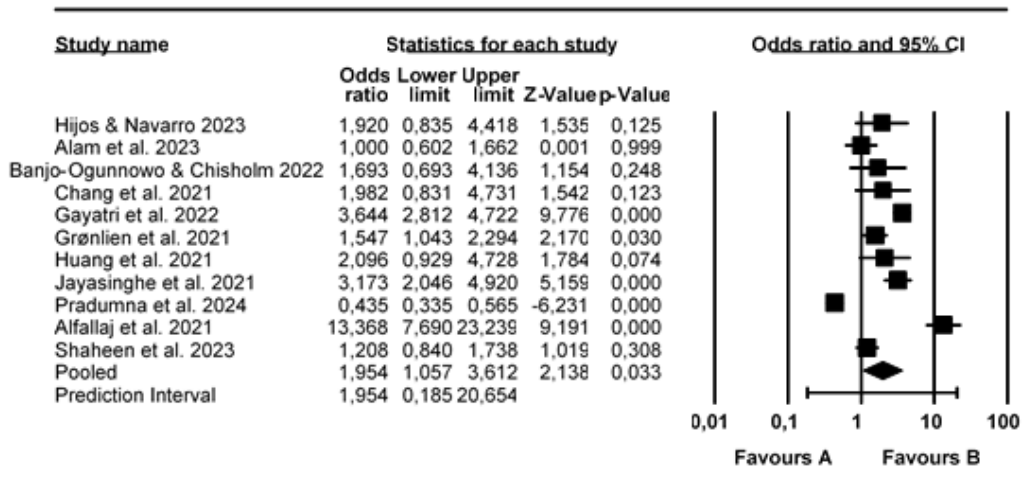
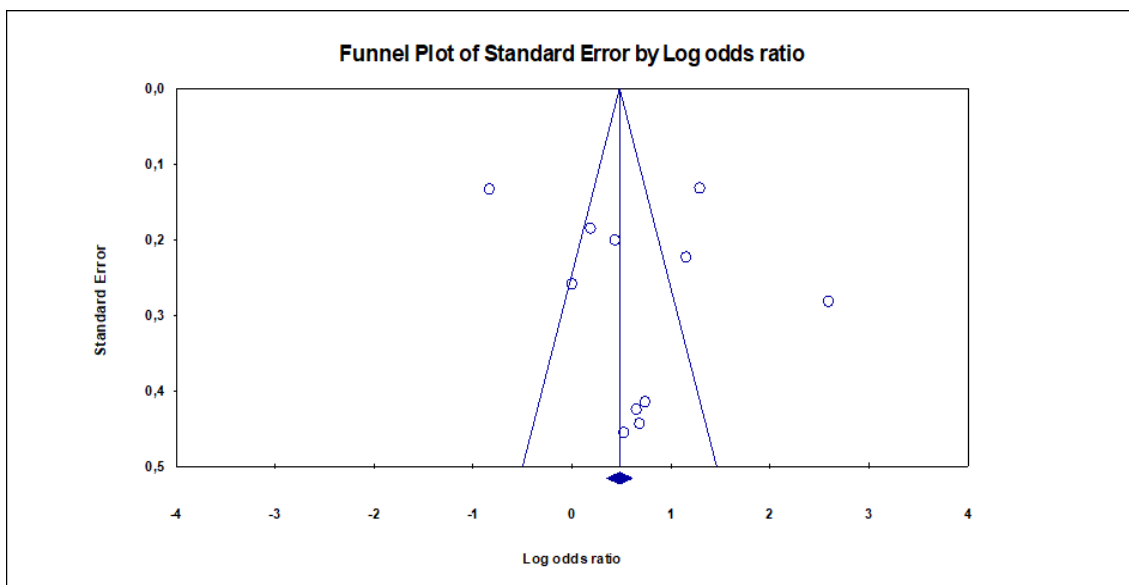


Figure 7. Funnel distribution chart created for Learning-Teaching



DISCUSSION AND CONCLUSION

This study aimed to explain the role of digitalization in health sciences education by comparing online education methods with traditional methods. A total of 15 studies (n=2,344) were examined as part of the meta-analysis conducted for this purpose. Online education methods which have become widely used in health sciences education with the advent of digitalization can be said to be more effective than traditional education methods in terms of satisfaction, competence, usability and learning-teaching aspects according to the findings. However, satisfaction was the dimension with the largest effect size.

Satisfaction in education is a concept that reflects students' attitudes toward the educational experience, services and facilities which provided by an institution (Çakmakkaya et al. 2024; Kanwar & Sanjeeva 2022). Students believe that online education techniques are more effective in terms of satisfaction than traditional education methods, indicating that research participants value the advantages offered by digital education techniques, such as flexibility and accessibility in the increasingly digitalized health sciences education. This result suggests that attitudes toward and

participation in digitalization activities in health sciences education may be positive. This will enable the rapid expansion of digitalization activities in educational institutions and the integration of technologies into various aspects, including clinical practice. Some studies in the literature also indicate that online education is more effective and effective than traditional educational techniques in terms of satisfaction (Batool et al. 2023, Selcuk et al. 2025). However, it's important to remember that there are also studies which suggest that traditional education methods are more effective than digital education methods in terms of satisfaction (Khojasteh et al. 2025). The diversity of results reported here can be explained by various factors, including the adequacy of technical infrastructure and planning, and the aptitude of students and faculty members regarding technological applications. Hence, further studies on satisfaction are recommended. Furthermore, educational institutions must meet the requirements for digitalization of education, such as technical infrastructure, to increase satisfaction.

Usability relates to the usability or ease of use of a technology used in education. Dimensions such as adequate content preparation and satisfaction must be met to speak of usability in education (Asarbaksh & Sandars 2013). The fact that online education methods are more convenient than traditional methods demonstrates their potential to meet students' and teachers' educational expectations. The crucial point here is for educational institutions and decision-makers to accurately identify these expectations.

Competence is a holistic concept representing a combination of knowledge, skills, and attitudes, aimed at developing a specific level of expertise in education (Pramila-Savukoski et al. 2023). The perception that online education is more effective than traditional methods in health sciences suggests a belief that digital approaches can successfully equip students with essential professional skills. The fact that online education techniques are found to be more effective in establishing competence demonstrates that digitalization in health sciences education is not mandatory but rather is gaining acceptance due to its genuine benefits.

Just as with other dimensions, online education methods have been found to be more effective than traditional methods in teaching and learning. This means that online education methods can provide benefits in many areas such as supporting the theoretical knowledge required for health sciences students. Studies in the literature on health science education explain that rather than the medium-sized effect which obtained in this study, the effectiveness level of online education in various dimensions reflecting learning-teaching compared to classical education has a slight or almost similar effect (Richmond et al. 2017, Tudor Car et al. 2019, Cook et al. 2008).

As can be seen from the results of this study, it can be said that digitalization in health sciences education will be more useful for students and teachers. Beyond usability, the digitalization of health sciences education will enhance students' professional competencies and improve the quality of their learning. It will improve the quality of teaching to students for teachers. Educational institutions and decision-makers responsible for education have certain responsibilities to achieve the positive impacts which outlined here. Educational institutions need to improve their digital infrastructure and enhance the quality of the environment for creating educational environments that integrate the technologies associated with digitalization in health sciences. Academicians also have a role to play in the digitalization of education in the health sciences. In the future, studies are needed to measure student learning outcomes and examine their impact through increasingly widespread educational technology applications, particularly those examining the potential impact of digital technologies on both the professional and educational lives of students studying in departments closely related to clinical practice.

REFERENCES

- Akpen, C. N., Asaolu, S., Atobatele, S., Okagbue, H., & Sampson, S. (2024). Impact of online learning on student's performance and engagement: a systematic review. *Discover Education*, 3(1), 205.
- Alam, B. F., Bashir, R., Hussain, T., Abbas, T., Malik, S. A., Jan, S. H., & Khurshid, M. (2023). Online vs. traditional

- learning: A comparative analysis of student's responses during COVID-19. *Work*, 74(1), 21-29.
- Alfallaj, H. A., Alkadhi, R. M., Alfuriji, S. N., Alfadley, A. A., & Aleksejuniene, J. (2021). Dental students and faculty perceptions of teaching methods: Traditional classes, online virtual classes, and recorded lectures.
- Arisoy, B., (2022). Digitalization in education. *Cypriot Journal of Educational Science*. 17(5), 1799-1811.
- Asarbakhsh, M., & Sandars, J. (2013). E-learning: the essential usability perspective. *The clinical teacher*, 10(1), 47-50.
- Baig, M. I., Shuib, L., & Yadegaridehkordi, E. (2022). E-learning adoption in higher education: A review. *Information Development*, 38(4), 570-588.
- Banjo-Ogunnowo, S. M., & Chisholm, L. J. (2022). Virtual versus traditional learning during COVID-19: quantitative comparison of outcomes for two articulating ADN cohorts. *Teaching and Learning in Nursing*, 17(3), 272-276.
- Barteit, S., Guzek, D., Jahn, A., Bärnighausen, T., Jorge, M. M., & Neuhann, F. (2020). Evaluation of e-learning for medical education in low-and middle-income countries: A systematic review. *Computers & education*, 145, 103726.
- Batool, S., Mehrukh, N., & Waseem, M. (2023). Comparing the impact of online learning platforms and traditional classroom settings on student performance and satisfaction. *Global Educational Studies Review VIII*, 8, 343-354.
- Begg, C. B., & Mazumdar, M. (1994). Operating characteristics of a rank correlation test for publication bias. *Biometrics*, 1088-1101.
- Behmadi, S., Asadi, F., Okhovati, M., & Sarabi, R. E. (2022). Virtual reality-based medical education versus lecture-based method in teaching start triage lessons in emergency medical students: Virtual reality in medical education. *Journal of advances in medical education & professionalism*, 10(1), 48.
- Borenstein, M. (2019). *Common Mistakes in Meta-Analysis and How to Avoid Them*. Biostat, Inc.
- Borenstein, M., Hedges, L. V., Higgins, J. P., & Rothstein, H. R. (2010). A basic introduction to fixed-effect and random-effects models for meta-analysis. *Res Synth Methods*, 1(2), 97-111.
<https://doi.org/10.1002/jrsm.12>
- Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2021). *Introduction to Meta-Analysis (Second ed.)*. Wiley.
- Bosman, A., & Agyei, S. K. (2022). Technology and instructor dimensions, e-learning satisfaction, and academic performance of distance students in Ghana. *Heliyon*, 8(4), e09200.
- Chang, J. Y. F., Wang, L. H., Lin, T. C., Cheng, F. C., & Chiang, C. P. (2021). Comparison of learning effectiveness between physical classroom and online learning for dental education during the COVID-19 pandemic. *Journal of dental sciences*, 16(4), 1281-1289.
- Cook, D. A., Levinson, A. J., Garside, S., Dupras, D. M., Erwin, P. J., & Montori, V. M. (2008). Internet-based learning in the health professions: a meta-analysis. *Jama*, 300(10), 1181-1196.
- Çakmakkaya, Ö. S., Meydanlı, E. G., Kafadar, A. M., Demirci, M. S., Süzer, Ö., Ar, M. C., ... & Gönen, M. S. (2024). Factors affecting medical students' satisfaction with online learning: a regression analysis of a survey. *BMC Medical Education*, 24(1), 11.
- Cooper, H. (2015). *Research Synthesis and Meta-Analysis: A Step-by-Step Approach*. Sage, 2, 1-351.
- Dinçer, S. (2014), *Applied Meta-Analysis in Educational Sciences*, Pegem Akademi, Ankara.
- Egger, M., Smith, G. D., Schneider, M., & Minder, C. (1997). Bias in meta-analysis detected by a simple, graphical test. *BMJ*, 315(7109), 629-634.
- Elshami, W., Taha, M. H., Abdalla, M. E., Abuzaid, M., Saravanan, C., & Al Kawas, S. (2022). Factors that affect student engagement in online learning in health professions education. *Nurse Education Today*, 110, 105261.
- Forde, C., O'Brien, A., Croitoru, O., Molloy, N., Amisano, C., Brennan, I., & McInerney, A. (2024). Comparing face-to-face, blended and online teaching approaches for practical skill acquisition: a randomised

- controlled trial. *Medical Science Educator*, 34(3), 627-637.
- Gayatri, B. S. S. N. V. R., Kishore, S. R., Surekha, T., & Triveni, V. (2022). Traditional method or online teaching; which method students prefer: an observational study. *International Journal of Research in Medical Sciences*, 10(12), 2916.
- Grønlien, H. K., Christoffersen, T. E., Ringstad, Ø., Andreassen, M., & Lugo, R. G. (2021). A blended learning teaching strategy strengthens the nursing students' performance and self-reported learning outcome achievement in an anatomy, physiology and biochemistry course—A quasi-experimental study. *Nurse education in practice*, 52, 103046.
- Hayat, A. A., Keshavarzi, M. H., Zare, S., Bazrafcan, L., Rezaee, R., Faghihi, S. A., ... & Kojuri, J. (2021). Challenges and opportunities from the COVID-19 pandemic in medical education: a qualitative study. *BMC Medical Education*, 21(1), 247.
- Hedges, L. V., & Vevea, J. L. (1998). Fixed and random-effects models in meta-analysis. *Psychological Methods*, 3(4), 486-504.
- Higgins, J. P. T., & Thomas, J. (2019). *Cochrane Handbook for Systematic Reviews of Interventions* (J. P. T. Higgins, J. Thomas, J. Chandler, M. Cumpston, T. Li, M. J. Page, & V. A. Welch, Eds. 2nd Edition. ed.). Wiley.
- Hijós, A., & Navarro, L. (2023). Exploratory analysis of an e-learning course based on micro-videos to improve the preparation of the undergraduate dissertation in Spanish context. *Cogent Education*, 10(1), 2186571.
- Huang, T. H., Liu, F., Chen, L. C., & Tsai, C. C. (2021). The acceptance and impact of Google Classroom integrating into a clinical pathology course for nursing students: A technology acceptance model approach. *PloS one*, 16(3), e0247819.
- Ichikura, K., Watanabe, K., Moriya, R., Chiba, H., Inoue, A., Arai, Y., ... & Tsutsumi, A. (2024). Online vs. face-to-face interactive communication education using video materials among healthcare college students: a pilot non-randomized controlled study. *BMC Medical Education*, 24(1), 746.
- Jayasinghe, R. M., Thilakumara, I. P., Bandara, D. L., Edirisinghe, G., Fonseka, M. C. N., Attygalla, M., & Jayasinghe, R. D. (2021). Sri Lankan dental students' perspective on the effectiveness of e-learning. *The Asia Pacific Scholar*, 6(4), 7.
- Kanwar, A., & Sanjeeva, M. (2022). Student satisfaction survey: a key for quality improvement in the higher education institution. *Journal of innovation and entrepreneurship*, 11(1), 27.
- Khojasteh, L., Karimian, Z., Nasiri, E., Sharifzadeh, S., & Farrokhi, M. R. (2025). From classroom to screen: a cross-sectional study on medical students' first experiences with e-learning during the COVID-19 pandemic. *Frontiers in Education*, 10, 1476240
- Kozak, A., Blyznyuk, L., Knysh, T., Ivanashko, O., & Honchar, K. (2023). Online learning as a tool for the education system in the context of digitalisation. *Journal of curriculum and teaching*, 12(2), 2.
- Liu, Z. (2023). Face-to-face and online learning in higher education: Academic achievements and learners' experience in the Chinese SFL context. *Sage Open*, 13(4), 21582440231218114.
- Luginbuehl, H., Nabecker, S., Greif, R., Zuber, S., Koenig, I., & Rogan, S. (2023). Transforming traditional physiotherapy hands-on skills teaching into video-based learning. *BMC medical education*, 23(1), 624.
- Maheshwari, K., Ladha, N., Khapre, M., & Deol, R. (2022). Perception of online learning among health sciences' students—A mixed methods study. *Journal of Education and Health Promotion*, 11(1), 286.
- Malta, K., Glickman, C., Hunter, K., & McBride, A. (2025). Comparing the impact of online and in-person active learning in preclinical medical education. *BMC Medical Education*, 25(1), 329.
- Moher, D., Liberati, A., Tetzlaff, J. and Altman, D.G. and the PRISMA Group (2009), "Reprint — preferred reporting items for systematic reviews and metaanalyses: the PRISMA Statement", *Physical Therapy*, Vol. 89 No. 9, pp. 873-880.
- Naciri, A., Radid, M., Kharbach, A., & Chemsy, G. (2021). E-learning in health professions education during the COVID-19 pandemic: a systematic review. *Journal of educational evaluation for health professions*, 18
- Panigrahi, R., Srivastava, P. R., & Sharma, D. (2018). Online learning: Adoption, continuance, and learning

- outcome—A review of literature. *International Journal of Information Management*, 43, 1-14.
- Parviainen, P., Tihinen, M., Kääriäinen, J., & Teppola, S. (2017). Tackling the digitalization challenge: how to benefit from digitalization in practice. *International journal of information systems and project management*, 5(1), 63-77.
- Perez, J. J., González-García, L., Flacco, N., Taberner-Cortés, A., García-Arnandis, I., Pérez-López, G., ... & Romá-Mateo, C. (2023). Traditional vs. virtual laboratories in health sciences education. *Journal of Biological Education*, 57(1), 36-50.
- Petrusevich, D. A. (2020, November). Modern trends in the digitalization of education. In *Journal of physics: Conference series* (Vol. 1691, No. 1, p. 012223). IOP Publishing.
- Phelan, H., Yates, V., & Lillie, E. (2022). Challenges in healthcare delivery in low-and middle-income countries. *Anaesthesia & Intensive Care Medicine*, 23(8), 501-504.
- Polit, D.F. and Beck, C.T. (2009), "Literature reviews: finding and reviewing research evidence", in Polit, D.F. and Tatano, B.C. (Eds), *Essentials of Nursing Research: Appraising Evidence for Nursing Practice*, 7th ed., Lippincott Williams & Wilkins, Philadelphia, pp. 169-193.
- Pradumna, P., Kumar, T. B., Abdul, H., & Rumi, D. A Cross-Sectional Study of Online Medical Education and Traditional Offline Education at Tertiary Care Hospital, Barpeta, Assam (India).
- Pramila-Savukoski, S., Kärnä, R., Kuivila, H. M., Juntunen, J., Koskenranta, M., Oikarainen, A., & Mikkonen, K. (2023). The influence of digital learning on health sciences students' competence development—A qualitative study. *Nurse Education Today*, 120, 105635.
- Prosen, M., & Ličen, S. (2025). Evaluating the digital transformation in health sciences education: a thematic analysis of higher education teachers' perspectives. *BMC medical education*, 25(1), 820.
- Richmond, H., Copsey, B., Hall, A. M., Davies, D., & Lamb, S. E. (2017). A systematic review and meta-analysis of online versus alternative methods for training licensed health care professionals to deliver clinical interventions. *BMC medical education*, 17(1), 227.
- Rosak-Szyrocka, J. (2024). The era of digitalization in education where do universities 4.0 go?. *Management Systems in Production Engineering*.
- Rosenthal, R. (1979). The file drawer problem and tolerance for null results. *Psychological bulletin*, 86(3), 638.
- Selcuk, A., Ozturk, N., Onal, N., Bozkir, A., & Aksoy, N. (2025). Online simulation versus traditional classroom learnings in clinical pharmacy education: effect on students' knowledge, satisfaction and self-confidence. *BMC Medical Education*, 25(1), 437.
- Siddiqui, A. A., Abideen, M. Z. U., Fatima, S., Khan, M. T., Gillani, S. W., Alrefai, Z. A., ... & Waqar, M. (2024). Students' Perception of Online Versus Face-to-Face Learning: What Do the Healthcare Teachers Have to Know?. *Cureus*, 16(2).
- Shaheen, M. Y., Basudan, A. M., Almubarak, A. M., Alzawawi, A. S., Al-Ahmari, F. M., Aldulaijan, H. A., ... & Aldulaijan, H. (2023). Dental students' perceptions towards e-learning in comparison with traditional classroom learning. *Cureus*, 15(12).
- Totlis, T., Tishukov, M., Piagkou, M., Kostares, M., & Natsis, K. (2021). Online educational methods vs. traditional teaching of anatomy during the COVID-19 pandemic. *Anatomy & Cell Biology*, 54(3), 332-339.
- Tudor Car, L., Soong, A., Kyaw, B. M., Chua, K. L., Low-Beer, N., & Majeed, A. (2019). Health professions digital education on clinical practice guidelines: a systematic review by Digital Health Education collaboration. *BMC medicine*, 17(1), 139.
- Zavala-Cerna, M. G., Caballero, A. E., Verbeeck-Mendez, S., & Parker, M. J. (2025). Self-rated benefits and knowledge gain from e-learning: the longitudinal use of an online learning experience at an international medical school. *BMC Medical Education*, 25(1), 222.

WHICH SOCIO-DEMOGRAPHIC FACTORS DRIVE DIGITAL MERCHANT PAYMENTS? EVIDENCE FROM SERBIA AND TÜRKIYE

Marija Antonijević

Institute of Economic Sciences, Belgrade, Serbia, marija.antonijevic@ien.bg.ac.rs

<https://orcid.org/0000-0002-7212-7794>

Ivana Domazet

Institute of Economic Sciences, Belgrade, Serbia, ivana.domazet@ien.bg.ac.rs

<https://orcid.org/0000-0002-3493-4616>

ABSTRACT

Advances in digital technologies have led to changes in behavioral patterns among individuals when performing financial activities. However, the adoption of digital banking services varies across countries, making it important to investigate the key predictors of digital merchant payment usage in nations with diverse characteristics. This study aims to examine the impact of socio-demographic factors on the use of digital merchant payments. The analysis is based on a sample of 1,975 respondents from Serbia and Türkiye, using data from the Global Findex Database 2021. Binary logistic regression is employed to test the proposed hypothesis. The dependent variable is the use of digital merchant payments, while the independent variables include gender, age, education, employment, income, and country of residence. The results indicate that all variables, except age, have a statistically significant influence on the likelihood of using digital merchant payments. These findings provide valuable insights for policymakers and stakeholders in developing strategies to promote digital payment adoption, which plays a crucial role in fostering economic growth.

KEYWORDS

gender, age, education, employment, income

INTRODUCTION

The importance of digital payments lies in their contribution to fostering economic growth (Aguilar et al., 2024; Birigozzi et al., 2025; Patra & Sethi, 2024; Zandi et al., 2013). Continuous advancements in digital technologies, changes in lifestyle, and the emergence of the COVID-19 pandemic have significantly increased the use of digital solutions. Consequently, both banks and consumer behavior have undergone significant changes in recent years. To ensure that individuals can fully participate in the digital environment, they must possess an adequate level of digital competencies (Domazet & Marjanović, 2024; Lazić et al., 2025; Ivanović & Simović, 2020), as well as access to the internet and mobile devices. Considering that women in developing countries frequently face discrimination in various aspects of life (Achakpa & Radović-Marković, 2018), including financial exclusion (Antonijević et al., 2022), their digital empowerment is particularly crucial for achieving greater social inclusion. For that reason, acquiring adequate digital skills is essential for women (Jevtić et al., 2023). Popoola (2025) also emphasizes the importance of financial literacy, particularly in enhancing women's access to finance.

The adoption of digital payment methods varies both within and across countries. Previous research has been limited in its exploration of the factors driving the use of digital merchant payments across different national contexts. Accordingly, this study aims to identify which socio-demographic factors influence the use of digital merchant payments in Serbia and Türkiye. Although Serbia and Türkiye differ in several aspects, such as dominant religion (Christianity vs. Islam), geographic size (Türkiye is approximately nine times larger), inflation rates (5.7% vs. 29% in 2021), and GDP in current US dollars (Türkiye's GDP is approximately 12 times higher in 2021), they are similar in terms of internet

penetration (81.2% vs. 81.4% in 2021). Also, they are both classified as upper-middle-income countries (World Bank, n.d.a).

Recent studies have reported mixed findings regarding the role of socio-demographic factors. Lohana and Roy (2023) found that age, education, and income significantly influence digital payment usage, while gender was not a significant factor. Chamboko (2022) identified education and income as key determinants but found no significant effect of gender and age. Similarly, Sahoo et al. (2025), Andaregie et al. (2024), and Stavins (2016) emphasized the importance of age, education, and income. Ghosh and Hom Chaudhury (2022) and Banerjee and Pradhan (2022) highlighted gender and education as critical predictors. Dzogbenuku et al. (2022) pointed to gender and age differences, while Alnemer (2022) found that men, individuals aged 25–49, those with tertiary education, and those in higher income groups were more likely to adopt digital financial services. Glowka et al. (2023) emphasized that payment behavior differs across countries. Similarly, Malaquias et al. (2024) and Górká (2025) confirmed that countries vary significantly in the use of digital channels for conducting financial payments. These findings underscore the importance of considering the respondent's country of residence when analyzing digital payment behavior.

Based on the previous findings, the following hypotheses are proposed:

H1: Gender has a statistically significant influence on conducting digital merchant payments.

H2: Age has a statistically significant influence on conducting digital merchant payments.

H3: Education has a statistically significant influence on conducting digital merchant payments.

H4: Employment has a statistically significant influence on conducting digital merchant payments.

H5: Income has a statistically significant influence on conducting digital merchant payments.

H6: Country of residence has a statistically significant influence on conducting digital merchant payments.

METHODOLOGY

The sample consists of 1,975 respondents, with 995 from Serbia and 980 from Türkiye. The structure of the sample is presented in Table 1.

Table 1: Sample structure (% of respondents)

Category	Description	% of respondents
Gender	Female	48.4
	Male	51.6
Age	15-34	45.5
	35-64	45
	65+	9.5
Education	Primary school or less	15.4
	Secondary education	56.9
	Tertiary education	27.7
Employment	Employed	64.1
	Unemployed	35.9
Income quintile	1	14.3

	2	17.2
	3	18.9
	4	21.7
	5	27.9
Country of residence	Serbia	50.4
	Türkiye	49.6
Conducting digital merchant payment	Yes	32.81
	No	67.19

Source: Authors' calculation

Data from the Global Findex Database 2021 (Demirgüç-Kunt et al., 2022) were used for both countries to analyze consumer behavior. Binary logistic regression was employed to test the proposed hypotheses. The definitions and coding of the variables are presented in Table 2.

Table 2: The overview of dependent and independent variables

Variable Type	Description	Coding
Dependent	Conducting digital merchant payment in the past year	1=Yes 0= No
Independent	Gender	1 =female 2=male
	Age	1= 15-34 2 = 35-64 3 = 65+
	Education	1 = Elementary school or lower 2 = Secondary education 3 = Tertiary education
	Employment	1 = Employed 2 = Unemployed
	Income quintile	1 = 20% of individuals with the lowest income ... 5 = 20% of individuals with the highest income
	Country of residence	1= Serbia 2 = Türkiye

Source: Authors

The variable digital merchant payment refers to the use of a card or mobile phone for in-store payments or to make an online payment for an internet purchase.

The statistical software package SPSS 23 was used to conduct binary logistic regression and other descriptive statistical analyses. The significance level is 5% ($\alpha = 0.05$). The reference category is the last one in each variable group.

RESULTS

The proposed binary logistic regression model provides a good fit to the data (Table 3), as indicated by a nonsignificant Hosmer-Lemeshow Test ($p > 0.05$). This result suggests that there is no significant difference between the observed and predicted values.

Table 3: Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	9.475	8	.304

Source: Authors' calculation

The classification accuracy was 74.8%, and the ROC AUC score of 0.768 (Figure 1) suggests good discriminatory performance.

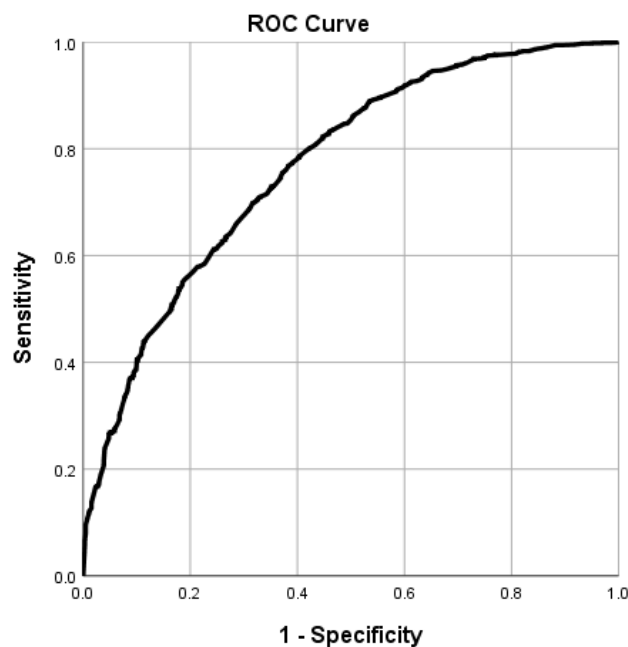


Figure 1. ROC Curve

Source: Authors

Table 4 presents a summary of the binary logistic regression model, indicating that the Nagelkerke R Square value is 27.3%.

Table 4: Model summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	2068.138 ^a	.196	.273

Source: Authors' calculation

The findings presented in Table 5 suggest that gender, education, employment, income quintile, and country of residence have a statistically significant impact on executing digital merchant payments.

Age was not found to be a statistically significant predictor of digital merchant payment, which may be partially explained by the timing of data collection during the COVID-19 pandemic. The pandemic accelerated the adoption of digital payments across different age groups due to concerns about virus

transmission, social distancing measures, and mobility restrictions. Additionally, access to digital financial services has expanded due to increased internet penetration, the widespread use of mobile devices, and the availability of user-friendly interfaces. Moreover, older respondents may possess higher levels of education or prior work experience involving the use of digital technologies, making it easier for them to use digital channels for executing digital payments.

Table 5: Variables in the equation

Variable	β	S.E.	Wald	df	Sig.	Exp(β)	95% C.I. for EXP(B)	
							Lower	Upper
Gender (1)	-.278	.112	6.192	1	.013	.758	.609	.943
Age category			1.222	2	.543			
Age category(1)	-.215	.197	1.195	1	.274	.806	.548	1.186
Age category(2)	-.155	.194	.638	1	.425	.856	.585	1.253
Education			68.640	2	.000			
Education (1)	-1.621	.196	68.638	1	.000	.198	.135	.290
Education (2)	-.736	.146	25.492	1	.000	.479	.360	.638
Employment (1)	1.074	.121	79.314	1	.000	2.927		
Income quintile			60.761	4	.000		.214	.437
Income quintile (1)	- 1.185	.182	42.423	1	.000	.306	.263	.513
Income quintile (2)	- 1.002	.171	34.463	1	.000	.367	.426	.826
Income quintile (3)	-.522	.169	9.540	1	.002	.593	.550	1.064
Income quintile (4)	-.268	.168	2.534	1	.111	.765	2.311	3.707
Country of residence (1)	- 1.012	.117	74.392	1	.000	.363	.289	.457
Constant	2.193	.249	77.854	1	.000	8.965		

Source: Authors' calculation

Women are 24.2% less likely to perform digital merchant payments compared to men (Cohen's $d = -0.153$, small effect). Additionally, respondents with primary or lower levels of education are 80.2% less likely (Cohen's $d = -0.893$, large effect), and those with secondary education are 52.1% less likely to conduct digital payments than individuals with tertiary education (Cohen's $d = -0.406$, moderate effect). Respondents who are employed are approximately 2.9 times more likely to execute digital merchant payments compared to the unemployed (Cohen's $d = 0.592$, moderate effect). Individuals in income quintile one are 69.4% less likely (Cohen's $d = -0.653$, moderate effect), those in quintile 2 are 63.3% less likely (Cohen's $d = -0.553$, moderate effect), and those in quintile 3 are 40.7% less likely to make digital payments compared to those in the highest income group (Cohen's $d = -0.288$, small effect). Respondents from Serbia are 63.7% less likely to perform digital merchant payments than those from Türkiye (Cohen's $d = -0.559$, moderate effect). A possible explanation for the higher level of digital merchant payment usage among Turkish individuals compared to their Serbian counterparts could be Türkiye's higher GNI per capita, higher educational attainment (i.e., tertiary enrollment) (World Bank, n.d.b), as well as stronger efforts to promote digital payments, particularly through the Central Bank's launch of open banking in the area of payment services (TCMB, 2022).

CONCLUSION

Given the limited number of studies examining the determinants of digital merchant payments in countries with diverse characteristics, this research aims to identify the variables that significantly influence individuals from Serbia and Türkiye to conduct digital merchant payments. The findings indicate that women respondents, those with lower levels of education, unemployed individuals, and those belonging to lower income quintiles are less likely to perform digital merchant payments. Additionally, the study suggests that the country of residence plays a crucial role, as respondents from Serbia are significantly less likely to execute digital payments compared to those from Türkiye. Based on these results, relevant stakeholders, including national banks, commercial banks, ministries of finance, and other regulatory bodies, should take appropriate measures to increase the use of debit and credit cards, as well as digital banking services, such as e-banking and m-banking. Strategies should be developed based on a gender-sensitive approach, focusing on raising awareness about the benefits of digital payments, especially among vulnerable groups, given their potential positive impact on economic growth.

Despite the significance of this research, the study has several limitations. First, it examines only the behavior of respondents from Serbia and Türkiye. Second, it explores the impact of six socio-demographic factors on the use of digital merchant payments. Third, the analysis is based on secondary data from a single point in time. Despite the advantages of the Global Findex Database, a key limitation of using secondary data lies in the measurement of the dependent variable, which fails to provide insights into the frequency of digital payment use, the types of digital channels utilized (e.g., mobile banking, internet banking, QR codes), or the specific contexts in which digital payments are made (e.g., bill payments, shopping, peer-to-peer transfers). Moreover, the dataset does not provide insight into the process of adopting digital payment methods over time. Also, self-reported data introduces potential bias, considering that respondents may not accurately recall past behaviors or may provide socially desirable responses. Future studies should expand the geographic scope by including respondents from other countries to conduct cross-national comparisons of behavioral patterns. Additionally, future research should incorporate other socio-demographic variables, such as marital status, ethnicity, and area of residence (urban or rural), as well as variables like digital skills and personal innovativeness. Moreover, to better understand the country-level differences in the use of digital merchant payments, researchers should collect primary data with detailed questions on these variables and examine the entire process of adopting digital payment methods. Thus, it is recommended to conduct in-depth interviews or focus groups to gain deeper insights into users' habits, beliefs, and motivations, and incorporate longitudinal studies to capture the entire adoption process and provide a more comprehensive analysis of technology use.

ACKNOWLEDGMENTS

The research presented in this paper was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia under contract number 451-03-47/2023-01/200005.

REFERENCES

- Achakpa, P., & Radović-Marković, M. (2018). Employment of women through entrepreneurship development and education in developing countries. *Journal of Women's Entrepreneurship and Education*, (1-2), 17-30.
- Aguilar, A., Frost, J., Guerra, R., Kamin, S., & Tombini, A. A. (2024). Digital payments, informality and economic growth. Bank for International Settlements, Monetary and Economic Department.
- Alnemer, H. A. (2022). Determinants of digital banking adoption in the Kingdom of Saudi Arabia: A technology acceptance model approach. *Digital Business*, 2(2), 100037.
- Andaregie, A., Abebe, G. K., Gupta, P., Worku, G., Matsumoto, H., Astatkie, T., & Takagi, I. (2024). Exploring individuals' socioeconomic characteristics and digital infrastructure determinants of digital payment

- adoption in Ethiopia. *Digital Business*, 4(2), 100092.
- Antonijević, M., Ljumović, I., & Ivanović, Đ. (2022). Is there a Gender Gap in Financial Inclusion Worldwide?. *Journal of Women's Entrepreneurship and Education*, (1-2), 79-96.
- Banerjee, A. K., & Pradhan, H. K. (2022). Influence of demographic profiles in adoption of digital payment system in India: A multigroup invariance analysis. *Technology Analysis & Strategic Management*, 1-17.
- Birigozzi, A., De Silva, C., & Luitel, P. (2025). Digital payments and GDP growth: A behavioral quantitative analysis. *Research in International Business and Finance*, 102768.
- Chamboko, R. (2022). On the role of gender and age in the use of digital financial services in Zimbabwe. *International Journal of Financial Studies*, 10(3), 82.
- Demirgüç-Kunt, A., Klapper, L., Singer, D., & Ansar, S. (2022). *The Global Findex Database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19*. World Bank Publications.
- Domazet, I. S., & Marjanović, D. (2024). Digital Progress and Information Society: Evidence From EU Countries and Serbia. In *Driving Decentralization and Disruption With Digital Technologies* (pp. 1-20). IGI Global.
- Dzogbenuku, R. K., Amoako, G. K., Kumi, D. K., & Bonsu, G. A. (2022). Digital payments and financial wellbeing of the rural poor: The moderating role of age and gender. *Journal of International Consumer Marketing*, 34(2), 113-136.
- Ghosh, C., & Hom Chaudhury, R. (2022). Determinants of digital finance in India. *Innovation and Development*, 12(3), 343-362.
- Glowka, M., Kosse, A., & Szemere, R. (2023). Digital payments make gains but cash remains. Bank for International Settlements. https://www.bis.org/statistics/payment_stats/commentary2301.pdf
- Górka, J. (2025). The rise of instant payments: a cross-country comparison. *Central European Management Journal*.
- Ivanović, Đ., & Simović, V. (2020). DigComp: Methodological Frame for measuring digital competencies. *Trendovi u poslovanju*, 8(1), 83-92.
- Jevtić, B., Vučeković, M., & Tasić, S. (2023). The Effects of Digitalization and Skills on Women's Labor Market Inclusion-Serbian Gap Study. *Journal of Women's Entrepreneurship and Education*, 58-75.
- Lazić, M., Simović, V., Domazet, I., & Abdallah, F. (2025). Predictive Insights into Digital Competencies: A Data-Driven Approach to Inclusion. *Journal of Technology in Human Services*, 1-28.
- Lohana, S., & Roy, D. (2023). Impact of demographic factors on consumer's usage of digital payments. *FIIB Business Review*, 12(4), 459-473.
- Malaquias, R. F., Malaquias, F. F., & Hwang, Y. (2024). A Cross-Country Study on Digital Payment Considering Cultural Dimensions. *Information Systems Management*, 42(1), 22-36.
- Patra, B., & Sethi, N. (2024). Does digital payment induce economic growth in emerging economies? The mediating role of institutional quality, consumption expenditure, and bank credit. *Information Technology for Development*, 30(1), 57-75.
- Popoola, T. (2025). Scoping Review of the Impact of Financial Literacy Empowerment on the Growth of Female Entrepreneurship in Nigeria. *Journal of Women's Entrepreneurship and Education*, (1-2), 129-154.
- Sahoo, R., Pattanayak, N. C., & Panda, A. K. (2025). Digital payments – A way forward to digital financial inclusion. *Journal of Emerging Technologies and Innovative Research (JETIR)*, 12(4), 475-481.
- Stavins, J. (2016). The effect of demographics on payment behavior: panel data with sample selection (No. 16-5). Working Papers.
- TCMB. (2022). Open Banking Press Release. <https://www.tcmb.gov.tr/wps/wcm/connect/EN/TCMB+EN/Main+Menu/Announcements/Press+Releases/2022/ANO2022-48>
- World Bank. (n.d.a). Country Profile. https://databank.worldbank.org/views/reports/reportwidget.aspx?Report_Name=CountryProfile&Id=b450fd57&tbar=y&dd=y&inf=n&zm=n&country=SRB

World Bank. (n.d.b). World Bank Open Data. <https://data.worldbank.org/>

Zandi, M., Singh, V., & Irving, J. (2013). The impact of electronic payments on economic growth. *Moody's Analytics: Economic and Consumer Credit Analytics*, 217(2), 1-16.

DIGITAL LITERACY AND ENTREPRENEURSHIP: TRENDS & INSIGHTS

Ece Nur Polat

Gebze Technical University, Kocaeli, Turkiye, edegirmenci@gtu.edu.tr

Dilan Kızıltepe

Gebze Technical University, Kocaeli, Turkiye

Senanur Selda Çetinkaya

Gebze Technical University, Kocaeli, Turkiye

Dilan Derya Durak

Gebze Technical University, Kocaeli, Turkiye

Şevval Nisa Küllü

Gebze Technical University, Kocaeli, Turkiye

ABSTRACT

This paper aims to undertake a comprehensive analysis of scientific production by using bibliometric methods to comprehend the current research status of digital literacy studies on entrepreneurship in order to provide guidance for scholars, researchers and policy makers in identifying research focal points and emerging patterns in the field of digital literacy in entrepreneurship. A total of 121 documents published between 2008 and 2024 were identified and analyzed using bibliometric research methods in the Web of Science and Scopus database. The study's results highlight that digital literacy in entrepreneurship is a highly multidisciplinary field of study, conducted in both developed and developing countries. Digital literacy in entrepreneurship has been studied especially with regard to performance and impact. Interest in studies on digital literacy as increased since 2021, as has the scope of potential research areas.

KEYWORDS

Digitalization, entrepreneurship, digital skill, digital literacy, digital competence

INTRODUCTION

Technologies such as the Internet of Things, cloud computing, and big data have transformed the business landscape, offering innovative products and services, and providing new ways to interact with customers (Ancillai et al. 2023; Rachinger et al. 2019). While these technologies offer significant opportunities for businesses of all sizes in terms of market access, efficiency and performance, they also have the potential to disrupt, bringing with them many new challenges (Oggero et al., 2019; Zhang et al., 2023). In this context, it is critical to adapt to the skills required by digitalization in the VUCA (volatility, uncertainty, complexity, ambiguity) environment created by the digital age (Penetta, 2024).

In the context of Industry 4.0, the importance of digital skills in the creation and management of digital enterprises is becoming increasingly significant (Sousa & Rocha, 2019). In this framework, understanding the dimensions of digital literacy is critical not only for individuals, but also for organisations and society as a whole (Martzoukou & Elliott, 2016). As Glister (1997) defined, digital literacy refers to the ability to comprehend and utilise information presented by computers in a variety of formats and from different sources. However, it has been stated that proficiency in

information and communication technologies (ICT) alone is not sufficient to ensure success in today's highly competitive business environment (Orero-Blat, 2022). This evolution of the concept of digital literacy has broadened from a technical skills perspective to encompass the effective use of digital resources (Van Laar et al., 2017). In the 21st century, digital literacy has evolved beyond its traditional ICT-based scope, expanding to include broader skills (Eshet-Alkalai, 2004; Van Laar et al. 2017). The concept has evolved continuously over the years, in line with developments in information technology (Wang & Si, 2023).

With the pandemic, SMEs face challenges due to increased uncertainty, complexity and rapid technological developments. In this context, it is critical for entrepreneurs to improve their digital skills in order to achieve sustainable competitive advantage (Penetta, 2024; Neumeyer, 2021). Otherwise, entrepreneurship is no longer an option for individuals with low digital skills (Fossen, 2021). In the literature, the impact of the digital literacy level of SME managers on the digitalization process has been clearly demonstrated (Destrian, 2025). Research has indicated that digital literacy is sometimes more effective on performance than economic literacy and entrepreneurial skills (Chege et al., 2020; Sariwulan et al 2020; Hasan et al. 2024). On the other hand, while increasing the level of digitalization of 90% of SMEs is among the European Union's goals, a significant proportion of SMEs still exhibit low (34%) or very low (42%) levels of digital intensity (Eurostat, 2024). As Raharjo et al. (2024) explain, entrepreneurs have a positive attitude towards digital technology, but their limited digital literacy skills act as a significant barrier to the digitalization process.

The increasing tendency of entrepreneurs to start and develop businesses using technology and their increasing dependence on technology has led to a significant increase in academic publications on technology and entrepreneurship (Jayanna et al., 2025). Although there have been numerous bibliometric analyses on digital literacy in the literature, these studies have mostly focused on education, health, and general business contexts, and the number of studies addressing entrepreneurship is quite limited (Wang & Si, 2023). Existing studies in the field of entrepreneurship have mostly focused on entrepreneurial education (Dvorakova & Polents, 2021), financial literacy or digital financial literacy (Sari et al, 2024; Yadav & Banerji, 2023) or digital entrepreneurship (Lungu et al 2024). Furthermore, the concept of digital literacy in SMEs is not sufficiently addressed in literature, despite the fact that the adoption of digital technologies by SMEs is A complex process (Raharjo et al. 2024) and they face more obstacles in this process compared to large-scale firms (Destrian, 2025; Chatterjee et al., 2022). In this context, there are calls to understand how digital skills contribute to entrepreneurial performance (Orero-Blat et al, 2022). This study aims to provide a comprehensive overview of research trends, publication outputs, and emerging issues in digital literacy research in the context of entrepreneurship using bibliometric analysis as a research tool.

METHODOLOGY

This study aims to provide a comprehensive overview of research trends, publication output, and emerging topics in digital literacy research, particularly on entrepreneurship, through bibliometric analysis. The objective of this research is to assist scholars, researchers and decision makers in identifying research focal points and emerging patterns in the field of digital literacy in entrepreneurship, thus guiding future research efforts.

The objective of the research is to provide answers to the following research questions;

- What are the global digital literacy research trends?
- What are the hot research topics and emerging trends in digital literacy on entrepreneurship research?
- Which authors, affiliations and countries have actively contributed to digital literacy on entrepreneurship research?

- What are the most important cited articles that contribute to the body of knowledge in digital literacy on entrepreneurship research?

For our study, WOS and Scopus databases were used. The search was made with the keywords "entrepreneur*" AND "Digital Literacy". Since 2025 has not been completed yet, it was excluded from the scope of the research, but early accesses were included. The search was limited to the content of the English language and articles. As a result of these criteria, 105 articles were reached from Scopus and 72 from Web of Science. After removing duplicate publications, the final sample resulted in 121 articles.

RESULTS

Main Information

After reviewing Table 1, the majority of the 121 publications published between 2008 and 2024 were co-authored. The cumulative count of writers for 121 articles is 409, with 17 of these articles authored by a single individual. The annual growth rate is indicated as 0% due to the equal number of articles in the initial and final years of the study (2008, n=2; 2025, n=2). Despite the exclusion of articles from 2025 from the present study, early access articles made available in 2024 were included in the analysis. Consequently, the 2025 data was considered as the final year, resulting in a growth rate of 0%. When early access articles were excluded from the calculation, the annual growth rate was found to be 23.15%. This clearly demonstrates the field's significant potential for development.

Table 1. Main Information

Description	Results
Timespan	2008:2025
Sources (Journals, Books, etc)	105
Documents	121
Annual Growth Rate %	0
Document Average Age	2,86
Average citations per doc	10,62
Authors	409
Authors of single-authored docs	17
Single-authored docs	18
Co-Authors per Doc	3,62
International co-authorships %	13,22

The annual publications depicted in Figure 1 offer valuable insights into the advancements in digital literacy in the context of entrepreneurship research. The first article was published in 2008, but there was a period of stagnation in the following years (2009-2016). Recent observations indicate an increase as of 2018. The number of articles increased from 11 in 2022 to 56 in 2024. The year 2024 has the highest number of articles published to date, with a total of 56. The analysis of digital literacy in the context of entrepreneurship represents a recently emergent yet increasingly prominent area of study, as indicated by the existing body of research.

Figure 1. Annual Scientific Production

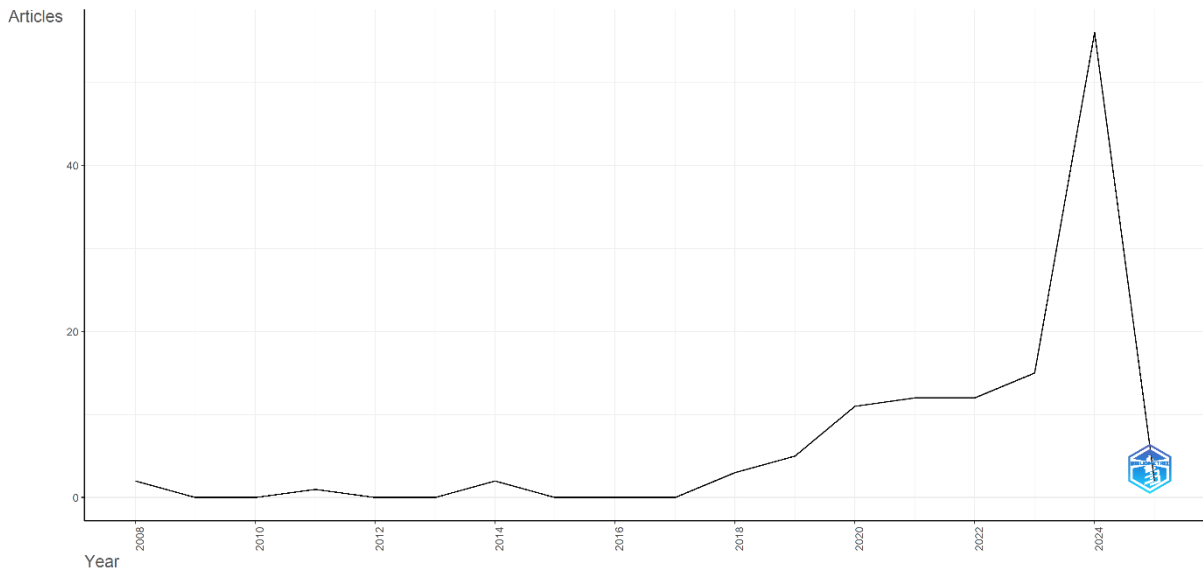
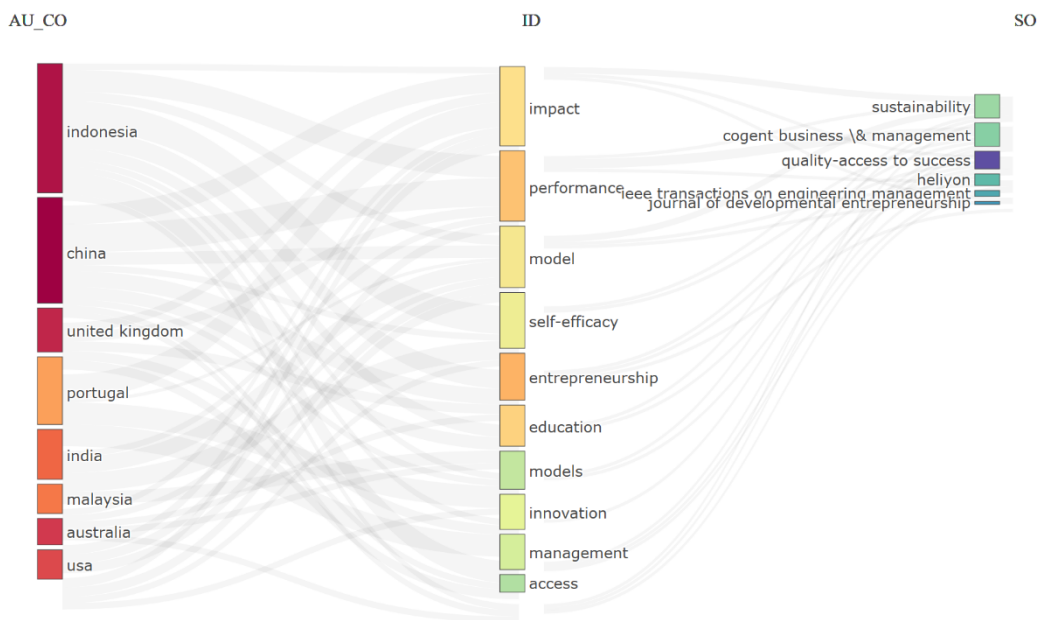


Figure 2. Three-Field Plot Analysis (Left: Countries, Middle: Keywords, Right: Sources)



In Figure 2, three-field plot analysis provides a comprehensive assessment of the top 10 countries, keywords and sources enhances understanding of the subject's scope. This study highlights a significant focus on Indonesia and China in digital literacy in the context of entrepreneurship.

Among the 121 article sources considered, Sustainability, published the most papers, registering 13 (7, n = 121, 5,79%) and Cogent Business & Management followed with 3 articles (3, n=121, 2,48%). Further analysis of contributions from other sources reveals a diverse range of journals from multiple fields, including management, entrepreneurship and engineering. This finding suggests that the research field exhibits a multidisciplinary structure.

A review of the second field (ID) reveals that the keywords to consider are 'impact', 'performance', 'model', 'self-efficacy', 'entrepreneurship', and 'education'. An analysis of keywords by country provides an interesting perspective. In the context of Chinese academic research, there is a particular emphasis on the concepts of 'impact' and 'performance'. In a similar vein, Portuguese researchers have a strong focus on the concepts of 'impact' and 'innovation'. A notable distinction emerges in the concepts of "self-efficacy" and "management," with Indonesia and India displaying similar trends.

Keyword Analysis

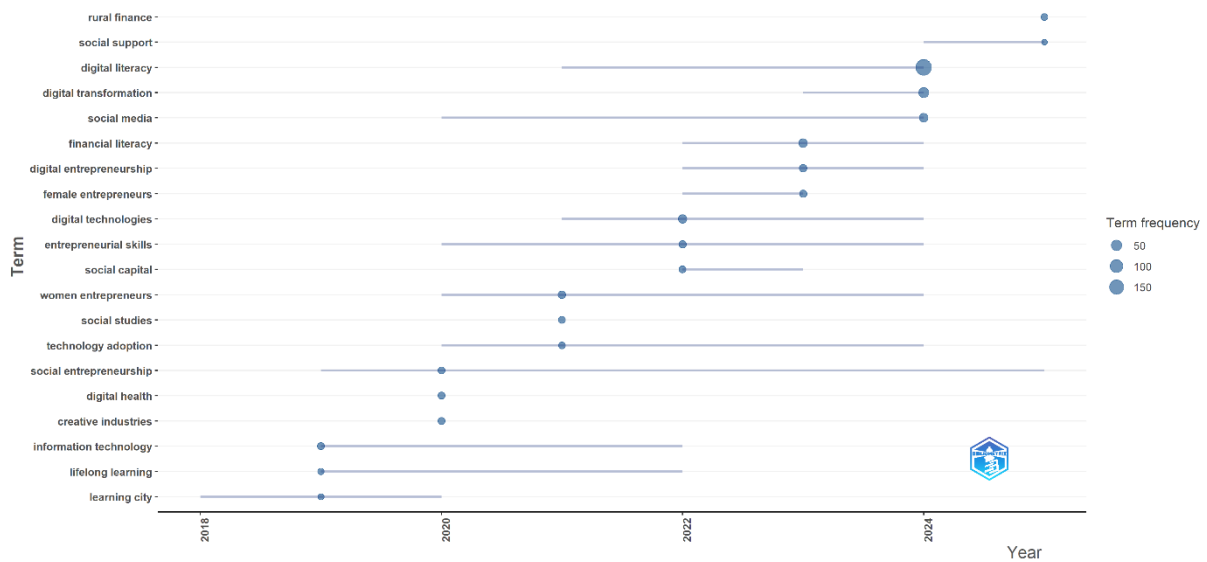
We analyzed the keywords used in 121 articles to examine the emerging themes in digital literacy research within the scope of entrepreneurship. We identified the keywords that recorded the highest frequency, as presented in Table 4. “entrepreneurship” (10), “performance” (10), “education” (8), and “impact” (8) emerged as high-frequency keywords.

Table 4. 10 Most Frequent Word (Keywords Plus)

Word	F
entrepreneurship	10
performance	10
education	8
impact	8
model	8
self-efficacy	6
innovation	5
management	5
models	5
access	4

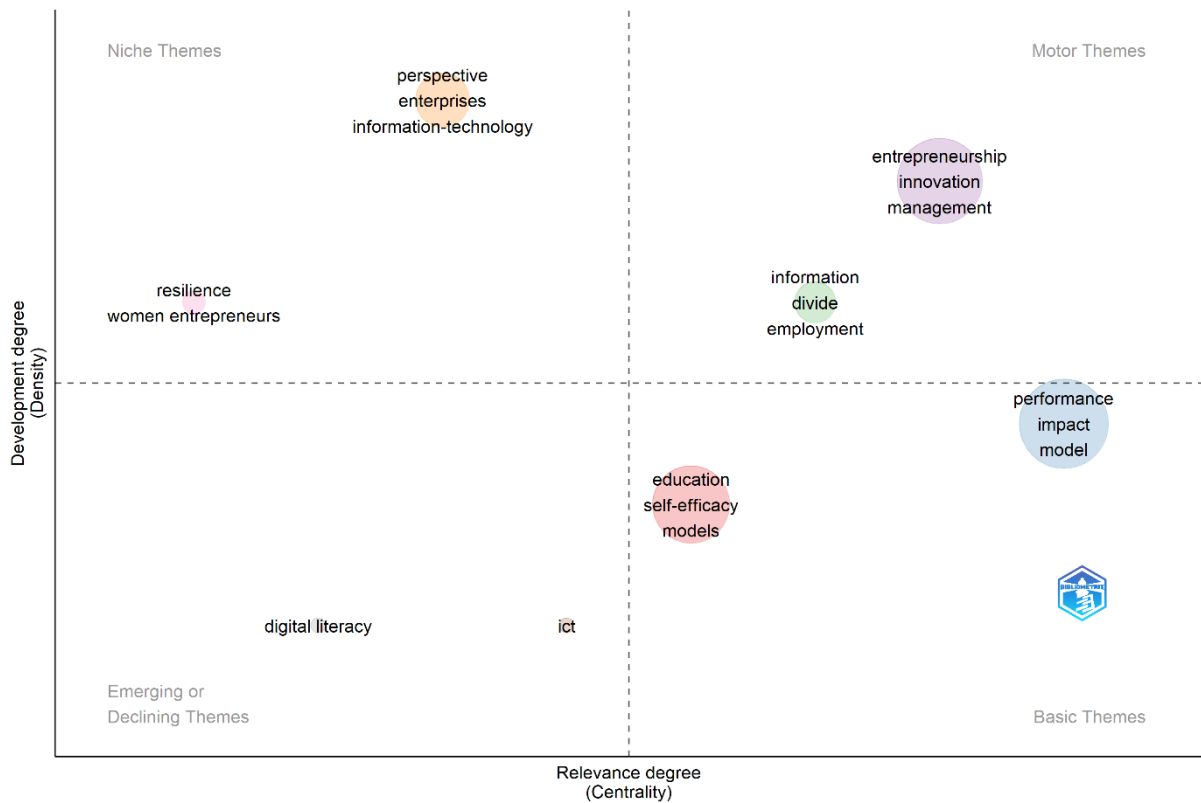
A 20-word word cloud was created on keywords to determine the themes that emerged in the digital literacy on entrepreneurship research. As illustrated in Figure 4, entrepreneurship, performance, education, and impact are represented as the prevailing concepts. Secondly, there are innovation-related concepts such as innovation, technology, management, and access. It can thus be concluded that micro-level concepts, including self-efficacy, creativity, capabilities, have been incorporated.

Figure 6. Trend Topics (Keywords Plus)



A comprehensive analysis of the thematic map derived from 121 articles obtained from the Scopus and Web of Science databases between 2008 and 2024 was conducted to explain developments in the field. The study focused on keywords that appeared at least five times in the thematic analysis. The motor themes cluster has been identified as being significantly associated with the intersection of "entrepreneurship," "innovation," and "management." This finding reflects a central and mature research area where entrepreneurial processes are integrated with innovative and managerial capacities. In the basic themes quadrant, the terms "performance", "impact" and "model" are dominant, emphasising the ongoing importance of performance evaluation, measurable outcomes, and model development in the literature. An additional basic-theme cluster contains "education," and "self-efficacy" thus highlighting the role of skill development as foundational to entrepreneurship research. The niche themes quadrant includes "enterprises," and "information technology," in addition to "resilience" and "women entrepreneurs," suggesting context-specific lines of inquiry. The final quadrant, which pertains to emerging or declining themes, identifies "digital literacy" as a low-density, low-centrality theme. This suggests that while the topic is relatively novel or underdeveloped within the bibliometric network, it possesses the potential for future growth. As demonstrated in Figure 6, although digital literacy is the theme with the highest frequency, it is still gaining importance. Consequently, its categorisation within this section is not unexpected, and within this particular context, it is perceived as a emerging theme.

Figure 7. Thematic Map (Keywords Plus)



4. CONCLUSION

This study provides a comprehensive overview of the current state of digital literacy research in the context of entrepreneurship, identifying key trends, important publications and institutions, and emerging themes in the field. Our findings demonstrate the increasing importance of digital literacy for entrepreneurship, especially after the COVID-19 pandemic.

The analysis results show that China and Indonesia are the leading countries in digital literacy research. However, the subject is also being studied in both developed and developing countries. The most influential journals in this field are Sustainability, Cogent Business and Management, and Edelweiss Applied Science And Technology.

Word frequency analyses reveal that research focuses particularly on the concept of 'performance'. Micro-level themes such as 'self-efficacy' are also evident in literature. The concept of 'digital literacy' was categorized as 'emerging or declining' in thematic analysis, it has become the most frequently used term in the trend analysis, particularly since 2021, demonstrating a significant increase. Therefore, it would be more accurate to evaluate it as an 'emerging theme'.

Overall, this study highlights the importance of digital literacy research in the context of entrepreneurship. Bibliometric analysis is a valuable tool for identifying research trends and gaps, and providing insights into the most influential publications, institutions, and authors. As digital literacy is an evolving field, it is important to explore emerging themes and topics. In summary, our study demonstrates a growing interest in digital literacy and entrepreneurship literature. Our results provide guidance for future research and offer strategic insights for policy makers and academics.

REFERENCES

Ancillai, C., Sabatini, A., Gatti, M., & Perna, A. (2023). Digital technology and business model innovation: A systematic literature review and future research agenda. *Technological Forecasting and Social*

Change, 188, 122307.

- Rachinger, M., Rauter, R., Müller, C., Vorraber, W., & Schirgi, E. (2019). Digitalization and its influence on business model innovation. *Journal of manufacturing technology management*, 30(8), 1143-1160.
- Pennetta, S., Anglani, F., Reaiche, C., & Boyle, S. (2024). Mapping the Field of Entrepreneurial Versus Managerial Abilities: A New Trend of Dynamic Capabilities-A Bibliometric Analysis. *SAGE Open*, 14(1), 21582440241234718.
- Sousa, M. J., & Rocha, Á. (2019). Skills for disruptive digital business. *Journal of Business Research*, 94, 257-263.
- Glister P (1997) *Digital literacy*. Wiley Computer Pub, New York
- Orero-Blat, M., Jordán, H. D. J., & Palacios-Marqués, D. (2022). A literature review of causal relationships in 21st century skills and digital leadership. *International Journal of Services Operations and Informatics*, 12(1), 1-12.
- Van Laar, E., Van Deursen, A. J., Van Dijk, J. A., & De Haan, J. (2017). The relation between 21st-century skills and digital skills: A systematic literature review. *Computers in human behavior*, 72, 577-588.
- Eshet, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of educational multimedia and hypermedia*, 13(1), 93-106.
- Wang, C., & Si, L. (2023). A bibliometric analysis of digital literacy research from 1990 to 2022 and research on emerging themes during the COVID-19 pandemic. *Sustainability*, 15(7), 5769.
- Neumeyer, X., Santos, S. C., & Morris, M. H. (2020). Overcoming barriers to technology adoption when fostering entrepreneurship among the poor: The role of technology and digital literacy. *IEEE Transactions on Engineering Management*, 68(6), 1605-1618.
- Destrian, O. (2025). The influence of manager's digital literacy on SMEs' digital transformation in Indonesia: A micro-foundational context. *IEEE Transactions on Engineering Management*.
- Glänzel, W., & Schubert, A. (2004). Analysing scientific networks through co-authorship. In *Handbook of quantitative science and technology research: The use of publication and patent statistics in studies of S&T systems* (pp. 257-276). Dordrecht: Springer Netherlands.
- Dabbous, A., Barakat, K. A., & Kraus, S. (2023). The impact of digitalization on entrepreneurial activity and sustainable competitiveness: A panel data analysis. *Technology in Society*, 73, 102224.
- Jeffrey, B., Bagala, M., Creighton, A., Leavey, T., Nicholls, S., Wood, C., ... & Pit, S. (2019). Mobile phone applications and their use in the self-management of Type 2 Diabetes Mellitus: a qualitative study among app users and non-app users. *Diabetology & metabolic syndrome*, 11, 1-17.
- Dvorakova, Z., & Polents, I. (2021). Enfovertrepreneurship education and digital literacy as element of innovative learning. In *Digital transformation and new challenges* (pp. 253-263). Springer, Cham.
- Sari, R., Abbas, E. W., Putro, H. P. N., & Jannah, F. (2024). Bibliometric Analysis in the Digital Economy: An Overview of Entrepreneurship, Local Wisdom, and Financial Literacy in 2021-2023. *Lentera: Jurnal Ilmiah Kependidikan--Edisi Khusus ISETA*, 19(2), 187-195.
- Yadav, M., & Banerji, P. (2023). A bibliometric analysis of digital financial literacy. *American Journal of Business*, 38(3), 91-111.
- Lungu, A. E., Georgescu, M. R., & Juravle, D. (2024). A bibliometric analysis of digital entrepreneurship. *Journal of the Knowledge Economy*, 1-29.
- Chatterjee, S., Chaudhuri, R., Vrontis, D., & Thrassou, A. (2022). SME entrepreneurship and digitalization—the potentialities and moderating role of demographic factors. *Technological Forecasting and Social Change*, 179, 121648.
- Raharjo, K., Afrianty, T. W., & Prakasa, Y. (2024). Digital literacy and business transformation: social-cognitive learning perspectives in small business enterprises. *Cogent Business & Management*, 11(1), 2376282.
- Jayanna, U. R., Jaya Prakash, S. K., Aluvala, R., & Venkata Rao, B. (2025). The role of technology in entrepreneurship: a comprehensive systematic and bibliometric analysis. *Kybernetes*, 54(5), 2537-2562.
- Eurostat. *Digitalisation in Europe – 2025 edition*. Available

online: <https://ec.europa.eu/eurostat/web/interactive-publications/digitalisation-2025#:~:text=The%20EU%20has%20set%20itself,data%20analysis%20or%20use%20AI>. (accessed on 23 May 2023).

Sariwulan, T., Suparno, S., Disman, D., Ahman, E., & Suwatno, S. (2020). Entrepreneurial performance: The role of literacy and skills. *The Journal of Asian Finance, Economics and Business*, 7(11), 269-280.

Hasan, M., Jannah, M., Supatminingsih, T., Ahmad, M. I. S., Sangkala, M., Najib, M., & Elpisah. (2024). Understanding the role of financial literacy, entrepreneurial literacy, and digital economic literacy on entrepreneurial creativity and MSMEs success: a knowledge-based view perspective. *Cogent Business & Management*, 11(1), 2433708.

A STUDY ON THE ABILITY OF DIGITAL TWIN TECHNOLOGIES TO FULFILL MANAGERIAL TASKS IN BUSINESSES

İzzet Kılınc

Duzce University, Düzce, Türkiye, izzetkilinc@duzce.edu.tr

Asel Demirdağ

Duzce University, Düzce, Türkiye, asel.1997.d@gmail.com
<https://orcid.org/0000-0003-0239-7008>

Aslıhan Ünal

İstanbul Gelişim University, İstanbul, Türkiye, asunal@gelisim.edu.tr
<https://orcid.org/0000-0001-5896-8880>

ABSTRACT

The primary aim of this research is to explore whether digital twin technology can assist business managers in performing their duties and, if so, which specific tasks it can support. The study follows a qualitative research approach, focusing on the interpretation and understanding of the subject. The research methodology is structured within the framework of a phenomenological design, with in-depth interviews conducted with 10 participants selected through purposive sampling. Data were gathered through both face-to-face and online interviews, utilizing a semi-structured interview technique. The collected data were then analyzed using content analysis, resulting in the identification of 35 codes, 8 categories, and 3 overarching themes. The findings indicate that managerial tasks can be categorized into two distinct groups: routine (procedural) tasks and strategic tasks. It was determined that digital twins are capable of handling routine tasks, which are typically based on numerical data and follow established procedures. However, strategic tasks, which necessitate emotional intelligence and complex decision-making, are beyond the current capabilities of digital twin technology. This limitation arises from the inability of digital twins to integrate emotional intelligence, an essential aspect of managerial judgment. Furthermore, the research reveals a consensus among participants that delegating routine tasks to digital twins would be beneficial for managers. While digital twins can significantly enhance the efficiency of routine tasks, the findings underscore that human involvement remains crucial in strategic decision-making processes, where emotional intelligence and nuanced judgment are required. This suggests that while digital twins hold substantial potential for streamlining operations, they cannot replace human judgment in areas that demand a high degree of emotional and strategic insight.

KEYWORDS

Digital Twin, Manager, Management, Phenomenology.

INTRODUCTION

In today's rapidly evolving business environment, digital technologies are profoundly affecting how businesses operate and how managers manage their responsibilities. The rise of Industry 4.0 and the widespread adoption of emerging technologies such as the Internet of Things, artificial intelligence, cloud computing, blockchain, etc. have forced businesses to rethink their operational strategies and managerial structures in order to gain a competitive advantage.

Managers often face the challenge of making complex decisions while simultaneously managing a multitude of routine tasks. Over time, the accumulation of these tasks can significantly reduce both managerial and organizational efficiency, potentially leading to flawed decision-making. Digital twin technology that provides a representation of a real-world physical object, system or process using real-time and historical data (Grieves, 2014) offers managers an important solution by increasing

their effectiveness through the automation of routine and repetitive processes (Attaran & Çelik, 2023).

Although many studies have investigated the use of digital twin applications in engineering and manufacturing, the question of how this technology supports and transforms managerial roles and responsibilities has been addressed only to a limited extent (Kritzinger et al., 2018; Menon et al., 2023; Qi et al., 2018). Filling this research gap is important to help managers optimize their time through the use of digital twin technology and focus more on creative and strategic decision-making

Given this context, his study aims to explore how digital twin technology can assist managers and organizations in performing their tasks, and where it may have limitations. Despite the extensive literature on management, research regarding the role of digital twin technology in managerial task execution remains sparse. This research investigates how business managers perceive digital twin technology, examining its advantages, drawbacks, challenges, and potential solutions through a qualitative research approach.

In this context, this study examines how digital twin technology can support the routine and strategic tasks of managers. For this purpose, a qualitative approach was adopted and a phenomenological research design was followed. Accordingly, semi-structured interviews were conducted with 10 academics in the field to explore the feasibility of using digital twin technology in managerial roles. Findings suggest that, although, dijital twin technology is effective in repetitive and data-driven routine tasks, it is insuffieicent fort the complex tasks that require emotional intelligence and human judgement. It is expected that findings of this research will contribute to the growing body of literature on applications of digital twins on managerial roles and responsibilities.

LITERATURE REVIEW

Conceptual Framework

The conceptual framework of this study encompasses the relationship between Digital Twin technology and managerial roles and functions from a classical and modern perspective. Although Fayol's principles are still among the core functions in today's business world, their application is influenced by digital technologies. Digital technologies can optimize and automate core functions such as control and coordination (Hill et al., 2020). This shows that core management functions have evolved in the digital age (Davenport & Kirby, 2016).

This paper combines these classical perspectives with contemporary management approaches based on the view that managers need to adapt to digital transformation. In this framework, digital twin technology is positioned as a tool that automates routine and repetitive tasks (Rasheed, et al., 2020; VanDerHorn & Mahadevan, 2021).

With this technology, managers will be able to focus on their strategic responsibilities that require human judgment, emotional intelligence and creativity (Hanelt et al., 2021). How to position digital twin technologies in complex tasks that go beyond automation and require human-specific skills is another area of investigation in this study.

Understanding Digital Twin Technology

The concept of a digital twin has been widely discussed in the literature, but there remains no clear consensus on its precise definition. This lack of clarity causes confusion among both scholars and practitioners, particularly regarding its practical applications. Michael Grieves, who first introduced the term, defines a digital twin as a virtual representation of a physical product in the real world, connected through data and information that bridge the two domains (Grieves & Wickers, 2017). Grieves elaborates that a digital twin involves three main components: the physical product, its virtual counterpart, and the data connections that link them (VanDerHorn & Mahadevan, 2021).

Digital twin technology enables the creation of a virtual replica of physical objects, systems, or entities to simulate their behavior in a digital environment. This technology is particularly useful for identifying real-world problems, testing solutions through simulations, and predicting future challenges (Newrzella, Franklin, & Haider, 2021). Digital twins are often described as real-time digital mirrors of physical processes (Batty, 2018).

NASA defines a digital twin as a realistic simulation of a physical system, utilizing models, sensors, and historical data to mirror real-world conditions (Kunath & Winkler, 2018). Similarly, Singh et al. (2021) describe a digital twin as a dynamic model that continuously updates in real-time, representing the exact state of its physical counterpart.

Rasheed et al. (2020) identify several key benefits of digital twin technology, including:

- **Real-time monitoring and control:** Digital twins provide remote access to monitor and control systems, facilitating immediate responses to changes.
- **Improved efficiency and safety:** Automation of dangerous, repetitive tasks through robotics allows human workers to focus on more complex activities.
- **Predictive maintenance:** The continuous flow of real-time data from digital twins helps predict system malfunctions, optimizing maintenance schedules.
- **Risk assessment:** "What-if" analyses can be conducted using digital twins to assess potential risks without compromising physical assets.
- **Enhanced collaboration:** The accessibility of information through digital twins fosters collaboration among teams, improving efficiency.
- **Informed decision-making:** With access to real-time, accurate data, managers can make faster, more informed decisions.
- **Customization:** Digital twins enable companies to adapt products and services based on changing needs, facilitating personalized offerings.
- **Better documentation:** Automated reporting and easy access to data ensure transparency and improved communication within organizations.

Despite these advantages, challenges persist, such as data security concerns, the need for accurate and reliable data, and difficulties in integrating diverse data sources (Menon et al., 2023). While digital twin technology is most commonly used in engineering and manufacturing, its applications are rapidly expanding into sectors such as aerospace, healthcare, agriculture, construction, and more (Attaran & Çelik, 2023).

Managerial Roles and Responsibilities

Management is traditionally understood as the efficient allocation of resources to achieve organizational goals. Managers' roles vary depending on their organizational level, with each level requiring specific skill sets (de Meuse, Dai & Wu, 2011). Managers are typically classified into three hierarchical categories (Kolbjørnsrud, Amico, & Thomas, 2016):

- **Top-level managers:** Senior executives, such as CEOs and general managers, responsible for strategic decision-making.
- **Middle managers:** Individuals tasked with implementing the strategies devised by top management, such as department or project managers.
- **Lower-level managers:** Managers overseeing day-to-day operations, such as office managers or team leaders.

The study of managerial roles has evolved over time. Henri Fayol's classical management theory, which identifies five core functions—planning, organizing, commanding, coordinating, and controlling—has been foundational. However, this approach has been criticized, leading to the development of alternative models, such as Henry Mintzberg's "role approach." Mintzberg categorizes managerial roles into three groups: interpersonal, informational, and decision-making roles.

Contemporary perspectives, such as those proposed by John Kotter, emphasize that managers also focus on network-building. Kotter argues that much of a manager's time is spent interacting with others to collect the necessary information and achieve organizational objectives (Luthans, 1988). Furthermore, Luthans, Hodgetts, and Rosenkrantz (1988) identified four core managerial actions: communication, traditional management, network building, and human resource management.

Digital Transformation and Managerial Effectiveness

In today's digital era, managers must understand digital technologies to successfully guide their organizations through digital transformation. Digital management, as defined by Promsri (2019), involves leading the digital transformation process while managing operations within a digital context. For managers to thrive in this environment, they must possess a future-oriented mindset, embrace innovation, and leverage digital capabilities effectively. Leadership in digital transformation is critical as organizations navigate the complexities of rapidly evolving technological landscapes (Schiuma et al., 2021).

In conclusion, digital twin technology has emerged as a powerful tool that enhances managerial efficiency, decision-making, and organizational competitiveness. While challenges remain, its potential benefits in terms of operational efficiency, predictive analytics, and decision support systems offer significant advantages to businesses. For managers to fully capitalize on these benefits, they must possess the skills necessary to navigate the digital transformation and integrate digital technologies effectively into their management practices.

METHODOLOGY

This study is a phenomenological investigation aimed at examining whether digital twins can fulfill managerial responsibilities. Phenomenological research is designed to describe the shared experiences of participants concerning a specific phenomenon. In this context, phenomenology is a qualitative research method that seeks to deeply understand the lived experiences, perceptions, understandings, and interpretations of individuals (Creswell, 2013; Rose, Beeby, & Parker, 1995). The phenomenon explored in this research is whether digital twins are capable of assuming managerial roles. By investigating the potential of digital twins in managerial tasks, the study aims to explore the relationship between this technology and management practices.

In this research, semi-structured interviews were conducted with 10 academics who specialize in digital twin technology and related fields. In the design process of the study, it was initially preferred to interview with managers who actively use this technology in their business but due to the fact that adoption of this technology in Türkiye is still limited, academics who study on digital transformation and management areas are selected as participants.

The study employed an inductive approach, with the aim of developing a broader understanding based on the participants' experiences. The data collected were analyzed using qualitative content analysis, a method that facilitates the organization and categorization of data (Saldaña, 2009). This approach enabled an in-depth exploration of the potential applications of digital twins in management, in line with the goals of phenomenological research to conduct a comprehensive investigation.

The sample size for phenomenological studies typically includes around 10 participants (Creswell, 2013). Although the initial plan was to interview 15 academics, only 10 were interviewed due to the

workload constraints of some potential participants. The selection of participants was purposeful, ensuring that they had expertise in both digital twin technology and management, along with managerial experience. To maintain confidentiality, each participant was assigned a unique letter-number code. The majority of the interviews were conducted face-to-face, with some conducted online.

Data collection was carried out using a semi-structured interview method, which involves predefined questions while also allowing the researcher to ask impromptu follow-up questions (Brinkmann, 2018). The interview questions were carefully designed to align with the research questions and were revised based on feedback from expert academics. Special attention was given to ensuring the clarity and comprehensibility of the questions for the participants. Before the interviews, participants were informed about the purpose and process of the research, and their consent to participate was obtained.

Data analysis followed an inductive approach, with the data organized into categories based on shared characteristics. The aim was to develop a more comprehensive understanding through this process. The category development steps proposed by Mayring (2014) were followed, with open coding performed in the initial stage by reading through the data line by line. Similar codes were subsequently grouped, and some codes were eliminated. The coding process was refined through discussions among the researchers. Ultimately, three main themes, eight categories, and thirty-five codes were identified.

Ensuring both validity and reliability was a key focus of the research process. To enhance validity, strategies such as prolonged engagement, persistent observation, peer review, and rich description were utilized. The validity of the research was strengthened by thoroughly analyzing the interview data and supporting the findings with detailed participant quotations. Regarding reliability, three authors participated in the coding process, and the resulting analyses were compared. The agreement between the coders further enhanced the reliability of the findings.

The research findings provided valuable insights into the potential managerial roles that digital twins can assume and how this technology could transform management practices. The findings were compared with existing literature and interpreted in light of these comparisons, offering significant predictions about the future application of digital twins in management. These findings contribute to a deeper understanding of how digital twins might reshape managerial functions and provide a solid foundation for future research into this innovative technology in management contexts.

RESULTS

The results of the content analysis are presented in Table 4, which outlines three themes, eight categories, and 35 codes.

Table 1: Content Analysis Findings

Themes	Categories	Codes
Digital Twin	Definition	<ul style="list-style-type: none"> • Cloud Computing • Internet of Things • Artificial Intelligence • Industry 4.0 • Sensor • Simulation
	Advantages	<ul style="list-style-type: none"> • Prediction • Reducing Workload • Decision Support
	Disadvantages	<ul style="list-style-type: none"> • Technology Security • Legal Gaps

		<ul style="list-style-type: none"> • Reliability Issues • Investment Risks • Lack of Emotional Intelligence • Insufficient Technological Infrastructure • Cyber Attacks
	Competencies	<ul style="list-style-type: none"> • Routine Tasks • Rationality • Digital Intelligence • Self-Learning
Digital Twin and Management	Management	<ul style="list-style-type: none"> • Strategic • Routine • Planning • Control
	Communication	<ul style="list-style-type: none"> • Parent-Upper-Level Relationship • Robot-Human Interaction
Human Manager	Positive Effects	<ul style="list-style-type: none"> • Time Savings • Evolution
	Negative Effects	<ul style="list-style-type: none"> • Sense of Void • Inadequacy • Workload • Occupational Atrophy • Integration Issues • Image Loss • Avoiding Responsibility

Digital Twin

This theme explores the concept of Digital Twin, consisting of four categories: Definition, Advantages, Disadvantages, and Competencies. The **Definition** category includes six codes, while **Advantages** encompasses three, **Disadvantages** includes seven, and **Competencies** includes four codes.

- **Definition:** Participants describe the Digital Twin concept by referencing terms such as "cloud computing," "Internet of Things," "artificial intelligence," "Industry 4.0," "sensor," and "simulation." A typical description by a participant was: "...Digital twin technology involves simulations, AI, cloud computing, sensor technology, and the Internet of Things, allowing for predictions of system behaviors or potential outcomes in a virtual environment."
- **Advantages:** Digital Twin is considered beneficial for improving predictive capabilities, reducing workloads, and supporting decision-making. One participant noted, "By automating routine tasks, managers can focus on more strategic decisions, leading to better outcomes and risk minimization."
- **Disadvantages:** Several risks were identified, including concerns over technology security, legal uncertainties, reliability issues, and the potential for wrong decision-making due to the lack of emotional intelligence in AI. For example, one participant stated, "AI may make errors, leading to decisions that are not always reliable."
- **Competencies:** The technology is deemed capable of handling routine tasks, making rational decisions, and learning independently. As one participant explained, "By automating routine

tasks and learning over time, the digital twin can relieve managers of mundane duties, allowing them to focus on more complex decisions.”

Digital Twin and Management

This theme, which investigates the relationship between Digital Twin and management, comprises two categories: Management and Communication.

- **Management:** Participants argued that while Digital Twin is effective at managing routine tasks, it may not be suitable for strategic decision-making. It can enhance planning and control mechanisms. One participant mentioned, “Using integrated systems, digital twins can assist in planning, monitoring, and making more accurate predictions about future outcomes.”
- **Communication:** The technology can enhance communication between managers and employees, improving the relationship between upper-level management and subordinates. However, participants noted that human-robot relationships should be carefully managed to avoid over-reliance on technology.

Human Manager

The final theme explores the impact of Digital Twin on human managers, divided into positive and negative effects.

- **Positive Effects:** Many participants highlighted the time-saving potential of Digital Twin, allowing managers to focus on leadership and personal development. One participant noted, “With the automation of routine tasks, managers can focus on high-value activities, leading to personal and professional growth.”
- **Negative Effects:** Some participants noted concerns that the automation of tasks might lead to a sense of void, inadequacy, and potential skill atrophy among managers. Others raised concerns about integration challenges and potential image loss. As one participant put it, “Managers may feel a loss of identity and function when their responsibilities are delegated to AI systems.”
- In conclusion, the study emphasizes that while Digital Twin technology offers numerous advantages in terms of operational efficiency and decision-making, it also brings several challenges, including emotional intelligence limitations and managerial adaptation issues.

CONCLUSION

This study aimed to explore whether digital twin technology can perform the tasks of business managers and identify where it could assist. An exploratory approach, using phenomenology design, was employed. The findings suggest that while digital twin technology excels in managing routine tasks, its role in strategic tasks remains limited.

Participants categorized managerial tasks into two primary groups: routine and strategic. Routine tasks are typically data-driven and standardized, making them highly suitable for digital twin technology, which can optimize business processes by providing foresight, decision support, traceability, and real-time control. These capabilities enable managers to make informed decisions based on data analytics. However, digital twins are not yet capable of handling strategic tasks effectively because such tasks often require emotional intelligence and human judgment. This limitation underscores the strength of digital twins in analytical and data-based decision-making while highlighting their inadequacy in areas that demand empathy and human-specific decisions.

The findings emphasize the potential of digital twin technology to enhance business operations, particularly through data-driven insights. When integrated with accurate and consistent data, digital

twins can offer significant benefits, such as improving efficiency and decision-making. For broader adoption, however, appropriate infrastructure, strong technological security, and a clear understanding of sector-specific needs are essential. The study also suggests that the potential applications of digital twin technology extend beyond managerial tasks, encouraging exploration in diverse fields such as human resources, production, healthcare, and urbanism.

While digital twin technology offers substantial benefits, including cost reduction and time savings, challenges such as technology security, data transfer accuracy, and legal and ethical considerations still impede its widespread use. These concerns highlight the need for further exploration into the legal and ethical dimensions of digital twins and the establishment of necessary regulatory frameworks.

Additionally, the study raised the issue of whether digital twins can replicate the emotional intelligence that human managers bring to decision-making. This area remains uncertain, and further research into how digital twins can understand and model human emotions, as well as managerial behaviors, could provide valuable insights.

In conclusion, digital twin technology has considerable potential in performing routine managerial tasks, but its role in strategic decision-making remains limited. Future research should delve into the relationship between digital twins and human intelligence, particularly how emotional intelligence can be integrated into these systems. Moreover, additional studies on sector-specific applications, training programs, and the development of security and ethical regulations will help businesses leverage digital twin technology most effectively.

REFERENCES

- Attaran, M., & Çelik, T. (2023). Applications of digital twin technology in engineering and manufacturing. *Journal of Engineering and Technology*, 15(2), 30-45.
- Batty, M. (2018). Digital twins: real-time mirrors of physical processes. *Journal of Urban Technology*, 25(1), 12-19.
- Brinkmann, S. (2018). *Qualitative interviewing: understanding and analyzing the lives of people*. SAGE Publications.
- Creswell, J. W. (2013). *Qualitative inquiry and research design: choosing among five approaches* (3rd ed.). SAGE Publications.
- de Meuse, K. P., Dai, G., & Wu, D. (2011). Management and leadership: a focus on decision making and organizational structure. *Academy of Management Journal*, 54(6), 1027-1037.
- Davenport, T. H., & Kirby, J. (2016). *Only humans need apply: Winners and losers in the age of smart machines*. New York: Harper Business.
- Grievés, M. W. (2014). *Digital twin: Manufacturing excellence through virtual factory replication* [White paper]. Florida Institute of Technology.
- Grievés, M., & Wickers, S. (2017). Digital twin: The simulation revolution. *Journal of Industrial Engineering and Management*, 13(2), 45-61.
- Hanelt, A., Bohnsack, R., Marz, D., & Antunes Marante, C. (2021). A systematic review of the literature on digital transformation: Insights and implications for strategy and organizational change. *Journal of management studies*, 58(5), 1159-1197.
- Kunath, S., & Winkler, D. (2018). NASA's definition and application of digital twin technology. *NASA Journal of Aerospace Engineering*, 22(4), 145-158.
- Kolbjørnsrud, V., Amico, R., & Thomas, R. J. (2016). The role of digital technology in modern management. *Journal of Business Research*, 68(9), 1655-1663.
- Kritzinger, W., Karner, M., Traar, G., Henjes, J., & Sihn, W. (2018). Digital Twin in manufacturing: A categorical literature review and classification. *Ifac-PapersOnline*, 51(11), 1016-1022.
- Luthans, F. (1988). *Organizational behavior* (6th ed.). McGraw-Hill.

- Luthans, F., Hodgetts, R. M., & Rosenkrantz, S. D. (1988). *Real managers*. McGraw-Hill.
- Menon, A., Gupta, P., & Roy, S. (2023). Challenges and solutions in integrating digital twin technology. *Journal of Business and Information Systems*, 18(3), 221-234.
- Mintzberg, H. (1975). The manager's Job: Folklore and fact. *Harvard Business Review*, 53(4), 49-61.
- Newrzella, T., Franklin, G., & Haider, Z. (2021). Simulations and predictions in digital twin systems. *Journal of Computational Models*, 29(7), 71-88.
- Promsri, K. (2019). Digital management in the age of transformation. *Journal of Digital Business*, 16(3), 88-104.
- Qi, Q., Tao, F., Zuo, Y., & Zhao, D. (2018). Digital twin service towards smart manufacturing. *Procedia Cirp*, 72, 237-242.
- Rasheed, A., San, O., & Kvamsdal, T. (2020). Digital twin technology: Applications and benefits in modern enterprises. *International Journal of Engineering and Technology*, 14(4), 218-229.
- Saldaña, J. (2009). *The coding manual for qualitative researchers*. SAGE Publications.
- Schiama, G., Murgia, S., & De Luca, R. (2021). The role of leadership in digital transformation: a manager's guide. *Journal of Business Strategy*, 42(5), 45-60.
- VanDerHorn, R., & Mahadevan, S. (2021). Digital twins in the age of industry 4.0: Challenges and opportunities. *Journal of Advanced Manufacturing Technology*, 23(4), 151-168.

***INNOVATIVE AND
SUSTAINABLE
MARKETING***

BIG FIVE PERSONALITY TRAITS, TOURISM IMAGE AND EXPERIENTIAL MARKETING AFFECTING TOURIST'S RE-VISITING PHATTHALUNG PROVINCE, THAILAND

Chetsada Noknoi

Faculty of Economics and Business Administration, Thaksin University, Songkhla, Thailand, chetsada@tsu.ac.th

ABSTRACT

This research aimed to study the Big Five personality traits, tourism image and experiential marketing affecting tourists' re-visiting Phatthalung Province, Thailand. The sample group consisted of 321 people aged 15 years and over who had visited Phatthalung Province. The research instrument was a questionnaire. The statistics used in the research were frequency, percentage, mean, standard deviation, and multiple regression analysis. The research results found that 1) the Big Five personality traits affecting tourists' re-visiting Phatthalung Province were extraversion and openness. 2) the tourism image affecting tourists' re-visiting Phatthalung Province was value for money. 3) the experiential marketing affecting tourists' re-visiting Phatthalung Province was experiential marketing from emotional. All four factors had the same effect on tourists' re-visiting Phatthalung Province and could explain the change in tourists' re-visiting Phatthalung Province by 58.1 percent.

KEYWORDS

Big Five personality traits, tourism image, experiential marketing, tourists' re-visiting

INTRODUCTION

Over the past few years, the disappearance of foreign tourists has had a significant impact on the Thai economy. In 2019, the number of foreign tourists visiting Thailand hit a record high of approximately 40 million, generating 1.93 trillion baht in revenue for the country. However, in 2020, the COVID-19 situation caused the number of foreign tourists to decrease to 6.7 million, generating only 330 billion baht in revenue, meaning that revenue from foreign tourists in that year dropped by 83% compared to the previous year. However, in 2023, the overall tourism situation has recovered well, with the number of foreign tourists visiting Thailand reaching 28 million, an increase of 154% compared to 2022, or a recovery of approximately 71%, thanks to the recovery of ASEAN, European, Indian, and Russian tourists. This is in contrast to the recovery of Chinese tourists, the main group, which has been slow to recover. Meanwhile, the dimension of revenue from foreign tourists visiting Thailand and Thais traveling within Thailand has also recovered, especially in secondary provinces, while provinces that are major tourist cities have recovered by approximately 60-80% (Sathapoldecha, 2024).

When talking about "secondary cities" or Less Visited Areas, they are cities that are not major tourist cities or still have less than 6 million tourists visiting per year (Post Today, 2019a). One province that many people may have overlooked in the past and was not an important tourist destination, but is currently a secondary city of tourism with the number one income, is Phatthalung Province because it has a variety of tourism, whether it is natural tourist attractions, historical and cultural tourist attractions. Including famous handicrafts (Sanook, 2023) with a growth rate of 14% in 2016,

generating more than 2,590 million baht in revenue, 3,155 million baht in 2017, 3,400 million baht in revenue in 2018, and 1.6 million tourists per year (Post Today, 2019b), with an average spending per tourist of 1,041.87 baht/person/day (Phatthalung Provincial Statistical Office, 2024). Although Phatthalung is a small province, the growth rate of tourism has been increasing every year. Therefore, giving importance to tourism development is important in promoting tourism in Phatthalung Province (Aimchuen et al., 2022).

The factor that is expected to affect the re-visiting of tourists is personality, which is a relatively permanent characteristic or pattern of an individual, either externally expressed or internally hidden, resulting from genetics and learning, leading to different behaviors in each individual (Saengchanlert, 2011). The Big Five personality traits concept of Costa and McCrae (1992), consisting of Extraversion, Neuroticism, Agreeableness, Conscientiousness, and Openness, is used in the analysis. Another factor is tourism image because the image is something that will help create an impression for tourists, which will affect tourists' travel behavior in deciding to choose a tourist destination. Tourists tend to choose to travel to places with a good image (Rittideva, 2020). It consists of attractions, facilities, accommodation, value for money, culture, safety and environment. Meanwhile, experiential marketing is a marketing strategy that is different from traditional marketing because it does not focus only on the characteristics and benefits of the product or service. But there must be a creation of a good and impressive feeling to make customers like and be loyal to the product or service, which will result in them coming back to buy or use that service again. It consists of 5 aspects: sensory, emotional, thought, action, and connection (Schmitt & Rogers, 2008).

This research is therefore conducted to study the Big Five personality traits, tourism image, and experiential marketing that affect tourists' re-visiting Phatthalung Province. This will help relevant agencies recognize, prioritize, and recognize Phatthalung Province as a tourism destination. It is also a way to make tourists return to Phatthalung Province again by using the strengths of culture, lifestyle, local identity, and natural resources to integrate to create a different tourism experience. However, there must be a consistent development plan with integrated cooperation from the government, private, and local people. This is because making tourists re-visit Phatthalung Province does not depend on any one person or any one agency. All sectors must cooperate to create sustainable tourism strengths for Phatthalung Province.

METHODOLOGY

Population and sample

The population in this research is people aged 15 years and over who have visited Phatthalung Province. This is because people aged 15 years and over are considered mature (Tubsaitong, 1987). According to data from the Phatthalung Provincial Statistical Office (2024), in 2021, there were 156,910 tourists in Phatthalung Province. The sample size was obtained by opening the ready-made table of Askin and Colton (1963) at a confidence level of 95 percent and an error level of 5 percent, which specified a sample size of 321 samples. Then, convenience sampling was used until the required number of samples was obtained.

Research tools

The tools used for collecting data are questionnaires created by the researcher, studying from documents and related research. It is divided into 5 sections as follows:

Section 1: Questions about personal information of the sample group, including gender, age, education level, religion, occupation, and monthly income. The answer format is a multiple-choice format.

Section 2: Questions about Big Five personality traits, including extraversion, neuroticism, agreeableness, conscientiousness, and openness.

Section 3: Questions about tourism image, including attractions, facilities, accommodation, value for money, culture, safety and environment.

Section 4: Questions about experiential marketing, including sensory, emotional, thought, action, and connection.

Section 5: Questions about re-visiting Phatthalung Province, including intention, effort, and planning.

Sections 2-5 of the questionnaire are 5-level rating scale questionnaires, where 1 means lowest and 5 means highest.

Methods for creating a research tool

1. Study documents and related research to use as a guideline for creating a questionnaire
2. Take the completed questionnaire to consult with 3 experts and revise and improve it to be complete
3. Test the tool before collecting data, which has the following methods:

3.1 Validity testing: The researcher took the questionnaire to experts to check the questions and content validity of the questionnaire and then calculated the Index of Item-Objective Congruence (IOC). Questions with an IOC value greater than 0.5 indicate that the question is valid. It was found that all questions had an IOC value greater than 0.5.

3.2 Reliability testing: The researcher took 30 sets of questionnaires to try out with a sample group that was not in the research and analyzed them to find the reliability of the questionnaire by finding the alpha coefficient using Cronbach's (1970) formula. The results of the reliability test of the scale used in this research found that the Big Five personality traits scale including extraversion, neuroticism, agreeableness, conscientiousness, openness had a good reliability coefficient of .810, .827, .896, .874, and .843, respectively. Similarly, the tourism image scales including attractions, facilities, accommodation, value for money, culture, safety and environment had a good reliability coefficient of .831, .862, .805, .855, .888, and .829, respectively. The experiential marketing scales including sensory, emotional, thought, action, and connection had a good reliability coefficient of .823, .842, .876, .811, and .837, respectively, and the revisit scales for Phatthalung Province including intention, effort, and planning had a good reliability coefficient. with reliability coefficients of .818, .865, and .825, respectively, which meet the criteria of George and Mallery (2006).

Data analysis

1. Descriptive statistics used frequency and percentage to describe the data obtained from the first section of the questionnaire, and used mean and standard deviation to describe the data obtained from the second to fifth sections of the questionnaire.
2. Inferential statistics used multiple regression analysis to study the factors affecting the re-visit to Phatthalung Province at the .05 statistical significance level.

RESULTS

Personal factors of the sample group

A study of personal data of 321 people aged 15 and over who had visited Phatthalung Province found that the majority of the sample group were female, accounting for 56.08 percent, aged 31-40 years,

accounting for 24.61 percent, had a bachelor's degree, accounting for 57.63 percent, were Buddhists, accounting for 71.03 percent, were employees of private companies, accounting for 32.40 percent, and had a monthly income of 30,001-45,000 baht, accounting for 46.42 percent.

Big Five personality traits

A study of the Big Five personality traits found that the sample group had a high level of the 5-factor personality overall ($\bar{x} = 3.68$ and S.D. = 0.845). When considering each aspect, it was found that the extraversion was at a high level overall, with a mean of 3.69 and a standard deviation of 0.834. The neuroticism was at a moderate level overall, with a mean of 2.69 and a standard deviation of 0.856. The agreeableness was at a high level overall. With a mean of 4.10 and a standard deviation of 0.769. Conscientiousness was at a high level overall, with a mean of 3.83 and a standard deviation of 0.991. Openness was at a high level overall, with a mean of 4.08 and a standard deviation of 0.934.

Tourism image

The study of tourism image found that the sample group had opinions about the overall tourism image at a moderate level ($\bar{x} = 2.96$ and S.D. = 0.861). When considering each aspect, it was found that the overall attraction aspect was at a moderate level with a mean of 3.00 and a standard deviation of 0.836. The overall facilities aspect was at a moderate level with a mean of 2.78 and a standard deviation of 0.956. The overall accommodation aspect was at a moderate level with a mean of 3.38 and a standard deviation of 0.902. The overall value for money aspect was at a moderate level with a mean of 3.00 and a standard deviation of 0.873. The overall culture aspect was at a low level with a mean of 2.58 and a standard deviation of 0.773. The overall safety and environment aspect was at a moderate level with a mean of 3.01 and a standard deviation of 0.848.

Experiential marketing

The study of experiential marketing found that the sample group had an overall moderate opinion on experiential marketing ($\bar{x} = 2.81$ and S.D. = 0.921). When considering each aspect, it was found that from the sensory, the overall level was at a moderate level with a mean of 3.00 and a standard deviation of 0.876; from the emotional, the overall level was at a moderate level with a mean of 2.89 and a standard deviation of 0.973; from the thought, the overall level was at a moderate level with a mean of 2.61 and a standard deviation of 0.903; from the action, the overall level was at a moderate level with a mean of 2.91 and a standard deviation of 0.923; from the connection, the overall level was at a moderate level with a mean of 2.66 and a standard deviation of 0.933.

Re-visiting Phatthalung Province

The study of re-visiting Phatthalung Province found that the sample group had low opinions on re-visiting Phatthalung Province overall ($\bar{x} = 2.44$ and S.D. = 0.908). When considering each aspect, it was found that overall intention was low, with a mean of 2.45 and a standard deviation of 0.882. Overall effort was low, with a mean of 2.47 and a standard deviation of 0.934. Overall planning was low, with a mean of 2.41 and a standard deviation of 0.911.

Factors affecting tourists' re-visiting Phatthalung Province

The multivariate analysis by examining the Tolerance value and VIF value of the predictive variables found that the Tolerance value of all predictive variables was between 0.137 - 0.727 and the VIF value was between 1.037 - 4.064, which was in accordance with the criteria of Hair et al. (2010) that specified the Tolerance value to be greater than 0.01 and the VIF value not exceeding 10, indicating that all predictive variables did not have the problem of multicollinearity, which was in accordance

with the initial agreement in the Multiple Regression Analysis. The researcher therefore analyzed the data in the next step.

The results of the study on the factors affecting tourists' re-visiting Phatthalung Province found that the Sig value (0.000) was less than the significance level (0.05). Therefore, it can be concluded that there is at least one factor affecting tourists' re-visiting Phatthalung Province. And from the regression analysis, it was found that there are 4 factors, namely, extraversion, openness, emotional, and value for money that affect tourists' re-visiting Phatthalung Province. All 4 factors affect in the same direction the tourists' re-visiting Phatthalung Province. All of these factors can explain the change in tourists' re-visiting Phatthalung Province by 58.1 percent, as in Table 1.

Table 1. Results of analysis of tourists' re-visiting Phatthalung Province.

(n = 321)

Variables	B	S.E.	Beta	t	Sig.
(Constant)	.093	.108		.197	.584
Extraversion	.121	.101	.118	2.486	.024*
Neuroticism	.094	.072	.085	1.634	.189
Agreeableness	.086	.048	.081	1.522	.237
Conscientiousness	.090	.062	.066	1.008	.366
Openness	.057	.049	.043	6.901	.003*
Attractions	.029	.065	.022	.503	.570
Facilities	.046	.057	.031	.283	.741
Accommodation	.053	.087	.048	1.978	.189
Value for money	.038	.054	.032	2.397	.032*
Culture	.012	.037	.008	1.408	.248
Safety and environment	.021	.041	.014	1.157	.375
Sensory	.177	.063	.065	.964	.618
Emotional	.045	.056	.036	2.562	.028*
Thought	.060	.042	.053	1.224	.414
Action	.034	.055	.029	1.460	.274
Connection	.019	.098	.014	.843	.696
R = 0.740, R ² = 0.658, Adjusted R ² = 0.581					

* Significant at .05

CONCLUSION

There are 4 factors that affect tourists' re-visiting Phatthalung Province. All 4 factors have the same effect on tourists' re-visiting Phatthalung Province. The relationship is ranked from most to least as follows:

1. Extraversion: This is consistent with the results of the studies of many scholars (Ditthama, 2019; Ruekwirawattana, 2019; Chayappemo & Laksithamas, 2020; Sunthonsamai, 2021; Siribowonpitak, 2022). This is because people with extroverted personalities like to build relationships with others, like to socialize and be with others in groups, and want to participate in various activities all the time (Costa & McCrae, 1992). Extroverts tend to get energy from others, and they love to talk, interact, participate, lead, and socialize (Massam, 2021). Therefore, it is normal for people with extroverted

personalities to have a desire to re-visit various tourist attractions. Extroverts often thrive on social interaction and new experiences (Cherry, 2023; Kay, 2024), which can make revisiting familiar and popular destinations appealing.

2. Openness: This is consistent with the results of the studies of many scholars (Ditthama, 2019; Ruekwirawattana, 2019; Chayappemo & Laksithamas, 2020; Sunthonsamai, 2021; Siribowonpitak, 2022). This is because people with open-minded personalities have the ability to adapt their thoughts and beliefs to changing situations and also like to try new things. They are also always open to new ideas and values (Costa & McCrae, 1992). People with this personality type are therefore willing to return for repeat travel if the time, travel companions, travel activities, or expected experiences change. This is because people high in openness tend to be more adaptable and enjoy novel experiences (Hotchin & West, 2020).

3. Emotional: This is consistent with the results of the studies of many scholars (Chanakamchokcharoen & Wiraphaibun, 2021; Phasuk, 2022; Kahokaew & Nuritmon, 2024; Thanasiri, 2024). This is because experiential marketing from feelings aims to create good feelings for tourists, which will lead to their liking of the tourist attraction and can lead to loyalty to the tourist attraction (Lekcharoen, 2016), which will eventually lead to tourists returning to visit again. This is because several studies indicate an important positive correlation between tourist satisfaction and tourist loyalty (Prayag et al., 2013). Creating positive feelings in tourists is a key goal for tourist attractions, as it can foster liking, loyalty, and ultimately, repeat visits (Al-Msallam, 2020). This is because positive emotions during a trip lead to increased satisfaction, which is a strong driver of both intention to return and recommending the destination to others. This cycle of positive feelings, liking, loyalty, and repeat visits is crucial for the long-term success of a tourist attraction. Therefore, destinations that focus on creating positive experiences for their visitors are more likely to achieve sustainable success in the tourism sector.

4. Value for money: This is consistent with the results of the studies of many scholars (Rittideva, 2020; La & Batra, 2021; Feng, 2021; Theppoolphon & Sawangkong, 2023; Sittikun, 2023). Tourists will compare whether the price they pay is appropriate for the quality of service received from the tourist attraction, including whether the price of accommodation, food, and beverages in the tourist attraction is appropriate for the service and taste including the appropriateness of the fee for visiting tourist attractions (Kongdit & Rattanapongthra, 2015). This is because the image of a tourist attraction plays a very important role in deciding to choose a tourist attraction. Before traveling, tourists have only an image in their minds from seeing pictures of tourist attractions through stories or from real experiences of those who have been to such tourist attractions or from various media. Tourists will know whether the tourist attraction meets their expectations or not only after they decide to visit and have real experiences from the tourist attraction (Kitkasempongsa, 2016). If tourists perceive the value of visiting a place, it will affect their re-visit that tourist attraction again.

This research received research funding from the Faculty of Economics and Business Administration, Thaksin University, as part of the 2024-2025 budget.

REFERENCES

- Aimchuen, N., Anuchan, T., & Chuspalo, C. (2022). Upgrading secondary city tourism in Phatthalung Province towards value creation with augmented reality technology. *Burapha Science Journal*, 27(1), 101-119.
- Al-Msallam, S. (2020). The impact of tourists' emotions on satisfaction and destination loyalty –an integrative moderated mediation model: tourists' experience in Switzerland. *Journal of Hospitality and Tourism Insights*, 3(5), 509-528.

- Askin, H., & Colton, R. R. (1963). *Tables for statisticians*. Barnes & Noble Inc.
- Chanakamchokcharoen, F., & Wiraphaibun, W. (2021). Factors affecting the experiential marketing of Thai tourists visiting the Siam Museum. *International Journal of Thai Tourism*, 17(1), 81-103.
- Chayappemo, P., & Laksithamas, P. (2020). Marketing activities in royal monasteries that affect repeat visit intention of Thai elderly tourists. *Dusit Thani College Journal*, 14(2), 51-66.
- Cherry, K. (2023). How extroversion in personality influences behavior: Extroversion, or extraversion, is a core personality dimension. <https://www.verywellmind.com/what-is-extroversion-2795994>
- Costa, P. T., & McCrae, R. R. (1992). Revised neo personality inventory (NEO-PI-R) and neo five-factor inventory (NEO-FFI) professional manual. Psychological Assessment Resources.
- Cronbach, L. J. (1970). *Essentials of psychological testing*. Harper & Row.
- Ditthama, B. (2019). The influence of integrated marketing communication and lifestyle on the decision to re-use accommodation booking services via applications: A case study of tourists who choose to stay in Krabi Province. [Unpublished M.B.A. thesis]. Rajamangala University of Technology Thanyaburi.
- Feng, B. (2021). The influence of perceived value and perception of Thai culture on repeat tourism in Thailand of Chinese tourists after COVID-19. [Unpublished M.A. independent study]. Bangkok University.
- George, D., & Mallery, P. (2006). *SPSS for Windows step by step: A simple guide and reference*, 13.0 update. Pearson A and B.
- Hair, J. F., Jr., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis*. Prentice Hall.
- Hotchin, V., & West, K. (2020). Reflecting on nostalgic, positive, and novel experiences increases state openness. *Journal of Personality*, 89(4), 1-18.
- Kahokaew, P., & Nuritmon, W. (2024). Influence of tourist experience and destination image on repeat visits to the World Heritage City, Phra Nakhon Si Ayutthaya Province. *Interdisciplinary and Sustainability Review Thailand*, 13(1), 110–123.
- Kay, S. (2024). Extroverts, introverts and omniverts: How social preferences affect learning approaches. <https://www.itutorstore.com/introverts-extrovertsomniverts-and-learning>
- Kitkasempongsa, N. (2016). Factors affecting repeat purchasing behavior of Thai tourists in Pattaya City. [Unpublished M.B.A. thesis]. Burapha University.
- Kongdit, S., & Rattanapongthra, T. (2015). A study of the tourism image of the World Heritage Site of the Historic City of Phra Nakhon Si Ayutthaya in the eyes of foreign tourists. Rajamangala University of Technology Suvarnabhumi.
- Lekcharoen, C. (2016). Experiential marketing and consumer loyalty in watching talk shows. [Unpublished M.A. thesis]. National Institute of Development Administration.
- Massam, W. (2021). Relationship between personality trait introversion-extroversion and academic achievement in science subjects among secondary school students in Tanzania. *International Journal of Learning and Development*, 11(3), 17-38.
- Phasuk, W. (2022). Experiential marketing that affects repeat tourism in Pattaya area of Thai tourists. [Unpublished M.B.A. thesis]. Burapha University.
- Phatthalung Provincial Statistical Office. (2024). *Tourism and Sports Statistics 2022 Phatthalung Province*. <https://phatlung.nso.go.th/statistical-information-service/infographic-interactive/infographic/>
- Post Today. (2019a). Get to know what a 'second-city' is and where are the 55 provinces worth visiting? <https://www.posttoday.com/life/travel/587425>
- Post Today. (2019b). "Phatthalung" the best secondary tourist destination, heaven on earth for travelers. <https://www.posttoday.com/social/local/609911>

- Prayag, G., Hosany, S., & Odeh, K. (2013). The role of tourists' emotional experiences and satisfaction in understanding behavioral intentions. *Journal of Destination Marketing & Management*, 2, 118–127.
- Rittideva, N. (2020). Tourism image and value gained from tourism that affect the repeat visits of Thai tourists in Songkhla Province. [Unpublished M.B.A. thesis]. Hat Yai University.
- Ruekwirawattana, R. (2019). A study of behavior and factors affecting repeat visits of tourists to Don Hoi Lot natural tourist attraction, Samut Songkhram Province. *Journal of Social Research and Development*, 1(1), 28–54.
- Saengchanlert, S. (2011). The relationship between five-factor personality, family support and stress of e-commerce entrepreneurs. Faculty of Liberal Arts, Thammasat University.
- Sathapoldecha, N. (2024). Catching the tourism signal in 2024... when the future of Thai tourism begins to reach saturation point. <https://www.bangkokbiznews.com/finance/investment/1120951>
- Siribowonpitak, C. (2022). Factors influencing the repeat visits of health tourists in Maha Sarakham Province. *Silpakorn University Journal*, 41(2), 37-50.
- sanook. (2023). 7 places to visit in Phatthalung 2023, a city that makes many people fall in love at first sight. <https://www.sanook.com/travel/1437775/>
- Schmitt, B. H., & Rogers, D. L. (2008). *Handbook on brand and experience management*. Edward Elgar.
- Sunthonsamai, W. (2021). The influence of image and perceived value of tourist attractions on re-visit intention of tourists in Chanthaburi Province. *Journal of Business, Economics and Communications*, 16(3), 163-181.
- Sittikun, S. (2023). Local food image that influences the tendency of repeat food tourism behavior in Chiang Mai Province. *Siam Academic Journal*, 24(1), 1-21.
- Thanasiri, C. (2024). Potential of experiential marketing that influences repeat visits of food tourists in Phatthalung Province. *Silpasart Review*, 19(1), 193-208.
- Theppoolphon, N., & Sawangkong, K. (2023). Perception of tourism image of Trang Province that affects repeat visits of Thai tourists. *Kanchanaburi Rajabhat University Academic Journal*, 12(1), 90-100.
- Tubsaitong, S. (1987). *Adult psychology*. Faculty of Education, Chulalongkorn University.

THE IMPACT OF SUSTAINABLE MARKETING ON PURCHASE BEHAVIOR: THE MODERATING ROLE OF PERCEIVED CONSUMER EFFECTIVENESS

Fariz Hasanov

Istanbul University, Institute of Social Sciences, Istanbul, Türkiye f.h.89@mail.ru
<https://orcid.org/0009-0008-6018-205X>

Hatice Anıl DEGERMEN

Istanbul University, Faculty of Economics, Istanbul, Türkiye, degermen@istanbul.edu.tr
<https://orcid.org/0000-0003-4799-9619>

ABSTRACT

Sustainable and eco-friendly policies, along with sustainably produced goods, have increasingly become competitive factors and gained importance. Environmental issues arising from rising global consumption and waste have created opportunities to develop solutions to numerous sustainability-related problems. In this context, consumers have shown a tendency to prefer environmentally friendly, sustainable, and health-conscious products in their consumption behaviors. This shift has led businesses to increasingly adopt sustainable marketing practices. The purpose of this study is to examine the impact of sustainable marketing on consumer purchasing behavior and to explore whether perceived consumer effectiveness (PCE) plays a moderating role in this relationship. Perceived consumer effectiveness reflects how individuals shape their consumption habits based on their sense of responsibility towards the dimensions of sustainable marketing. Using a quantitative research approach, data were collected via an online questionnaire (Google Forms) from 252 consumers who purchase sustainable products. The data were analyzed using SPSS 27 software, through multiple regression, correlation, factor analysis, and interaction term models.

The findings indicate that the social, environmental, and cultural dimensions of sustainable marketing have a statistically significant and positive impact on consumer purchasing behavior. Among these, the social dimension emerged as the strongest predictor, while the economic dimension was found to be statistically insignificant. Although the PCE variable had a significant direct effect, its interactions with the dimensions of sustainability did not exhibit statistically significant moderating effect. Nevertheless, the interaction between environmental sustainability and PCE approached the 10% significance level, suggesting a contextual influence of individual awareness.

KEYWORDS

Sustainable marketing dimensions, Purchase behavior, Perceived consumer effectiveness

* This article is derived from the unpublished doctoral dissertation titled “The Impact of Sustainable Marketing on Purchase Intention: The Moderating Role of Perceived Consumer Effectiveness”, conducted at the Institute of Social Sciences, Istanbul University.

INTRODUCTION

In today's rapidly globalizing world, while competition intensifies with each passing day, issues such as environmental degradation and the depletion of natural resources are becoming increasingly critical. These developments have prompted businesses to adopt a holistic market understanding centered on consumer values and to integrate sustainable marketing practices into their global competitive strategies.

In the 21st century, sustainable marketing has become a prominent issue for businesses, driven by consumers' growing preference for companies that contribute to society and the environment. This approach refers to the provision of products and services by businesses that fulfill their environmental and social responsibilities in alignment with societal values. Consequently, sustainable marketing has transformed into a strategic approach that enables firms to operate not only with a profit-oriented mindset but also with environmental sensitivity and social responsibility (Kotler & Armstrong, 2021). Sustainable marketing is generally examined through environmental, economic, social, and cultural dimensions (Peattie, 1995). The environmental dimension encompasses actions such as reducing carbon footprints, supporting recycling, and using natural resources efficiently. The economic dimension relates to long-term financial viability and the value offered to consumers. The social dimension concerns businesses' ethical responsibilities, employee welfare, and engagement with the broader community (Elkington, 1997). The cultural dimension, on the other hand, is defined as "the preservation, evaluation, and transmission of tangible and intangible heritage, artistic production, and the knowledge and skills of various social groups, communities, and nations" (Stylianou-Lambert, Boukas & Christodoulou-Yerali, 2014). Cultural sustainability influences consumer preferences for sustainable products and services, shaped by various contextual factors.

Among these factors, "Perceived Consumer Effectiveness" (PCE) holds a significant place. PCE refers to individuals' belief that their sustainable consumption behaviors can truly make a difference in addressing environmental and social issues (Ellen, Wiener & Cobb-Walgren, 1991). Individuals who hold this belief tend to exhibit a stronger inclination toward purchasing sustainable products. The primary objective of this study is to examine the influence of sustainable marketing dimensions on consumer purchase behavior, while also investigating the moderating role of Perceived Consumer Effectiveness (PCE) in this relationship. This approach allows future research to explore the moderating effects of other variables within similar frameworks. In addition, the study aims to highlight the societal benefits that sustainable marketing practices offer to both individuals and communities. In doing so, it seeks to understand the extent to which marketing managers focus on the broader societal contributions of sustainable marketing and how they integrate this understanding into their strategic processes. The central research question guiding this study is as follows: What role does Perceived Consumer Effectiveness play in the relationship between the dimensions of sustainable marketing and consumer purchase behavior?

In summary, this study investigates the relationship between the four dimensions of sustainable marketing—economic, social, environmental, and cultural sustainability—and consumers' purchase intentions, while also exploring the moderating effect of individuals' belief in the impact of their consumption behavior, referred to as Perceived Consumer Effectiveness. Accordingly, the article is grounded in two key theoretical frameworks: (1) the theory of sustainable marketing, which posits that firms can influence consumer behavior by integrating their environmental, social, cultural, and economic responsibilities into marketing strategies, and (2) the theory of Perceived Consumer Effectiveness (PCE), which suggests that consumers' belief in the ability of their sustainable consumption behaviors to bring about real change is a significant determinant of their purchase intention. Previous literature has associated PCE with the "perceived behavioral control" component

of the Theory of Planned Behavior (TPB) (Nurse, 2009:18). The theoretical foundation of this study is also rooted in the Values–Attitudes–Behavior (VAB) model developed by Homer and Kahle (1988). According to this model, individuals’ core values shape their attitudes, which in turn drive their behaviors. Within the context of sustainable marketing, values such as environmental sensitivity, social responsibility, and cultural affinity foster positive attitudes toward sustainable marketing practices. These attitudes subsequently enhance consumers’ intention to purchase sustainable products and services.

Literature Review and Conceptual Framework

Sustainable Marketing and Consumer Purchasing Behavior

Sustainable marketing and consumer purchasing behavior are closely tied to environmental and social responsibilities. In this context, marketing strategies often include elements such as eco-friendly initiatives, fair trade, recyclable products, and social responsibility projects (Kotler, 2011). Studies on sustainable marketing have examined the effects of such strategies on purchasing behavior and generally found that consumers make purchasing decisions with consideration for environmental and societal concerns (Peattie & Crane, 2005). Consumers base their demand for sustainable products on environmental awareness, social responsibility, and economic values (Dangelico & Vocalelli, 2017). Accordingly, it is widely accepted that sustainable marketing has a direct impact on consumers’ purchase intentions.

In the study by Nguyen et al. (2019), the impact of sustainable marketing on purchase behavior was also linked to psychological factors such as brand image and trust. Consumers tend to shop from companies with an eco-friendly brand image, as they feel a greater alignment of values with these firms. Therefore, companies that communicate their sustainability messages transparently and credibly can positively influence consumer behavior. By focusing on sustainable practices, companies can enhance their brand image, which in turn contributes to higher purchase intentions in target markets (Rastogi et al., 2024). Gong et al. (2023), in their research on the Chinese electric car market, investigated how sustainable marketing practices influence brand image and purchasing behavior. Their findings revealed that sustainable marketing improves brand image, and purchase behavior increases accordingly. Brand image plays a significant mediating role in the relationship between sustainable marketing and purchase behavior. Neumann et al. (2020) examined the environmental dimension of sustainable marketing and its effects on purchase intentions in the fashion industry. Their analysis showed that trust in fashion brands and perceived consumer effectiveness (PCE) directly influence purchase intention. Sustainable marketing practices, along with growing environmental awareness among consumers and businesspeople, play a role in shaping purchase behavior. In a study by Setiawan et al. (2024) on consumers of “The Body Shop,” it was concluded that sustainable marketing has a strong influence on purchase intention. Additionally, electronic word-of-mouth communication was also found to significantly impact consumers’ purchasing intentions. Recently, sustainable beauty and personal care products have attracted growing interest in Indonesia, primarily due to the country’s high levels of pollution. Research comparing the effects of sustainable marketing versus traditional strategies seeks to reveal how sustainable marketing can transform consumer influence. Sustainable marketing refers to the shaping of business marketing strategies through environmental, social, and economic dimensions (Kelepçe Karacı, 2023). The literature frequently emphasizes that activities related to sustainable marketing have a positive impact on consumers’ purchase intentions. In particular, environmental and social sustainability dimensions are seen as critical determinants in consumers’ purchasing decisions. Çetin and colleagues (2018) indicated that sustainable marketing strategies enhance consumer loyalty and

brand value, while the influence of the economic dimension on purchase intent was found to be limited.

Jo (2023) emphasized the necessity of a comprehensive approach that considers the nuances of consumer behavior across both digital and physical environments for the effective development of sustainable marketing practices. This approach not only encompasses the promotion of sustainable products and services but also the creation of an ecosystem that facilitates and supports sustainable decision-making. In a study on sustainable insurance products, Jahnert et al. (2025) examined how sustainable marketing influences purchasing behavior and investigated the mediating roles of trust, quality, brand image, and perceived consumer effectiveness on purchase intention. The findings revealed that while sustainability has a positive influence on purchasing behavior, there is a need to improve perceptions regarding brand value, product quality, and perceived consumer effectiveness in the insurance sector. Schiffman and Kanuk (2009) defined purchase intention as the probability that a consumer will purchase a specific product, indicating that a high level of intention can translate into actual purchasing behavior. Their findings demonstrated that sustainable marketing dimensions positively affect consumer behavior and levels of environmental awareness. Furthermore, environmental awareness was found to have a significant mediating effect on the relationship between sustainable marketing strategies and consumer behavior (Jing Li et al., 2023). In a study by Neha et al. (2024), the researchers explored how fashion brands adopt sustainable marketing practices to encourage sustainable purchase behavior. Their results showed that companies could promote sustainable marketing by building brand image and consumer trust. These elements can influence consumer perceptions of sustainability and foster brand loyalty, which, in turn, plays a critical role in the development of long-term sustainable purchasing behavior. Jing Li (2023) aimed to investigate the impact of sustainable marketing practices and levels of environmental consciousness on consumer behavior. The findings revealed that sustainable marketing strategies positively influence consumer behavior and environmental awareness levels. Moreover, environmental awareness was found to mediate the relationship between sustainable marketing and consumer behavior, while environmental knowledge was shown to have a moderating effect on the link between sustainable marketing strategies and environmental awareness. Khanna (2023) examined the impact of sustainable marketing activities on purchasing behavior in the fast-moving consumer goods sector within India's food and beverage industry. The study found that demographic factors did not significantly influence sustainable purchasing behavior. Instead, purchase behavior was primarily driven by satisfaction with the product. Various attributes of sustainable marketing practices were found to directly affect both consumer behavior and customer satisfaction. Kanya (2020) also found a significant relationship between sustainable marketing and purchasing behavior, further reinforcing the importance of sustainability in shaping consumer preferences. In another study, Wang and Butuskaya (2020) examined the role of sustainable marketing activities in the context of the Beijing Winter Olympics. Their research explored the effect of sustainable marketing efforts (SME) on event image, perceived value of souvenir products, and tourists' behavioral intentions (TBI). The results revealed that sustainable marketing had a positive impact on the image of the event, the perceived value of souvenirs, and tourists' behavioral intentions. Furthermore, event image and perceived value of products served as mediators in the relationship between sustainable marketing activities and tourists' behavioral intentions.

Perceived Consumer Effectiveness (PCE)

The theory of Perceived Consumer Effectiveness (PCE) refers to individuals' belief that their own consumption behaviors can generate tangible environmental and social impacts. This belief plays a critical role in shaping sustainable consumption patterns and influencing purchase decisions. Ellen,

Wiener, and Cobb-Walgren (1991) first conceptualized PCE, demonstrating that individuals who believe their actions can positively affect the environment and society are more likely to make pro-environmental purchasing decisions. Their study showed that consumers with high levels of PCE tend to favor environmentally friendly products. Similarly, Vermeir and Verbeke (2008) emphasized that PCE is a significant determinant of sustainable food consumption, highlighting that consumers' perceptions of their own behavioral impact positively influence their intention to purchase sustainable products. Furthermore, they identified PCE as a moderator in the effectiveness of environmental marketing messages. Biswas and Roy (2015) found that PCE positively influences consumers' purchase intentions toward green products, with environmentally responsible individuals demonstrating stronger sustainable consumption behaviors. Likewise, Joshi and Rahman (2015) noted the central role of PCE among the various factors affecting sustainable consumption. They argued that consumers' self-perceived efficacy, combined with their awareness of social and environmental responsibilities, significantly shapes purchasing behavior.

Papadas, Avlonitis, and Carrigan (2018) positioned PCE as a key moderating variable in the success of sustainable marketing strategies. Their findings indicated that consumers with strong perceptions of their own effectiveness are more likely to adopt favorable attitudes and behaviors toward sustainable products. Similarly, Leonidou, Katsikeas, and Morgan (2013) demonstrated that PCE enhances consumers' attitudes and purchase intentions toward environmentally friendly products while also increasing the effectiveness of sustainability-focused marketing communications. In the context of cultural sustainability, Risius and Hamm (2017) showed that PCE also influences consumers' preferences for products that align with local and cultural values, suggesting that perceptions of personal effectiveness contribute to the preservation of cultural heritage through consumption choices. Biswas and Roy (2016) further examined the influence of PCE on green consumption behavior and found that individuals' environmental self-efficacy directly affects their intention to purchase sustainable products, especially when supported by prevailing social norms. Vermeir and Verbeke (2006) similarly found that consumers' beliefs about the environmental consequences of their actions significantly strengthen their motivation to choose sustainable food products.

In a subsequent study, Papadas, Avlonitis, and Carrigan (2019) developed a model of the impact of PCE on sustainable consumption behavior. They concluded that perceived consumer effectiveness plays a critical role in the success of marketing strategies and interacts meaningfully with the social and environmental dimensions of sustainability.

Overall, the literature consistently identifies PCE as a central factor in the formation of sustainable consumption behavior. Consumers' belief in the environmental and social consequences of their actions positively influences both their attitudes and intentions toward sustainable products. Moreover, PCE functions as a key moderator in marketing communications and sustainability strategies. In summary, the theory of Perceived Consumer Effectiveness offers a valuable conceptual framework for understanding and guiding sustainable consumer behavior. Businesses and policymakers can enhance the effectiveness of sustainable marketing practices by developing strategies that reinforce consumers' perceptions of their own impact.

Sustainable Marketing and Perceived Consumer Effectiveness

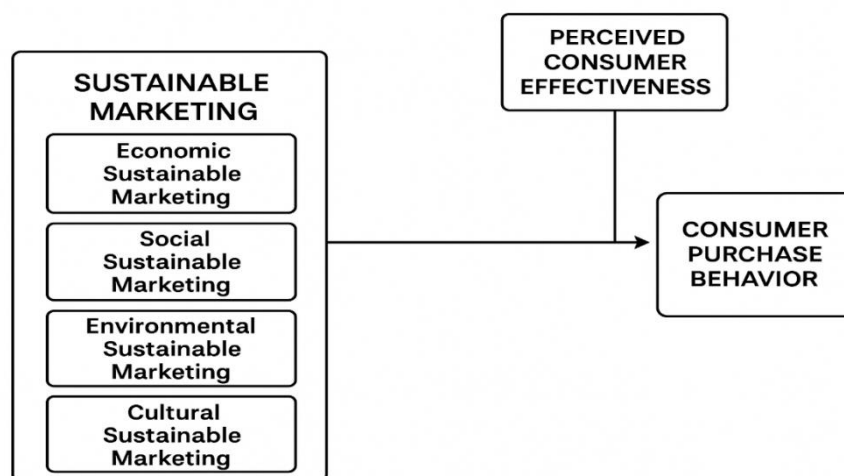
The impact of sustainable marketing on perceived consumer effectiveness (PCE) remains relatively underexplored in the existing literature. However, emerging studies suggest that sustainable marketing practices may enhance consumers' perceptions of their own effectiveness, which, in turn, positively influences their intention to purchase sustainable products. By providing consumers with information related to sustainability, brands can strengthen individuals' sense of agency in addressing

environmental challenges—ultimately shaping their purchasing intentions (Barber, 2010). In recent years, growing attention has been directed toward examining the influence of sustainable marketing dimensions on PCE. These practices can foster greater environmental sensitivity among consumers and reinforce their perceived ability to make a difference through consumption behavior. For instance, a brand’s commitment to sustainability and its environmental responsibility initiatives may lead consumers to prefer that brand, while also encouraging them to feel more accountable for their own environmental impact (Vermeir & Verbeke, 2006). In this context, sustainable marketing strategies serve not only as informational tools but also as motivational mechanisms that remind consumers of the potential power and significance of environmentally conscious choices. As a result, these strategies can significantly contribute to enhancing perceived consumer effectiveness (Barbarossa & De Pelsmacker, 2016).

METHODOLOGY

The primary objective of this research is to examine the moderating role of perceived consumer effectiveness in the relationship between sustainable marketing and purchasing behavior. Data were collected through an online survey administered via Google Forms, within the framework of a quantitative research methodology. The survey instrument was developed in accordance with ethical standards and was reviewed and approved by the Ethics Committee of Social and Human Sciences at Istanbul University on April 28, 2025, under decision number 04. The data for the research will be collected from 252 participants using an online method. Once the survey results are obtained, the final results will be evaluated. The collected data were analyzed using the SPSS statistical software package. In the development of the survey instrument, a total of 12 items related to sustainable marketing activities were adapted from the studies by Balderjahn (2013), Sang Jin Kim & Kyung Kim (2020), and Klein & Dawar (2004). Three items measuring purchasing behavior were derived from Yadav & Pathak (2016), and three items assessing perceived consumer effectiveness were obtained from Roberts (1996). The survey employed a five-point Likert scale. To analyze the research data, the normality of the distribution was first tested. As the data showed a normal distribution, exploratory factor analysis (EFA) and reliability analyses were conducted. The results confirmed that the scales used in the study were both valid and reliable. Subsequently, ANOVA analysis, multiple regression, and correlation analysis were performed to assess the relationships among the variables. Finally, the moderation model was tested to examine the accuracy of the proposed hypotheses. All statistical analyses were conducted using SPSS version 27.

Research Model



HYPOTHESES

H1: Dimensions of sustainable marketing positively influence consumers' purchasing behavior.

H2: Perceived consumer effectiveness moderates the relationship between dimensions of sustainable marketing and purchasing behavior.

Data Analysis

The sample of this study consists of 252 participants, whose demographic characteristics are as follows:

Gender: 52.4% (n = 129) of the participants are female, and 47.6% (n = 123) are male.

Marital Status: 50.4% (n = 127) are married, and 49.6% (n = 125) are single. Age Distribution: 13.9% (n = 35) are aged between 18–24, 28% (n = 113) between 25–34, 21% (n = 53) between 35–44, 22.6% (n = 50) between 45–54, and 13.9% (n = 35) are aged 55 and above. Educational Background: 2% (n = 5) have a middle school education, 8.7% (n = 22) graduated from high school, 3.2% (n = 8) hold an associate degree, 42.9% (n = 108) a bachelor's degree, 23.4% (n = 59) a master's degree, and 19.8% (n = 50) hold a doctoral degree. Monthly Personal Income: 28.5% (n = 73) earn between 22,000–35,000 TL; 18.4% (n = 47) earn 35,001–51,000 TL; 19.6% (n = 50) earn 51,001–71,000 TL; 13.6% (n = 35) earn 71,001–99,000 TL; and 18.7% (n = 47) earn 100,000 TL or above. Employment Status: 17.1% (n = 43) are students, 13.2% (n = 35) are public servants, 13.2% (n = 31) are retired, 3.9% (n = 9) are housewives, 13.5% (n = 34) are blue-collar workers, 19% (n = 48) are private sector employees, and 20.6% (n = 52) are self-employed. In terms of consumer behavior: Previous Experience with Sustainable Products: 79% (n = 199) of participants reported having previously purchased sustainable products, while 21% (n = 53) had no such experience. Sectoral Preferences for Sustainable Products: 65.1% (n = 161) prefer sustainable food products, 59.5% (n = 149) personal care and cosmetics, 70.2% (n = 176) hygiene and cleaning products, 27.9% (n = 70) transportation, 46.7% (n = 117) technological and electronic products, 65.7% (n = 165) prefer sustainable textile products.

These findings indicate a high level of awareness and demand for sustainable products among the participants.

Factor and Reliability Analysis

A reliability analysis was conducted for the variables included in the study, and all Cronbach's Alpha values were found to be above 0.80. This result indicates that the scale used in the study demonstrates a high level of internal consistency and reliability.

Additionally, in order to assess whether each item of the scale satisfies the assumption of normality, skewness and kurtosis values were examined. Acceptable thresholds were defined as ± 1.5 for skewness and ± 1.5 (or ± 2) for kurtosis, in line with criteria suggested by Tabachnick and Fidell (2007).

Table 1 Cronbach's Alpha Values

Construct	Cronbach's Alpha
Economic	0.879
Social	0.823
Environmental	0.829
Cultural	0.834
Purchase Intention	0.812
PCE	0.838

The results revealed that the skewness and kurtosis values for all items fell within these acceptable ranges. Therefore, it was concluded that the data follow a normal distribution, and parametric statistical analyses were subsequently employed.

Figure 1. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,879
Bartlett's Test of Sphericity	Approx. Chi-Square	965,546
	df	66
	Sig.	<,001

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity were conducted to assess the suitability of the dataset for factor analysis. The obtained KMO value was 0.879, which, according to Kaiser's (1974) classification, indicates an "excellent" level of sampling adequacy. This result clearly demonstrates that the dataset is appropriate for factor analysis. Moreover, it suggests that the correlations among variables are statistically significant and that the sample size is sufficient. The result of Bartlett's Test of Sphericity yielded a Chi-square value of 965.546 with 66 degrees of freedom, which was statistically significant ($p < .001$). This indicates that the variables exhibit sufficient correlations to proceed with factor analysis.

In this study, Principal Component Analysis (PCA) was used as the factor extraction method. The initial communalities of the variables were all set at 1.000, indicating that each variable contributed fully to the analysis. The communalities in the "Extraction" column were all found to be above 0.5, which suggests that each variable is adequately represented by the factor structure. Hair et al. (2010) have also stated that a communality value above 0.5 indicates a good representation of the variable by the factors. To examine the relationship between the dimensions of sustainable marketing and consumers' purchase intentions, separate Pearson correlation analyses were conducted. The results revealed a statistically significant and positive relationship between the economic sustainability dimension and consumer purchase intention ($r = 0.381$, $p < 0.001$). This finding suggests that economic practices aligned with sustainability principles may enhance consumers' purchasing tendencies. In other words, economically sustainable approaches contribute to the development of more favorable consumer attitudes, positively influencing their purchase intentions. The relationship between the social sustainability dimension and purchase intention was even stronger and

statistically significant ($r = 0.708, p < 0.001$). Social sustainability practices, such as fair working conditions, societal benefits, and ethical production processes, significantly influence consumer purchasing behavior. A correlation coefficient of 0.70 indicates a high and significant relationship between these two variables.

The environmental sustainability dimension was also found to have a positive and significant effect on purchase intention ($r = 0.637, p < 0.001$). This result highlights that corporate practices focusing on environmentally friendly production processes, reducing carbon footprints, and conserving natural resources positively influence consumer purchase decisions. Therefore, it can be asserted that marketing activities reflecting environmental responsibility significantly affect consumer behavior. These findings are consistent with the existing literature (Rahman, 2015). Furthermore, a statistically significant and positive relationship was found between cultural sustainability and consumers' purchase intentions ($r = 0.621, p < 0.001$). This result indicates that marketing practices that respect cultural values, local identity, and social heritage significantly enhance consumers' purchase intentions. The fact that correlation coefficients for the dimensions of sustainable marketing are above 0.60 reflects a strong relationship. Similarly, the literature provides evidence that cultural sensitivity positively influences brand loyalty and consumer preferences (Risius & Hamm, 2017).

Multiple Regression Analysis of the Impact of Sustainable Marketing on Purchase Behavior

Figure 2. Multiple Regression Analysis

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,778 ^a	,605	,599	,47824

The Model Summary table above demonstrates the overall fit of the regression model examining the relationship between the dependent variable (purchase intention) and the independent variables (economic, social, environmental, and cultural sustainability). According to the multiple linear regression analysis, the model's explanatory power for purchase intention is considerably high. The correlation coefficient (R) was found to be 0.778, indicating a strong and positive relationship between the independent variables and purchase intention. Furthermore, the R-squared (R^2) value is 0.605, which implies that approximately 60.5% of the variance in purchase intention is explained by the model. The Adjusted R^2 is 0.599, confirming the model's high level of explanatory power. These results demonstrate that, when considered collectively, the different dimensions of sustainable marketing have a significant impact on consumers' purchase intentions.

The model's Standard Error of the Estimate is 0.478, suggesting that the predictive performance of the model is within an acceptable margin of error and that the residual variance is relatively low.

These findings align with the literature emphasizing the significant influence of sustainability dimensions on consumer behavior (Papadas et al., 2018). Results of the Pearson correlation analysis show statistically significant and positive relationships between all dimensions of sustainable marketing and consumer purchase behavior. The highest correlation was found between social sustainability and purchase intention ($r = 0.708, p < 0.001$), indicating that marketing practices based

on social responsibility exert a particularly strong influence on consumer behavior.

Other correlations include environmental sustainability ($r = 0.637$, $p < 0.001$), cultural sustainability ($r = 0.621$, $p < 0.001$), and economic sustainability ($r = 0.381$, $p < 0.001$). These findings suggest that social, environmental, and cultural dimensions of sustainability exert a stronger influence on consumers' purchase intentions than the economic dimension, which still shows a significant but weaker effect. This implies that consumers place greater emphasis on humanistic and environmental values in their sustainability perceptions. Additionally, the moderate level of correlation between the independent variables (e.g., $r = 0.632$ between social and cultural sustainability) indicates a low risk of multicollinearity in the multiple regression analysis. These outcomes are consistent with previous studies in the literature. For instance, Joshi and Rahman (2015) emphasize the strong influence of social and environmental sustainability factors on consumer behavior, while Papadas et al. (2018) highlight the positive impact of holistic sustainability strategies on brand value and purchase behavior.

Figure.3 ANOVA Analysis

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	86,527	4	21,632	94,579	<.001 ^b
	Residual	56,493	247	,229		
	Total	143,021	251			

The ANOVA results of the multiple linear regression analysis indicate that the subdimensions of sustainable marketing—namely economic, social, environmental, and cultural sustainability—have a statistically significant effect on consumers' purchase intention ($F(4, 247) = 94.579$, $p < 0.001$). This finding demonstrates that the independent variables contribute significantly to the model and that the overall regression model is statistically meaningful. In other words, the combined impact of sustainability-oriented marketing practices plays an important role in shaping consumers' purchase intentions. The explained variance of the model ($R^2 = 0.605$), together with the high F-value, indicates that the model has strong explanatory power and that the results are unlikely to be due to random chance. Furthermore, the Variance Inflation Factor (VIF) values, which range from 1.219 to 2.075, suggest that multicollinearity is not a concern in the model ($VIF < 5$). This confirms that there is no excessively high correlation among the independent variables and that the model is statistically robust and reliable.

Moderating Effect Analysis via Multiple Regression

Figure 4. Moderating Role of Perceived Consumer Effectiveness (PCE)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,806 ^a	,650	,637	,45475

a. Predictors: (Constant), clt_Ace, ecn, ACE, soc, ecn_Ace, clt, env, soc_Ace, evn_Ace

In this study, the moderating effect of Perceived Consumer Effectiveness (PCE) on the relationship between the four main dimensions of sustainable marketing (economic, social, environmental, and cultural) and purchase intention was tested using multiple regression analysis. Interaction (multiplicative) terms were created between the independent variables and PCE (e.g., ecn_Ace, soc_Ace, clt_Ace, evn_Ace) and included in the model. According to the Model Summary table:

The model demonstrates a high explanatory power: $R^2 = 0.650$, Adjusted $R^2 = 0.637$. This means that the model explains approximately 65% of the variance in consumers' purchase intention. The correlation coefficient (R) was found to be 0.806, indicating a strong positive relationship between the independent variables and purchase intention. The standard error of the estimate is 0.45475, suggesting a low margin of error and strong predictive accuracy. These findings indicate that PCE not only has a direct effect on purchase intention, but also plays a moderating role through its interactions with certain dimensions of sustainable marketing. Literature supports that such moderating effects are especially pronounced in the context of environmental and social sustainability (Vermeir & Verbeke, 2008; Biswas & Roy, 2015). The results of the ANOVA test confirm the statistical significance of the regression model ($F(9, 242) = 49.954$, $p < .001$). This implies that the combined effect of the sustainable marketing dimensions, perceived consumer effectiveness, and their interactions has a significant impact on consumers' purchase intention. Specifically, the model explains 92.975 units of the total variance, while only 50.046 units are attributed to residual error, reinforcing the model's explanatory strength. Furthermore, the significance level ($p < 0.001$) indicates that the findings are highly reliable and not due to random chance. In conclusion, the significant F-value obtained from the ANOVA analysis ($F(9, 242) = 49.954$, $p < .001$) demonstrates that the interactions between the dimensions of sustainability and perceived consumer effectiveness significantly explain purchase intention. The study establishes that the model is statistically sound and provides a robust theoretical foundation for understanding consumer behavior in the context of sustainable marketing.

H1: The dimensions of sustainable marketing have a positive effect on consumers' purchase behavior. Accepted.

The overall significance of the model ($F = 49.954$, $p < .001$) and its explanatory power

($R^2 = .650$) indicate that the dimensions of sustainable marketing have a statistically significant and positive impact on purchase intention.

Table 2. Hypothesis

Hypothesis	Interaction Term	Beta	t	p-value	Result
H2a	Environmental_Ace	-0.148	-1.684	0.093	Marginal (Rejected)
H2b	Economic_Ace	0.093	1.562	0.12	Rejected
H2c	Social_Ace	-0.068	-0.786	0.433	Rejected
H2d	Cultural_Ace	0.083	1.166	0.245	Rejected

Except for economic sustainability, all dimensions of sustainable marketing have a positive and significant effect on purchase intention. According to the analysis results, social sustainability emerged as the strongest predictor ($\beta = 0.354$, $p < .001$).

The Moderating Role of Perceived Consumer Effectiveness (ACE) in the Relationship between Sustainable Marketing and Purchase Intention

This study examined the effects of sustainable marketing dimensions on consumer purchase intention and tested the moderating role of Perceived Consumer Effectiveness (ACE) in these relationships. The regression model included not only the main effects but also four interaction terms: *ecn_ACE*, *soc_ACE*, *evn_ACE*, *clt_ACE*. Based on the regression results:

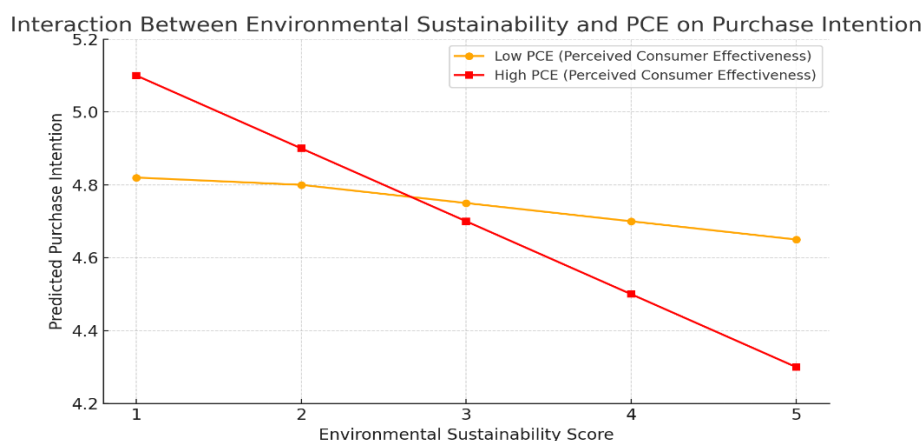
Social sustainability was identified as the most influential predictor ($\beta = 0.354$, $p < .001$), indicating that ethical production, social contribution, and socially responsible practices strongly affect purchase intention. This was followed by ACE itself ($\beta = 0.227$, $p < .001$), environmental sustainability ($\beta = 0.160$, $p = .005$), and cultural sustainability ($\beta = 0.158$, $p = .004$). The effect of economic sustainability was not statistically significant ($\beta = 0.046$, $p = .283$). Moderating Effects (Interaction Terms) -*ecn_ACE* ($\beta = 0.093$, $p = .120$): The interaction between economic sustainability and ACE is not statistically significant. However, the positive beta coefficient suggests that the effect of economic sustainability may increase as ACE levels rise. *soc_ACE* ($\beta = -0.068$, $p = .433$): The interaction between social sustainability and ACE is not significant and shows a negative direction. This may imply that as individuals perceive themselves as more effective consumers, the influence of social sustainability on purchase intention might slightly decrease. However, since the effect is not significant, this should be interpreted with caution. *evn_ACE* ($\beta = -0.148$, $p = .093$): The interaction between environmental sustainability and ACE is marginally significant (at the 10% level) and negative. This could suggest that for consumers with high ACE levels, environmental messages might be less persuasive. *CLT_ACE* ($\beta = 0.083$, $p = .245$): The interaction between cultural sustainability and ACE is also statistically insignificant. The overall results suggest that although ACE does not exhibit strong moderating effects, it plays a significant and positive direct role in shaping purchase intentions. These findings align with prior studies in the literature that highlight the direct impact of individual awareness and behavioral responsibility (e.g., Vermeir & Verbeke, 2008; Biswas & Roy, 2015).

H2: Perceived Consumer Effectiveness (ACE) has a moderating effect on the relationship between the dimensions of sustainable marketing and consumer purchase behavior.

Partially supported. The explanatory power of the model improved with the inclusion of interaction terms (R^2 increase: $.641 \rightarrow .650$), suggesting a potential moderating role of ACE. However, the lack

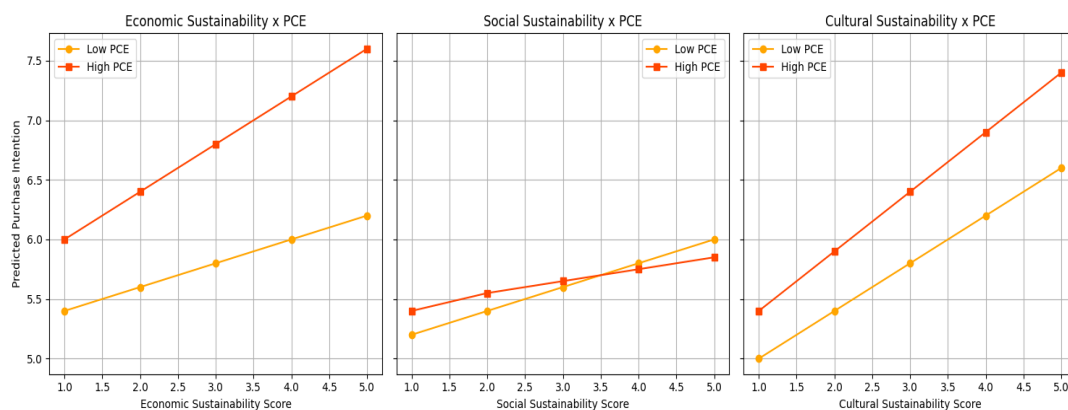
of statistical significance in the specific interaction terms limits the generalizability of this finding. None of the interaction terms were statistically significant ($p > .05$). Nevertheless, Hypothesis H2a (evn_ACE) approached marginal significance at the 10% level ($p = .093$), indicating that there may be a weak moderating effect of ACE in the relationship between environmental sustainability and purchase behavior.

Table 6. The Effect of Perceived Consumer Effectiveness on the Environmental Sustainability Dimension



As illustrated in the graph above, among individuals with low perceived consumer effectiveness (ACE) (orange line), a slight decrease in purchase intention is observed as perceptions of environmental sustainability increase. In contrast, for individuals with high levels of ACE (reddish line), an even steeper decline in purchase intention is evident with rising environmental sustainability perception. This pattern aligns with the negative interaction coefficient ($\beta = -0.148$) and its marginal significance level ($p = .093$), suggesting that the interaction between ACE and environmental sustainability is negative and borderline significant at the 10% level.

Figure 7. The Moderating Effect of Perceived Consumer Effectiveness on the Relationships Between Economic, Social, and Cultural Sustainability Dimensions and Purchase Behavior



A. Interaction Between Economic Sustainability and Perceived Consumer Effectiveness (ACE)

According to the graph above, as economic sustainability increases, purchase intention rises in parallel for both low and high levels of ACE. While higher levels of ACE are associated with increased predicted purchase intention, the interaction slope remains relatively flat. This indicates that ACE does not exert a significant moderating effect on the relationship between economic sustainability and purchase intention ($p = .120$).

B. Interaction Between Social Sustainability and ACE

In the case of social sustainability, the difference in slopes across ACE levels is more noticeable. Interestingly, the increase in purchase intention is lower for individuals with high ACE compared to those with low ACE. This finding aligns with the negative interaction coefficient observed in the analysis ($\beta = -0.068$), although the effect is not statistically significant ($p = .433$). Based on this result, individuals with high levels of Perceived Consumer Effectiveness (PCE) may be less responsive to social sustainability messages, or their purchase intentions may be influenced by other factors.

C. Interaction Between Cultural Sustainability and ACE

While the influence of cultural sustainability on purchase intention appears slightly more pronounced for individuals with higher ACE levels, the lines on the graph remain closely aligned. This observation is consistent with the non-significant interaction result obtained in the analysis ($p = .245$).

Conclusion and Recommendations

The primary aim of this study was to examine the impact of the four key dimensions of sustainable marketing—economic, social, environmental, and cultural—on consumers' purchase intentions, along with the moderating role of Perceived Consumer Effectiveness (PCE) in these relationships. The results indicate that consumer purchase behavior is significantly influenced by sustainable marketing dimensions. Correlation and multiple regression analyses confirmed that sustainable marketing dimensions have statistically significant and positive effects on consumers' purchase intentions. Social sustainability emerged as the most influential factor ($\beta = 0.354$, $p < .001$), followed by environmental ($\beta = 0.160$, $p = .005$) and cultural ($\beta = 0.158$, $p = .004$) dimensions. These findings suggest that consumers are more inclined to purchase from brands that uphold social benefit, environmental responsibility, and respect for cultural values. These results are consistent with those of Joshi & Rahman (2015) and Papadas et al. (2018). In contrast, the effect of economic sustainability was found to be statistically insignificant ($\beta = 0.046$, $p = .283$), suggesting that consumers may place less importance on economic sustainability or that awareness of such practices remains underdeveloped. The overall validity of the regression model was confirmed through ANOVA ($F(4, 247) = 94.579$, $p < 0.001$), affirming the explanatory power of sustainable marketing dimensions when considered collectively.

Moreover, the moderating role of PCE was tested. Adding interaction terms to the model resulted in an increase in explained variance (R^2 from .641 to .650), indicating a limited but potential moderating effect of PCE. However, most interaction terms were not statistically significant, with only the interaction between environmental sustainability and PCE approaching marginal significance ($p = .093$). This aligns with previous findings by Vermeir & Verbeke (2008) and Biswas & Roy (2015), suggesting that PCE may play a moderating role under certain conditions—particularly in the perception of environmental sustainability messages. In conclusion, this study is among the few to comprehensively evaluate the effects of various dimensions of sustainable marketing on consumer purchase behavior and empirically test the moderating role of PCE. It addresses notable gaps in the literature and provides a strong theoretical and practical foundation for future research. In particular,

the significant effect of cultural sustainability highlights the importance of integrating this dimension more actively into marketing strategies. Furthermore, the strong influence of social sustainability suggests that practices based on ethical production, fair trade, and social contribution substantially enhance consumer motivation to purchase. These findings are also consistent with studies by Joshi & Rahman (2015) and Leonidou et al. (2010), which emphasize the importance of socially responsible consumer behavior.

Recommendations Based on the Findings:

Social sustainability plays a critical role in shaping purchase decisions. Brands should therefore invest more in fair trade practices, ethical production, and corporate social responsibility to enhance consumer loyalty.

The visibility of environmentally friendly practices should be increased, especially for consumers with high PCE. Strengthening the impact of environmental messages in this group can improve engagement and purchase intent.

Brands that emphasize cultural sustainability should incorporate this aspect more strategically into their branding efforts. In sectors such as textiles and food, creating emotional connections through cultural elements can reinforce consumer loyalty.

The relatively weak effect of economic sustainability suggests that such efforts may not yet be fully recognized or persuasive to consumers. Hence, brands should more clearly and effectively communicate their economic sustainability strategies, such as sustainable pricing and product durability.

While PCE has a significant direct effect on purchase behavior, its moderating role is limited. Nonetheless, increasing PCE through public awareness campaigns may reinforce sustainable consumer behaviors by empowering individuals to view themselves as impactful decision-makers.

This underscores an important implication: enhancing perceived consumer effectiveness not only strengthens direct behavioral outcomes but may also amplify the effectiveness of sustainability messages in marketing communication.

REFERENCES

- Balderjahn, I. (2013). Sustainable marketing scales: Development and validation. *Journal of Business Ethics*, 120(4), 517–533. <https://doi.org/10.1007/s10551-013-1751-5>
- Barbarossa, C., & De Pelsmacker, P. (2016). Positive and negative antecedents of purchase intention for sustainable clothing: Evidence from Belgian and Italian consumers. *Journal of Fashion Marketing and Management*, 20(4), 446–468. <https://doi.org/10.1108/JFMM-12-2015-0104>
- Barber, N. (2010). The influence of brand communication on perceived consumer effectiveness. *Journal of Marketing Management*, 26(1–2), 45–61. <https://doi.org/10.1080/02672570903566238>
- Biswas, A., & Roy, M. (2015). Green products: An exploratory study on the consumer behaviour in emerging economies of the East. *Journal of Cleaner Production*, 87(1), 463–468. <https://doi.org/10.1016/j.jclepro.2014.09.075>
- Biswas, A., & Roy, M. (2016). Consumers' environmental concern and green purchase behaviour: The moderating role of perceived consumer effectiveness. *Marketing Intelligence & Planning*, 34(6), 738–752. <https://doi.org/10.1108/MIP-03-2016-0049>
- Choi, J., & Park, M. (2015). Sharing economic benefits: Sustainable marketing in local communities. *International Journal of Environmental and Rural Development*, 6(3), 89–95.

- Dangelico, R. M., & Vocalelli, D. (2017). "Green marketing": An analysis of definitions, dimensions and relationships with stakeholders. *Business Strategy and the Environment*, 26(4), 457–475. <https://doi.org/10.1002/bse.1933>
- Ellen, P. S., Wiener, J. L., & Cobb-Walgren, C. (1991). The role of perceived consumer effectiveness in motivating environmentally conscious behaviors. *Journal of Public Policy & Marketing*, 10(2), 102–117. <https://doi.org/10.1177/074391569101000210>
- Elkington, J. (1997). *Cannibals with forks: The triple bottom line of 21st century business*. Capstone.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis (7th ed.)*. Pearson Prentice Hall.
- Fujii, S., Tanaka, M., & Okamoto, K. (2001). Factors influencing recycling behavior in Japan: The role of perceived consumer effectiveness. *Family and Consumer Sciences Research Journal*, 30(4), 430–452. <https://doi.org/10.1177/1077727X01304003>
- Jahnert, A., et al. (2025). Sustainable insurance products: Mediating roles of trust, quality, brand image, and perceived consumer effectiveness. *Journal of Sustainable Finance*. (Forthcoming)
- Joshi, Y., & Rahman, Z. (2015). Factors affecting green purchase behaviour and future research directions. *International Strategic Management Review*, 3(1–2), 128–143. <https://doi.org/10.1016/j.ism.2015.04.001>
- Kamya, L. (2020). Consumer behavior and sustainability: Insights from FMCG in India. *Journal of Consumer Studies*, 35(2), 145–162.
- Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, 39(1), 31–36. <https://doi.org/10.1007/BF02291575>
- Khanna, P. (2023). Sustainable marketing in FMCG: Evidence from India's food and beverage sector. *Journal of Marketing Research*, 60(1), 78–95.
- Klein, J. G., & Dawar, N. (2004). Corporate social responsibility and consumers' perceptions of brand value. *Journal of Business Ethics*, 52(1), 65–74.
- Ko, W.-H., Chang, C.-S., & Lee, C.-C. (2015). Beyond TBL: Integrating cultural dimension into sustainable marketing. *Journal of Sustainable Development*, 8(2), 23–36.
- Kotler, P. (2011). *Reinventing marketing to manage the environmental mindshift*. Harvard Business School Press.
- Kotler, P., & Armstrong, G. (2021). *Principles of marketing (18th ed.)*. Pearson.
- Lee, C.-K., & Sung, K. (2016). Corporate social responsibility in the hotel industry: Influences on consumer behavior. *International Journal of Hospitality Management*, 55, 1–12. <https://doi.org/10.1016/j.ijhm.2016.02.004>
- Leonidou, C. N., Katsikeas, C. S., & Morgan, N. A. (2013). Greening the marketing mix: Do greener lead to greener? *International Journal of Business and Social Science*, 4(7), 86–98. <https://doi.org/10.1108/02634501311329229>
- Min Kong, & Ko, Y. J. (2017). Social sustainability in business: Impacts on stakeholder relations. *Corporate Social Responsibility and Environmental Management*, 24(2), 183–193.
- Neumann, M., et al. (2020). Trust and perceived consumer effectiveness in sustainable fashion: A cross-national study. *Fashion and Sustainability Review*, 5(1), 12–30.
- Nguyen, T. N., Lobo, A., & Greenland, S. (2019). Pro-environmental purchase behaviour: The role of green general knowledge and environmental consciousness. *Journal of Retailing and Consumer Services*, 51, 221–230. <https://doi.org/10.1016/j.jretconser.2019.06.014>
- Papadas, K. K., Avlonitis, G. J., & Carrigan, M. (2018). Green marketing orientation: Conceptualization, scale

- development and validation. *Journal of Business Research*, 101, 715–728. <https://doi.org/10.1016/j.jbusres.2018.11.022>
- Papadas, K. K., Avlonitis, G. J., & Carrigan, M. (2019). The role of perceived consumer effectiveness in green consumption: A moderated mediation model. *Journal of Business Ethics*, 154(3), 657–674. <https://doi.org/10.1007/s10551-017-3453-3>
- Peattie, K. (1995). *Environmental marketing management: Meeting the green challenge*. Pitman.
- Peattie, K., & Crane, A. (2005). Green marketing: Legend, myth, farce... or prophecy? *Qualitative Market Research*, 8(4), 357–370. <https://doi.org/10.1108/13522750510619733>
- Peterson, M., et al. (2021). Consumer behavior and sustainability: A global review. *International Journal of Consumer Studies*, 45(3), 315–331.
- Purohit, H. (2012). Demographic drivers of green purchase behavior: A comparative study. *Journal of Consumer Research*, 39(2), 234–248.
- Rastogi, P., Singh, A., & Verma, R. (2024). Sustainable marketing strategies and consumer purchase intentions. *Journal of Cleaner Production*, 299, 127–136. <https://doi.org/10.1016/j.jclepro.2021.127136>
- Risius, A., & Hamm, U. (2017). Consumer acceptance of organic food: The role of perceived consumer effectiveness and cultural values. *Sustainability*, 9(9), 1603. <https://doi.org/10.3390/su9091603>
- Roberts, J. A. (1996). Green consumers in the 1990s: Profile and implications for advertising. *Journal of Business Research*, 36(3), 217–231. [https://doi.org/10.1016/0148-2963\(95\)00150-6](https://doi.org/10.1016/0148-2963(95)00150-6)
- Ro, H., & Kim, H.-J. (2011). The influence of cultural heritage on sustainable tourism. *Tourism and Cultural Change*, 9(3), 199–214.
- Sang Jin Kim, & Kyung Kim. (2020). Consumer value and sustainable marketing dimension: A structural model. *Journal of Retailing and Consumer Services*, 54, 102111. <https://doi.org/10.1016/j.jretconser.2019.102111>
- Saraswati, P., & Wirayudha, I. (2022). Pre-purchase information search in green consumer behavior. *Indonesian Journal of Consumer Behavior*, 8(1), 15–29.
- Schiffman, L. G., & Kanuk, L. L. (2009). *Consumer behavior* (10th ed.). Pearson.
- Setiawan, H., et al. (2024). The effect of sustainable marketing on word of mouth among Body Shop consumers. *Journal of Marketing Communications*, 30(2), 181–199.
- Sheth, J. N., & Parvatiyar, A. (2021). Sustainable marketing's role in corporate strategy. *Journal of Strategic Marketing*, 29(4), 275–289. <https://doi.org/10.1080/0965254X.2020.172147>
- Straughan, R. D., & Roberts, J. A. (1999). Environmental segmentation alternatives: A look at green consumer behavior in the new millennium. *Journal of Consumer Marketing*, 16(6), 558–575.
- Stylianou-Lambert, T., Boukas, N., & Christodoulou-Yerali, F. (2014). *Cultural heritage and sustainable tourism*. Routledge.
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Pearson / Allyn & Bacon.
- Vermeir, I., & Verbeke, W. (2006). Sustainable food consumption: Exploring the consumer “attitude–behavioral intention” gap. *Journal of Agricultural and Environmental Ethics*, 19(2), 169–194. <https://doi.org/10.1007/s10806-005-5485-3>
- Vermeir, I., & Verbeke, W. (2008). Sustainable food consumption among young adults in Belgium: Theory of planned behaviour and the role of confidence and values. *Ecological Economics*, 64(3), 542–553. <https://doi.org/10.1016/j.ecolecon.2007.03.007>

Yadav, R., & Pathak, G. S. (2016). Intention to purchase organic food among young consumers: Evidences from an emerging market. *Appetite*, 96, 122–128. <https://doi.org/10.1016/j.appet.2015.09.017>

SAVING TIME OR SAVING MONEY?

EXPLORING THE EFFECT OF OPPORTUNITY COST OF TIME ON STORE DEAL PRONENESS AND VALUE CONSCIOUSNESS

Aysun Sahin

Gebze Technical University, Duzce University, aysun.sahin@gmail.com, aysunsahin@duzce.edu.tr
<https://orcid.org/0000-0003-3285-1232>

ABSTRACT

This study aims to investigate the direct effect of opportunity cost of time for finding cheaper products on consumer store deal proneness and value consciousness. The research data was gathered with online survey from personal care store consumers in Turkey, and the proposed hypothesis were assessed with partial least squares structural equation modelling (PLS-SEM) using a sample of 600 consumers who search for store deals. The results indicate that the perception of opportunity cost of time for finding cheaper products positively influence consumers' deal prone behaviors and value consciousness. This current study provides important managerial implications for retailers to develop value-driven strategies that form favorable consumer behaviors.

KEYWORDS

Opportunity cost of time, store deal proneness, value consciousness,

INTRODUCTION

The cosmetic market has experienced sustained expansion over time and is one of the markets holding relatively high substantial potential for ongoing growth and strategic development. The growing demand for personal care and cosmetic products has strengthened global competition, encoring the sector to invest in creative marketing strategies that consider the scarcity of consumers resources such as their time and Money. Retailers in this sector, to grow their income are mainly combining their mission and vision with the rising value of consumers' resources.

Despite the proliferation of research into the determinants of value driven consumer behaviour, less attention has been devoted into the role that the opportunity cost of time plays on how involved in-store promotions will help capture consumers and their value consciousness in the personal care retail environment. In today's fast-paced consumer culture, people are always making trade-offs in their mind about how much time and effort they want to spend to save money, and this study nudges them in the right direction. Yet, few have synthesized these constructs into a single model that epitomizes this intricate relationship.

To fill this void, the paper builds and tests a model that integrates opportunity cost of time for finding cheaper products, store deal proneness, and value consciousness. Anchored in Social Exchange Theory (SET), the research conceptualizes consumers' time investment in deal-seeking as a form of psychological and economic "cost" within a value-exchange relationship. SET posits that individuals assess the fairness and benefits of social and transactional interactions by weighing inputs (e.g., time, effort) against expected returns (e.g., savings, product value).

Applying Partial Least Squares Structural Equation Modelling (PLS-SEM) on a sample of 600 personal care retail consumers from Turkey, this research demonstrates that perceived opportunity cost of time has a positive effect on both deal-prone shopping behavior and value consciousness. Additionally, store deal proneness is a significant predictor of value consciousness, with mediating effect. These findings have significant implications for consumer researchers and retail strategists operating in highly competitive sectors such as personal care.

Research model and hypotheses development

Opportunity cost of time reflects the personal value placed on how one's time would be best spent when other options are foregone in favour of an activity. This general condition has been described in cognitive and decision sciences in terms of opportunity cost of mental resource allocation, the idea that allocating time and attention to one task necessarily implies a loss of benefit in the form of other potentially rewarding opportunities (Kurzban et al., 2013; Shenhav et al., 2017). Since time and attention are scarce cognitive resources, people are constantly evaluating if the return on investment of a certain action is worth their time.

Value consciousness of consumer refers to concern of consumer for paying low price while retaining the acceptable product quality (Lichtenstein et al., 1990, p. 56). It implies a cognitive inclination to optimize the effectiveness of money that is spent on the basis of cost and product performance: WP. Value-oriented consumers seek to obtain the best value by trading-off their concern with price with their desire for quality and value (Lichtenstein et al. 1990; 1993). It is consumeristic to the point that it encourages consumers to seek out products that are a better value for their cost. But value-conscious consumers reapplying extensive promotional search efforts is unlikely, when time is perceived to be of lower value (i.e., the time and cognitive effort required to secure the deals >what will be saved) when the savings may not. In such scenarios, the value consciousness – the compromise between saving money and saving time – may be more compromised, hindering one's behavioral elasticity in value consciousness. Thus, we propose the following hypothesis.

H1. The opportunity cost of time directly and positively influences consumer value consciousness.

Store deal proneness represents the general inclination of consumers to respond positively to bargain deals and also use bargain-related information for purchase decisions. Consumers who are more deal prone are more likely to adopt new shopping behavior in reaction to temporary incentives (i.e., monetary promotions i.e., discounts, price reductions) (Wakefield & Barnes, 1996). As promotion becomes criteria during consumer decision-making, such consumers look for promotions. From a resource allocation perspective, consumers who perceive their time as valuable may become more selective and strategic in their shopping behaviors. Rather than engaging in extensive price searches,

they tend to rely on store deals as efficient shortcuts to savings. Therefore, a higher perceived opportunity cost of time may increase consumers' deal proneness, encouraging them to respond more actively to promotional offers that reduce the need for extended effort (Kurzban et al., 2013; Shenhav et al., 2017). Thus, we propose the following hypothesis.

H2. Opportunity cost of time has a positive influence on store deal proneness.

Value-conscious consumers often engage in behaviors that support efficient trade-offs between price and quality. Store-level promotions—especially those that provide discounts without compromising perceived quality—are therefore particularly attractive to value-conscious consumers. As such, consumers who are highly responsive to store deals are also likely to exhibit heightened value consciousness (Lichtenstein et al.1990; 1993).

H3: Store deal proneness positively influences value consciousness

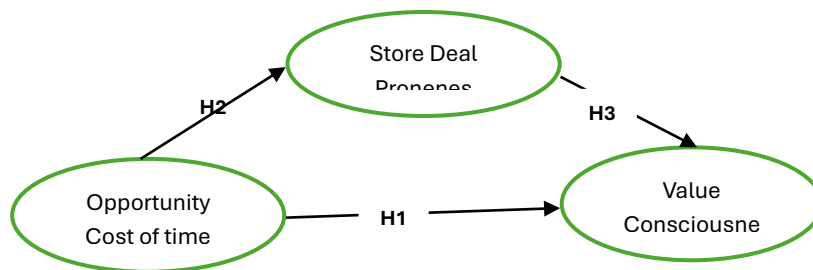


Figure.1: Conceptual Model

METHODOLOGY

Context and subjects

This study utilizes the convenience sampling approach in collecting the data. This approach is commonly preferred in quantitative studies (Etikan et al., 2016). But this approach creates some concerns related with the subjective nature in selecting the participants and data bias. To prevent these concerns, we used the common method bias test and procedures (Podsakoff et al., 2003).

The current research empirically tested the proposed model (Fig. 1) utilizing survey data from beauty and personal care store consumers who prefer private label brands (PLBs) in Turkey. The survey was pretested with 10 participants to correct any difficulties in readability. The research was performed with 600 personal care consumers who prefer private labels of personal care stores. The research sample detail is presented in Table 1.

Table 1. Respondents profile (n=600)

	No.	%		No.	%
Personal Care Store			Occupation		
Gratis	300	50%	Student	150	25%
Watson	110	18%	Primary sector employee	250	42%
Rosmann	90	15%	Government employee	100	17%
Diğer	100	17%	Business owner	55	9%
			House wife-not working	45	8%
Age			Education		
less than 20 years old	50	8%	Primary-secondary edu	100	17%
20-29 years old	250	42%	High school	200	33%
30-39 years old	150	25%	University	250	42%
40-49 years old	100	17%	Graduate	50	8%
50-59 years old	50	8%			
Gender			Residencial City		
Female	400	67%	istanbul	300	50%
Male	200	33%	Ankara	100	17%
			İzmir	100	17%
			Other	100	17%
Marital					
Single	300	60%			
Married	200	40%			

Research Instruments

Online survey was utilized in this study. It contains demographic questions related with the consumers and items based on the proposed research model in this study. As shown in Table 2, opportunity cost of time was measured with 3-item, 5-point likert scale proposed by Lichtenstein et al. (1993). Store deal proneness was measured using 3-item scale developed by Putrevu and Ratchford (1997) and Lichtenstein et al. (1993). Value consciousness was measured with 6-item, 5-point likert scale Lichtenstein et al. (1990).

Table 2. **Measures**

Construct* / Indicator	
Opportunity cost of time for finding cheaper products (Lichtenstein, et.al. 1993)	
OC1	The time spent looking for lower prices is not worth it.*
OC2	The money saved by searching for lower prices is not worth it. *
OC3	Searching for lower prices takes too much time
Store deal proneness (Putrevu and Ratchford, 1997; Lichtenstein, Ridgway, and Netemeyer 1993)	
SDP1	I check promotions to find the best personal care deals.
SDP2	I shop in a number of personal care retailers for their deals *
SDP3	I shop around to catch the best deals.
Value consciousness (Lichtenstein, et.al. 1990)	
VC1	I care about low prices, but product quality also matters to me.
VC2	I compare the prices of different personal care brands to get the best value
VC3	I aim to get the highest quality for the money I spend on personal care items.
VC4	I prefer to be sure my money is well spent when buying personal care products.
VC5	I look for lower prices but still expect a certain quality in personal care items.
VC6	I often compare unit prices of the personal care products I usually buy.
VC7	I check prices carefully to ensure good value in personal care shopping.

a. All items were measured using five-point Likert scales. anchored by “strongly disagree” (1) and “strongly agree” (5) and “very unsatisfied” (1) and “very satisfied” (5).

Data Analysis

In this research, partial least squares structural equation modelling (PLS-SEM) technique was used to analyze the research data (Chin, 1998). SmartPLS 4.01 software was utilized to test the relationships in the proposed model (Ringle et al., 2022). As a multivariate statistical analysis PLS-SEM involves two-stage assessment of measurement and structural models.

Common method bias

Common method bias was tested with Harman’s single factor test (Podsakoff et al. Its result shows that the main extracted factor a mere 39% of the total variance in the sample. Thus, it shows that common method bias is not issue in the study (Fuller et al., 2016).

Results

Measurement Model

Initially, the measurement model was tested (Hair et al., 2019). The research model consists of reflective measurement items. The assessment of reflective measurement model includes item-level reliability, internal consistency (composite reliability), internal consistency (composite reliability, convergent validity (average variance extracted: AVE), and discriminant validity (heterotrait-monotrait ratio of correlations; HTMT). As indicated in Table 3, all constructs meet the recommended threshold values. As shown in Table 3, the results indicate that the proposed model has a satisfactory discriminant validity, convergent validity, and measurement properties.

Table 3. Measurement Model

Construct/Item	FL	CA	CR (rho_a)	CR (rho_c)	AVE	VIF
	>0.7	>0.7	>0.7	>0.7	>0.5	<3
Opportunity cost of time		0.763	0.766	0.894	0.808	
OCT1	0.868					1.615
OCT2	0.878					1.615
Store diel prininiss		0.740	0.741	0.853	0.658	2.913
SDP1	0.788					1.390
SDP2	0.835					1.563
SDP3	0.811					1.499
Value consciousness		0.866	0.869	0.896	0.553	1.909
VC1	0.706					1.634
VC2	0.736					1.649
VC3	0.767					2.025
VC4	0.771					2.041
VC5	0.732					1.667
VC6	0.720					1.630
VC7	0.770					1.788

Notes: CA = Cronbach's alpha, VIF =Variance inflation factor, AVE =Average variance extracted, CR =Composite reliability.

The discriminant validity of the constructs in the proposed model was assessed with the Heterotrait-Monotrait (HTMT) method (Henseler et a., 2015). As outlined in Table 4, all HTMT values are below the threshold of 0.90, showing that discriminant validity is confirmed.

Table 5. Discriminant Validity (HTMT Criteria)

Constructs	OCT	SDP	VC
Opportunity cost of time (OCT)			
Store deal proneness (SDP)	0.667		
Value consciousness (VC)	0.536	0.5557	

Notes: OCT: Opportunity cost of time, SDP: Store deal proneness, VC: Value consciousness

Structural Model

Firstly, the collinearity issue in study was tested with variance inflation factor (VIF) values. All VIF values are below the recommended cut-off value of 3 (Hair et al., 2019). Therefore, the proposed model has no collinearity issue.

Structural model analysis begins with the prediction of the path model. The path model analysis was performed with 5,000-sample 95% bias-corrected bootstrap procedures to evaluate the direct and indirect paths with their significance levels (Hair et al., 2011). Structural model evaluation includes: collinearity (VIF); the significance of path coefficients β ; in-sample explanatory power with R^2 values; and out-of-sample predictive power with Q^2 and PLSpredict procedures. Additionally, the global fit measure with the standardized root mean square residual (SRMR) values was evaluated (Henseler, Ringle, and Sarstedt, 2015).

Table 5. Structural model

Hypotheses	β	SD	T	P	2.5%	97.5%	f^2	Support?
H1: OCT \rightarrow VC	0.501***	0.019	26.067	0.000	0.462	0.537	0.335	✓
H2: OCT \rightarrow SDP	0.285***	0.023	12.455	0.000	0.238	0.329	0.083	✓
H3: SDP \rightarrow VC	0.311***	0.023	13.548	0.000	0.266	0.355	0.099	✓
SRMR= 0.056, d_{ULS} = 0.607, d_G =0.285, NFI = 0.782								
Model fit summary:	R^2 (SDP) = 0.251, R^2 (VC) = 0.261							

*** $p < .01$

As shown in Table 5, all hypotheses were supported. Opportunity cost of time explains 25% of the variance in store deal proneness while opportunity cost of time and store deal proneness explain 26% of value consciousness. Q^2 values of two endogenous constructs are positive and thus, indicative of the model's predictive relevance (Hair et al., 2017).

Discussion

Research hypotheses findings

The present study proposed a model for exploring the associations among consumers' opportunity cost of time, store deal proneness, and value consciousness. The findings presented consumers' opportunity cost of time for finding cheaper products has a significant effect on value consciousness and store deal proneness. Furthermore, store deal proneness has a significant positive impact on value consciousness.

Research implications

The results of this study provide valuable implications for both academia and practice. Perhaps most strikingly, one of the most important findings is the powerful role of opportunity cost in shaping consumers' value consciousness. Although consumers behave with value consciousness, the opportunity cost of time is still a very relevant factor in the product's purchase decision. Thus, practitioners should strive to provide consumers with products that maximise quality-price, including the value of time, and focus on these. Secondly, store deal proneness also impacts value consciousness very strongly, which indicates that the idea of store deals is also important to reinforce the value consciousness. Lastly, the association between store deal proneness and opportunity cost of time is positive and significant, but marginally the weakest in significance (Becker, 1965; Burton et al., 1998). Thus, it has been suggested that the close association between the two should be taken into account when fostering consumer value consciousness.

Theoretical contributions

There are several novel contributions of the present research to the literature: the time of a deal leads to an opportunity cost of it that is a primary psychological factor influencing consumers' deal proneness and value consciousness. It serves to explain how consumers trade time and effort for monetary savings when making promotion decisions by providing an alternative viewpoint grounded in social exchange theory. Centered on the personal care retail industry, it applies established theories to a high-choice, promotion-rich market environment.

Practical contributions

The current study has several important implications for personal care retailers and managers. First, that the opportunity cost of time perceived by consumers has a significant impact on deal search and its association with deal-seeking behaviors suggests a need to reduce search and evaluation effort. Retailers can invest in intuitive digital solutions (e.g., personalized deal alerts, smart filters, or AI-driven recommendation systems) to reduce the amount of time and cognitive effort spent searching for relevant promotions.

Second, because store deal proneness highly predicts value consciousness, retailers ought to harness price promotion strategically so as to not only evoke short-term sales but also strengthen consumers' value perception. Creating transparent, focused and readily available promotions can satisfy the needs of both our value and time-conscious consumers.

Finally, these results highlight the importance of effective omni-channel integration. Providing easy-to-find and up-to-date promotional information can help reach high opportunity-cost consumers less likely to engage in extended deal search behaviors, regardless of channel. Retailers that match their promotional strategies with customers' time sensitivity might benefit in terms of transaction specific and general values perception.

CONCLUSION

Although a handful of studies have shed light on what influences value-seeking consumer behavior there has been limited understanding into how time opportunity cost (TOC) impacts the store deal proneness and value consciousness (VC), especially in the context of personal care retail. Further, few studies have investigated these constructs in an integrated way that considers the cognitive trade-offs that consumers must make when they compare the degree of price savings to their time investment. Therefore, the purpose of this research is to address these shortcomings in the literature by presenting and testing a research model that interrelates opportunity cost of time, deal proneness, and value consciousness. Results of the research conducted with PLS-SEM suggest that the perception of high opportunity cost of time leads to increase in both deal-prone and value conscious behavior. Furthermore, store deal proneness was found as a strong determinant of value consciousness in which the relationship was mediated.

REFERENCES

- Becker, G. S. (1965). A Theory of the Allocation of Time. *The Economic Journal*, 75(299), 493–517. <https://doi.org/10.2307/2228949>
- Burton, S., Lichtenstein, D. R., Netemeyer, R. G., & Garretson, J. A. (1998). A scale for measuring attitude toward private label products and an examination of its psychological and behavioral correlates. *Journal of the Academy of Marketing Science*, 26(4), 293–306.
- Chin, W. W. (1998). The partial least squares approach to structural equation modeling. *Modern methods for business research*, 295(2), 295-336.
- Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American journal of theoretical and applied statistics*, 5(1), 1-4.
- Euromonitor International. (2021). Retailing in Turkey: Market research report. <https://www.euromonitor.com/retailing-in-turkey/report>
- Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). Partial least squares structural equation modeling (PLS-SEM) using R: A workbook (p. 197). Springer Nature.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European business review*, 31(1), 2-24.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science*, 43, 115-135.
- Ismail, A. R. (2017). The influence of perceived social media marketing activities on brand loyalty: The mediation effect of brand and value consciousness. *Asia pacific journal of marketing and logistics*, 29(1), 129-144.
- Kurzban, R., Duckworth, A., Kable, J. W., & Myers, J. (2013). An opportunity cost model of subjective effort and

- task performance. *Behavioral and Brain Sciences*, 36(6), 661–679.
<https://doi.org/10.1017/S0140525X12003196>
- Lichtenstein, D. R., Netemeyer, R. G., & Burton, S. (1990). Distinguishing coupon proneness from value consciousness: An acquisition-transaction utility theory perspective. *Journal of marketing*, 54(3), 54-67.
- Lichtenstein, D. R., Netemeyer, R. G., & Burton, S. (1990). Distinguishing coupon proneness from value consciousness: An acquisition-transaction utility theory perspective. *Journal of Marketing*, 54(3), 54–67.
<https://doi.org/10.2307/1251816>
- Otto, A. R., & Daw, N. D. (2019). The opportunity cost of time modulates cognitive effort. *Neuropsychologia*, 123, 92-105.
- Payne, J. W., Bettman, J. R., & Luce, M. F. (1996). When time is money: Decision behavior under opportunity-cost time pressure. *Organizational behavior and human decision processes*, 66(2), 131-152.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of applied psychology*, 88(5), 879.
- Shaw, W. D. (1992). Searching for the Opportunity Cost of an Individual's Time. *Land Economics*, 107-115.
- Shenhav, A., Musslick, S., Lieder, F., Kool, W., Griffiths, T. L., Cohen, J. D., & Botvinick, M. M. (2017). Toward a rational and mechanistic account of mental effort. *Annual Review of Neuroscience*, 40, 99–124.
<https://doi.org/10.1146/annurev-neuro-072116-031526>
- Spiller, S. A. (2011). Opportunity cost consideration. *Journal of Consumer Research*, 38(4), 595-610.
- Sweeney, J. C., & Soutar, G. N. (2001). Consumer perceived value: The development of a multiple item scale. *Journal of retailing*, 77(2), 203-220.
- Tversky, A., & Shafir, E. (1992). Choice under conflict: The dynamics of deferred decision. *Psychological Science*, 3(6), 358–361
- Wakefield, K. L., & Barnes, J. H. (1996). Retailing hedonic consumption: a model of sales promotion of a leisure service. *Journal of retailing*, 72(4), 409-427.
- Zhao, C. X., Jiang, C. M., Zhou, L., Li, S., Rao, L. L., & Zheng, R. (2015). The hidden opportunity cost of time effect on intertemporal choice. *Frontiers in Psychology*, 6, 311.

PROACTIVE CUSTOMER LOYALTY INITIATIVES IN THE TELECOMMUNICATIONS SERVICES INDUSTRY – EVIDENCE FROM MONTENEGRO

Sabahudin Kujović

Telecommunications Company Mtel, Podgorica, Montenegro, sabahudin.kujovic@mtel.me

Ivana Domazet

Institute of Economic Sciences Belgrade, Srbija, ivana.domazet@bba.edu.rs

<https://orcid.org/0000-0002-3493-4616>

ABSTRACT

The main objective of this paper is to analyze the causes and parameters of customer churn in the telecommunications industry in Montenegro and to identify an effective model for reducing churn rates. Customer retention and churn reduction lead to higher profitability and the lifetime value of customers. This makes churn management an important task for telecom companies, as retaining existing customers is much more cost-effective than acquiring new ones. Monitoring customer churn and its impact on revenue and profitability increases the need for proactive measures to address this challenge. Accordingly, this paper presents a detailed study of customer churn in one (of four) telecom operators in Montenegro. The reasons and motivations for customer churn (if any) are identified and the necessary measures to reduce the risk of churn are outlined. In addition, the potential of AI-driven predictive models for processing large amounts of customer data to accurately predict the risk of customer churn is analyzed. Key strategies to reduce customer churn are explored, including personalized marketing campaigns, targeted interventions and proactive customer retention initiatives based on predictive analytics. Recommendations are also made for further improving customer relationship management (CRM) in telecommunications companies, as both maintaining existing customers and attracting new ones is the goal of any development strategy and the basis for profitable business in this industry.

KEYWORDS

CRM, churn, customer retention, customer data processing, customer satisfaction, loyalty.

INTRODUCTION

In the highly competitive telecommunications industry, customer churn may exert profound adverse effects on user satisfaction, profitability, and customer loyalty (Luo et al., 2024). Telecommunications networks in Montenegro are characterized by a high level of development, where state-of-the-art technologies are employed to provide electronic communication services. The market is exceptionally dynamic, with considerable user migration across operators. Seasonal fluctuations associated with tourism, the proliferation of digital services and platforms, as well as number portability—which facilitates operator switching—further intensify this dynamism. Consequently, understanding and mitigating customer churn has emerged as a strategic imperative for telecommunications companies seeking to sustain growth and profitability.

A closer examination of the drivers of customer attrition reveals several critical determinants. These include substandard service quality, delays in fault resolution, frequent alterations to contractual terms, inadequate customer support, (non-)competitive pricing, and the inability to meet specific

customer requirements. Proactive identification and effective management of these determinants are indispensable for companies aspiring to minimize churn rates and cultivate user loyalty. Importantly, the implications of churn extend well beyond immediate revenue losses, as they also compromise brand reputation and market positioning. To preserve market share and profitability, telecommunications operators must therefore ensure that their churn rates remain below the industry average. Whereas the average monthly churn rate in the global telecommunications sector is approximately 2.6% (Havlei, 2003), in Montenegro it exceeds 3%. Hence, customer retention is recognized as the most profitable strategic orientation (Kureshi, Rehman, Kamar, Kamal, & Rehman, 2013; Vei & Chiu, 2002), not only because it strengthens corporate reputation, but also because it reduces marketing expenditures related to customer acquisition (Bolton & Bronkhorst, 1995; Reichheld & Sasser, 1990).

The overarching objective of churn reduction is to design realistic and operationally feasible retention strategies, particularly within intensely competitive markets. A comparative analysis of return on investment between acquiring new customers and retaining existing ones clearly demonstrates the cost-effectiveness of the latter (Reinartz & Kumar, 2003; Lang & Peterson, 2004). Furthermore, generating sales from existing customers is generally more straightforward than acquiring new users (Ascarza, Iengar, & Schleicher, 2016). Accordingly, telecommunications operators must develop analytical models capable of examining churn and migration parameters and of predicting early indicators of voluntary attrition (Vei & Chiu, 2002). In this regard, leveraging customer databases as strategic assets becomes critical for understanding churn behavior (Coussement & Van den Poel, 2008). These databases typically encompass records of customer service interactions, detailed billing information, payment histories, and customer satisfaction indices. Beyond predicting the likelihood of churn, firms must also seek to uncover its root causes, which enables the profiling of at-risk customers and the formulation of targeted retention campaigns (Leung, Pazdor, & Souza, 2021). Effective churn modeling thus entails two interrelated components: (i) predicting whether a specific customer is likely to churn, and (ii) uncovering the reasons for their departure, either at a local or global level.

Among the prominent factors influencing customer migration are frequent modifications to contractual terms of service. This illustrates the necessity of deploying artificial intelligence-driven predictive models to systematically monitor churn. By utilizing advanced machine learning algorithms and predictive analytics techniques, telecommunications companies are able to analyze vast datasets encompassing users who repeatedly switch providers in pursuit of favorable promotional offers. Such analytical capabilities enable companies to devote targeted attention to these segments and to implement specialized retention strategies aimed at reinforcing loyalty. Enhancements in Customer Relationship Management (CRM) systems further facilitate a deeper understanding of user habits, preferences, and expectations, thereby strengthening firms' capacity to counteract churn. For example, operators may identify high-value customers with substantial monthly expenditures who are at risk of attrition and intervene through personalized offers, loyalty programs, or proactive customer support initiatives.

In sum, telecommunications operators must adopt a continuous, data-driven approach to managing churn-related factors if they are to maintain a competitive edge and safeguard their customer base. Artificial intelligence tools offer particularly promising opportunities, as they enable the precise identification of behavioral patterns, the detection of emerging trends, and the early recognition of potential attrition. AI-driven predictive models thus constitute a powerful instrument for firms endeavoring to mitigate churn and reinforce customer loyalty, as they allow for the optimization of resource allocation (both technological and human) and the strategic budgeting of marketing and sales initiatives in line with anticipated future churn rates.

METHODOLOGY

Using the case of one of the four existing telecommunications companies in Montenegro, this study identified and examined in detail the parameters that influence customer churn. A mixed-method approach was employed, combining quantitative data analysis with qualitative insights derived from customer comments and cancellation forms. Particular emphasis was also placed on the deductive method, drawing upon established knowledge from the academic literature. The objective of the research is to determine the underlying causes of customer migration and to define universal measures for customer retention. The implementation of a Customer Relationship Management (CRM) system within a telecommunications company represents a crucial factor in successfully addressing the problem of customer churn. CRM facilitates the development of strong customer relationships, which are fundamental to generating future revenues and profits. Satisfied customers are more likely to remain with the company, increase their spending on its products and services, and provide positive recommendations, thereby attracting new customers. While lists of potential customers can be compiled relatively quickly and easily, building long-term trust and understanding with customers is a gradual process characterized by trial and error and by continuous adaptation of business operations to customer needs and preferences.

The collection and processing of customer data, together with the subsequent analysis and action based on such insights, make CRM an indispensable tool. CRM serves as an important instrument that enables telecommunications companies to maintain effective communication with customers, improve retention, and ultimately increase revenues. Utilizing data collected through CRM systems and other communication channels provides a strategic advantage. Particularly important are data on the duration and nature of contractual relationships, the range of service packages utilized, the history of customer service interactions, and established measures of customer satisfaction (NPS, CSI). The CRM concept is closely linked to all business units directly interacting with customers (i.e., front-office operations). Within companies, CRM is primarily carried by marketing, sales, and customer service departments. In practice, CRM integrates these functions and communication channels into a unified customer-centric approach, with the aim of improving relationships, enhancing satisfaction, and thereby reducing customer churn.

The data stored within CRM systems allow companies to develop a comprehensive overview of their customers. The qualitative data analyzed in this study included textual comments from customer cancellation requests, as well as interviews conducted with a small number of customers who had discontinued the service. These interviews were carried out in operator retail outlets. For quantitative data, linear regression analysis was applied, whereas qualitative data in the form of comments and interview responses were examined through thematic analysis in order to identify key themes and sources of customer dissatisfaction. Having established the significance of addressing churn—given its intrinsic connection to loyalty and profitability—the role of CRM, combined with organizational knowledge and commitment to this issue, is recognized as decisive for long-term success (Kodua et al., 2022; Dhali et al., 2023).

This study further explores key strategies for mitigating churn, including personalized marketing campaigns, targeted sales initiatives, loyalty programs, and proactive engagement strategies. Personalized marketing campaigns utilize customer data and segmentation techniques to tailor marketing messages and offers to individual preferences, interests, and behaviors. By delivering timely and relevant content, such campaigns aim to enhance engagement, build brand loyalty, and encourage repeat purchases, thereby reducing churn. The success of personalized marketing initiatives depends on the effective use of customer data and the accurate identification of customer preferences and needs. Segmentation plays a critical role in this process, as it allows companies to categorize their customer base into distinct groups with shared characteristics or behaviors.

Personalized campaigns increasingly rely on advanced technologies and cloud-based solutions to predict customer behavior and optimize campaign performance. They represent a powerful strategy for reducing churn by delivering targeted, relevant, and timely messages that resonate with customers, thereby reinforcing brand loyalty and minimizing attrition.

All data were anonymized, and access to the database was granted by company management for the purpose of improving customer experience. Participants in the qualitative component of the study provided informed consent for the use of their information for academic purposes.

RESULTS

The results of the research and the analysis of CRM data indicate the existence of clear behavioral patterns that may signal an increased risk of customer churn. Quantitative analysis revealed that users who, in the preceding period, had shorter contractual commitments, expressed dissatisfaction with service quality, purchased fewer additional services, and frequently delayed bill payments were significantly more likely to switch operators within the following six months. These parameters reflect overall low customer satisfaction and weak engagement, both of which have proven to be strong predictors of churn.

Further analysis confirmed that users are more likely to switch operators during periods when competitors offer more favorable promotional campaigns, highlighting a high degree of price sensitivity and low loyalty among customers dissatisfied with the basic level of service. We also analyzed respondents' attitudes regarding their intention to leave the company (p13), taking into account the length of contractual obligations (p5) and perceived service quality (p10).

The sample consisted of 207 users, of whom 95 were female and 112 male. This is a representative sample covering the entire territory of Montenegro, stratified by region. In selecting the sample, attention was given to users' age and income levels, ensuring the relevance and validity of the research. Thus, variable p13 was treated as the dependent variable, while p5 and p10 were treated as independent variables.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	female	95	45.9	45.9	45.9
	male	112	54.1	54.1	100.0
	Total	207	100.0	100.0	

Correlations

		p10	p5	p13
p10	Pearson Correlation	1	-.008	-.206**
	Sig. (2-tailed)		.905	.003
	N	207	207	207
p5	Pearson Correlation	-.008	1	.525**
	Sig. (2-tailed)	.905		.000
	N	207	207	207
p13	Pearson Correlation	-.206**	.525**	1
	Sig. (2-tailed)	.003	.000	

N	207	207	207
---	-----	-----	-----

Pearson's correlation coefficient indicates a weak but statistically significant relationship between p10 and p13 ($p = 0.003 < 0.05$). Variables p10 and p5 were found to be independent ($p = 0.908 > 0.05$), whereas the correlation between p5 and p13 was statistically significant ($p < 0.05$).

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.563 ^a	.317	.310	.779

The two independent variables included in the model explain 31.7% of the variance in the dependent variable ($R^2 = 0.317$).

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	57.401	2	28.700	47.253	.000 ^b
	Residual	123.904	204	.607		
	Total	181.304	206			

ANOVA

$F(2, 204) = 47.253, p < 0.05$

The F-statistic confirms that the regression model as a whole is statistically significant. Examination of the t-values and their associated significance levels indicates that both the length of contractual obligations and perceived service quality significantly influence users' intentions to leave the company.

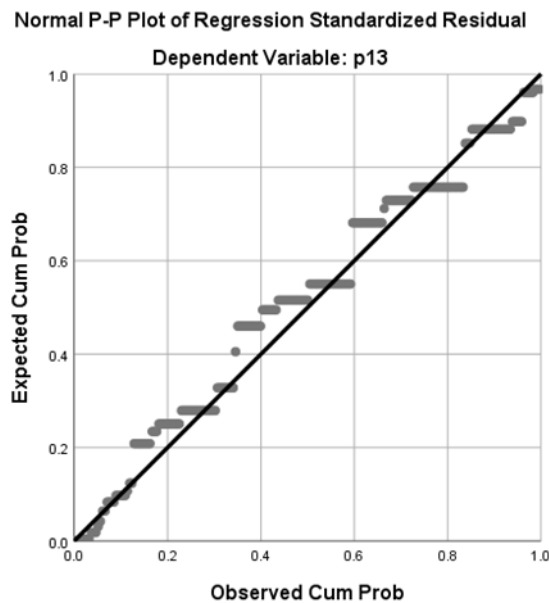
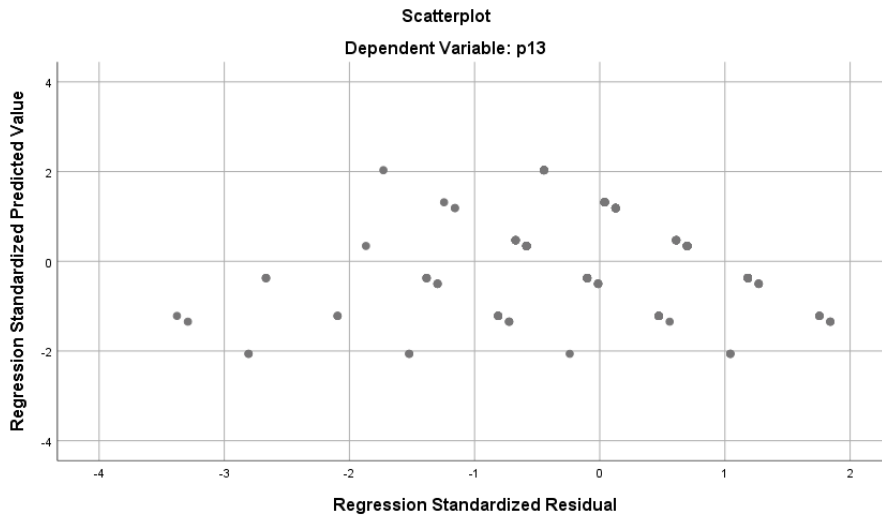
Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.497	.232		15.043	.000		
	p5	.446	.049	.524	9.050	.000	1.000	1.000
	p10	-.378	.109	-.201	-3.475	.001	1.000	1.000

The regression equation can be expressed as:

$$y=3.497+0.446p5-0.378p10$$

This indicates that longer contractual commitments are positively associated with customer retention, whereas lower perceived service quality increases the likelihood of churn.



The normal distribution of standardized residuals supports the validity of the regression model.

Qualitative analysis of cancellation requests and customer interviews further reinforced the quantitative findings, highlighting dissatisfaction with prices, unstable internet service quality, slow and inefficient technical support, and frequent price changes as the most common reasons for churn. These results, derived from interviews with 20 former customers conducted in operator retail stores, align with CRM theory, which emphasizes that high-risk customers often experience multiple

negative service encounters, perceive limited added value, feel neglected compared to new customers, and actively monitor competitors' offers. Consequently, firms should prioritize retaining customers who are both loyal and profitable (Naim, 2022; Masud et al., 2023a).

The research also showed that the highest churn rates occurred among operators offering only a single segment of telecommunications services, with churn exceeding the 3% threshold. In contrast, operators providing bundled mobile and cable services achieved greater success in retaining and acquiring customers. Moreover, churn rates were higher among users whose contractual obligations had expired and who renewed their agreements on a month-to-month basis. By contrast, customers utilizing advanced technologies such as 5G, VoLTE, and fiber-optic infrastructure were far less likely to switch operators, largely because they enjoyed state-of-the-art services, stable quality, competitive pricing, and, in some cases, limited technological alternatives due to slower adoption by competitors.

The foundation of customer retention strategies should be the implementation of CRM solutions designed to cultivate long-term relationships with customers through trust, responsiveness, high service quality, and reliability. The core of a successful CRM strategy lies in the company's ability to leverage reliable and high-quality customer information to provide superior service while maintaining an optimal balance between quality and price. Companies must maintain accurate records of the reasons customers defect to competitors. Based on our analysis, we recommend the following actions to reduce churn:

- Adapt service offerings, products, processes, and communication channels to customer needs and expectations.
- Personalize solutions to meet individual customer requirements.
- Implement customer loyalty programs.
- Continuously enhance customer care and engagement.
- Improve network quality.
- Prevent conflicts and minimize sources of dissatisfaction.
-

Telecommunications companies in Montenegro must critically assess their business models and customer strategies by adopting CRM as an advanced customer relationship management approach. This is particularly important given the rising demand for a single operator capable of fulfilling all customer needs, the ongoing acquisitions of smaller operators as companies seek new revenue streams, and the intense technological competition among service providers (Gerpott, Rams, & Schindler, 2001).

CONCLUSION

This paper focuses on the use of advanced analytics and predictive modeling to segment and analyze users based on various characteristics and behaviors. By understanding different customer segments, companies can tailor their marketing and sales efforts to meet the specific needs and preferences of each group. Implementing CRM systems can help identify potential churns, analyze at-risk user behavior patterns and take proactive measures to retain customers. Through effective customer segmentation and the application of personalized strategies, companies can increase customer satisfaction and loyalty, reduce churn and ultimately drive business growth (Harini T, Sandhya B, 2024).

In the telecommunications industry, it is crucial to accurately predict which customers are likely to leave the operator. The ability to identify customers at risk enables companies to take timely action and implement customer retention strategies. Our study has identified the key drivers of customer

churn and the direction in which customer retention strategies should evolve. Customer retention is a critical component of business strategy in the telecoms industry as companies strive to maintain a stable and loyal customer base. Customer churn is the process by which users stop using a company's services and switch to a competitor. This poses a significant threat to profitability and market share (Rane, Achari, & Choudhari, 2023). High churn rates can lead to increased costs in acquiring new customers and loss of revenue from existing customers. In such a competitive environment, where the cost of acquiring new customers exceeds the cost of retaining existing customers, telecommunications companies must prioritize strategies to minimize customer churn and strengthen customer loyalty (Hammah, 2020).

Customer churn can be caused by various factors, such as dissatisfaction with service quality, pricing, customer support and the availability of better offers from competitors. Accordingly, understanding and predicting customer churn is a top priority for telecommunication companies to retain customers and proactively improve overall business performance (Bhattachariia & Dash, 2021; Lappeman, Franco, Varner, & Sierra-Rubia, 2022). Dealing with customer churn is particularly important for telecommunications companies in Montenegro for several reasons:

1. The telecommunications market is highly saturated, with strong providers offering similar products and services. This saturation makes it easier for customers to switch providers if they are dissatisfied with their current service, which increases the risk of churning.
2. The cost of acquiring a new customer is often significantly higher than the cost of retaining an existing customer, especially when considering the technologies used in Montenegro for customer acquisition as well as the significant marketing, advertising and operational costs associated with acquiring new customers.

As a result, customer retention can lead to significant cost savings and higher profitability (Saleh & Saha, 2023). High churn rates can also have a negative impact on a company's financial stability and growth prospects. When customers churn, their revenue is lost, disrupting cash flow and financial planning. This loss can be particularly damaging in the telecommunications industry, where companies often operate on low profit margins. Increased churn rates can also undermine customer confidence and affect the influx of new users (Melian, Dumitrache, Stancu & Nastu, 2022). In Montenegro, regulatory pressure and increasing competition in the telecom sector have forced telecom companies to focus more on customer-centric strategies. Regulatory authorities often set strict guidelines in terms of service quality and pricing, making it essential for telecommunications companies to consistently meet their customers' expectations.

REFERENCES

- Ascarza, E., Iyengar, R., & Schleicher, M. (2016). The perils of proactive churn prevention using plan recommendations: Evidence from a field experiment. *Journal of Marketing Research*, 53(1), 46–60. <https://doi.org/10.1509/jmr.13.0166>
- Bhattachariia, D., & Dash, S. S. (2021). Customer churn analytics: Predicting customer attrition using machine learning. *International Journal of Information Management Data Insights*, 1(2), 100016. <https://doi.org/10.1016/j.ijime.2021.100016>
- Bolton, R. N., & Bronkhorst, T. M. (1995). The relationship between customer satisfaction, customer loyalty, and profitability: An empirical study. *International Journal of Service Industry Management*, 6(4), 20–38.
- Coussement, K., & Van den Poel, D. (2008). Churn prediction in subscription services: An application of support vector machines while comparing two parameter-selection techniques. *Expert Systems with Applications*, 34(1), 313–327. <https://doi.org/10.1016/j.eswa.2006.09.038>

- Gerpott, T. J., Rams, W., & Schindler, A. (2001). Customer retention, loyalty, and satisfaction in the German mobile cellular telecommunications market. *Telecommunications Policy*, 25(4), 249–269.
- Hammah, J. (2020). Predictive analytics in customer churn management: Evidence from telecoms industry. *International Journal of Business Analytics and Intelligence*, 8(2), 37–48.
- Havlei, L. (2003). Mobile churn rates: An international benchmark. *Telecom Research International Journal*, 7(3), 44–50.
- Iang, B., & Peterson, R. T. (2004). An analysis of customer retention strategies in the telecommunications industry. *Journal of Strategic Marketing*, 12(1), 25–40.
- Kodua, A. B., Adjin-Tettey, T. D., & Botchey, C. M. (2022). Enhancing customer retention through CRM adoption in telecoms. *Journal of Relationship Marketing*, 21(1), 13–27.
- Kureshi, S., Rehman, A., Kamar, A., Kamal, Y., & Rehman, K. (2013). Customer retention and churn management in the telecom industry: A case study. *Journal of Business Strategies*, 7(1), 11–19.
- Lappeman, J., Franco, A., Varner, T., & Sierra-Rubia, L. (2022). The role of artificial intelligence in customer loyalty and retention strategies. *Journal of Marketing Management*, 38(7–8), 765–789.
- Leung, E., Pazdor, L., & Souza, J. (2021). Segmenting and predicting telecom churn with explainable AI: A hybrid model approach. *Decision Support Systems*, 144, 113516. <https://doi.org/10.1016/j.dss.2021.113516>
- Liao, C., & Lien, C. (2012). Customer retention in the telecom industry: How customer satisfaction and loyalty programs affect churn. *Asia Pacific Management Review*, 17(3), 281–295.
- Masud, M. A., Zikria, Y. B., Ahmed, S. H., & Kim, D. (2023a). Explainable AI for churn prediction in telecom: An interpretable model for customer retention. *IEEE Access*, 11, 23234–23245.
- Melian, C., Dumitrache, I., Stancu, R., & Nastu, S. (2022). Customer churn behavior in mobile telecom: Evidence from emerging markets. *Journal of Strategic and International Studies*, 17(1), 54–65.
- Naim, A. (2022). Understanding user churn in telecom: A behavioral and machine learning approach. *International Journal of Marketing & Business Communication*, 11(2), 31–41.
- Rane, N. G., Achari, M. R., & Choudhari, S. A. (2023). Predictive modeling techniques for telecom churn prediction. *International Journal of Engineering Research and Technology*, 12(3), 58–65.
- Reichheld, F. F., & Sasser, W. E. (1990). Zero defections: Quality comes to services. *Harvard Business Review*, 68(5), 105–111.
- Reinartz, W., & Kumar, V. (2003). The impact of customer relationship characteristics on profitable lifetime duration. *Journal of Marketing*, 67(1), 77–99.
- Routh, R., Roi, M., & Meier, S. (2021). Predictive modeling of telecom customer churn: A survival analysis approach. *Telecommunications Policy*, 45(10), 102264.
- Saleh, K., & Saha, A. (2023). Comparative study on customer churn prediction using machine learning. *Journal of Big Data Analytics in Marketing*, 5(1), 25–39.
- Shalini, M., & Kavitha, R. (2023). Understanding voluntary customer churn: Drivers and strategies in telecom industry. *International Journal of Customer Relationship Marketing and Management*, 14(1), 1–17.
- Vei, C., & Chiu, C. (2002). A comparative analysis of churn prediction models in the mobile telecommunications industry. *International Journal of Information Technology & Decision Making*, 1(2), 219–233.
- Villoughbi, S. (2023). Exploring churn dynamics in digital communications: A customer-centric approach. *Journal of Telecommunications Strategy*, 10(2), 103–118.

***PSYCHOLOGICAL AND
ORGANIZATIONAL
DRIVERS***

THE MEDIATING ROLE OF PSYCHOLOGICAL EMPOWERMENT IN THE EFFECT OF GENERAL SELF-EFFICACY ON JOB CRAFTING: A STUDY ON AVIATION INDUSTRY EMPLOYEES

Semih Soran

Özyeğin University, Istanbul, Türkiye, semih.soran@ozyegin.edu.tr

<https://orcid.org/0000-0002-8731-9860>

Pınar Horasanlı Gökalp

Özyeğin University, Istanbul, Türkiye, pinar.horasanli@ozyegin.edu.tr

<https://orcid.org/0000-0003-3572-3551>

ABSTRACT

This research examines the mediating role of psychological empowerment in the effect of general self-efficacy levels of pilots and cabin crew working in airlines on job crafting behaviors from a strategic management perspective. Drawing on Resource-Based View theory and Dynamic Capabilities framework, this study investigates how individual psychological factors function as strategic human capital resources that contribute to organizational competitive advantage. A quantitative research method was adopted using an explanatory relational survey model. Data were collected from 250 aviation employees (127 pilots, 123 cabin crew) working in Turkish airline companies through structured questionnaires. General Self-Efficacy Scale, Psychological Empowerment Scale, and Job Crafting Scale were used as measurement instruments. Structural equation modeling analysis was performed to test the research hypotheses. Results show that general self-efficacy positively affects psychological empowerment ($\beta = .570, p < .001$) and job crafting ($\beta = .420, p < .001$). Psychological empowerment positively affects job crafting ($\beta = .280, p = .002$). Bootstrap analysis confirmed that psychological empowerment plays a partial mediating role in the relationship between self-efficacy and job crafting (indirect effect: $\beta = .122, 95\% \text{ CI } [.047, .204]$). The proposed structural model showed excellent fit values. From a strategic management perspective, these findings reveal that self-efficacy affects job crafting behaviors both directly and indirectly through psychological empowerment, demonstrating how individual psychological resources can be developed as sources of sustainable competitive advantage. The research provides important implications for strategic human resource management in the aviation industry, including competitive advantage through human capital optimization, operational excellence through empowered employees, and organizational agility through job crafting behaviors.

KEYWORDS

Job crafting, self-efficacy, psychological empowerment, aviation industry, structural equation modeling

INTRODUCTION

In today's rapidly changing business world, employees' ability to proactively shape their own jobs has become a critical factor for organizational success and sustainable competitive advantage. From a strategic human resource management perspective, employee proactivity represents a valuable organizational resource that contributes to dynamic capabilities and organizational agility (Wright & McMahan, 1992; Teece, 2007). Job crafting is conceptualized as employees' redefinition of the physical, cognitive, and relational boundaries of their work (Wrzesniewski & Dutton, 2001). This concept has gained particular significance in strategic management literature as it enables organizations to develop adaptive capacity and maintain competitive advantage in turbulent environments.

According to the Resource-Based View (RBV) theory, organizational resources that are valuable, rare, inimitable, and non-substitutable (VRIN) constitute the foundation of sustainable competitive

advantage (Barney, 1991). In this context, employees' self-efficacy beliefs and psychological empowerment perceptions can be considered as strategic human capital resources that are difficult to replicate and transfer between organizations. Dynamic capabilities theory further suggests that an organization's ability to integrate, build, and reconfigure internal and external competencies is crucial for achieving competitive advantage in rapidly changing environments (Teece et al., 1997). Job crafting behaviors of employees can be viewed as manifestations of these dynamic capabilities at the individual level, enabling organizational adaptation and innovation.

This concept is particularly significant in the aviation industry, which is characterized by high security requirements, strict adherence to standard procedures, and intense competitive pressures. The aviation sector operates in a highly regulated environment where both operational excellence and strategic flexibility are essential for competitive advantage. In such contexts, employees' ability to craft their jobs within regulatory constraints becomes a critical organizational capability that can differentiate airlines in terms of service quality, operational efficiency, and adaptability to market changes.

Self-efficacy, among the antecedents of job crafting behavior, refers to individuals' beliefs about their ability to cope with challenges and achieve their goals (Bandura, 1997). From a strategic human resource management perspective, self-efficacy represents a form of human capital that enhances organizational performance through improved employee engagement, innovation, and adaptability (Wright & McMahan, 1992).

Psychological empowerment is a multidimensional construct encompassing employees' perceptions of meaning, competence, self-determination, and impact regarding their work (Spreitzer, 1995). According to strategic empowerment theory, psychologically empowered employees contribute more effectively to organizational goals and strategic initiatives, as they experience greater autonomy and responsibility in their roles (Conger & Kanungo, 1988).

The positive relationship between self-efficacy and job crafting is theoretically and empirically supported in both organizational behavior and strategic management literature (Tims et al., 2012; Bakker et al., 2012). However, research on the mediating role of psychological empowerment in this relationship remains limited, particularly from a strategic management perspective. Understanding these relationships in industries with high security requirements and competitive pressures, such as the aviation sector, will contribute both theoretically to strategic human resource management literature and provide important findings for developing competitive advantage through human capital optimization.

The primary purpose of this research is to examine the mediating role of psychological empowerment in the effect of general self-efficacy levels of pilots and cabin crew working in airlines on job crafting behaviors, with a particular focus on strategic implications for organizational performance and competitive advantage. The research contributes to job crafting literature from both aviation industry and strategic management perspectives, tests the integration of Social Cognitive Theory, Psychological Empowerment Theory, and Resource-Based View theory, and explains the mediating mechanism of psychological empowerment in the self-efficacy-job crafting relationship within a strategic framework.

METHODOLOGY

This research adopted a quantitative research method to examine the mediating role of psychological empowerment in the effect of general self-efficacy levels of pilots and cabin crew working in airlines on job crafting behaviors. The research was conducted using an explanatory relational survey model with cross-sectional data collection.

The research population consists of pilots and cabin crew actively working in airline companies operating in Turkey. According to data from the Directorate General of Civil Aviation (DGCA), there are approximately 8,500 pilots and 15,000 cabin crew members in Turkey as of 2024. A total of 250

aviation employees participated in the research. 50.8% (n=127) of the participants are flight crew (pilots), and 49.2% (n=123) are cabin crew. Convenience sampling method was used due to the work intensity and access difficulties of aviation industry employees.

A structured questionnaire form was used for data collection. The questionnaire consists of four sections: demographic information form, general self-efficacy scale, psychological empowerment scale, and job crafting scale. The General Self-Efficacy Scale developed by Schwarzer and Jerusalem (1995) and adapted to Turkish by Aypay (2010) was used. The Psychological Empowerment Scale developed by Spreitzer (1995) and adapted to Turkish by Ergeneli, Ari, and Metin (2006) was utilized. The Job Crafting Scale developed by Tims, Bakker, and Derks (2012) and adapted to Turkish by Keser, O-Yoğun, and Er-Çalışkan (2019) was employed.

The analysis of collected data was performed using SPSS and AMOS software. Data analysis included descriptive statistics, reliability analysis, validity analysis through confirmatory factor analysis, correlation analysis, and hypothesis testing through structural equation modeling. Bootstrap analysis was conducted to test mediation effects.

RESULTS

The reliability analysis results show that all scales have Cronbach's Alpha values above 0.70. The General Self-Efficacy Scale ($\alpha = .938$), Psychological Empowerment Scale ($\alpha = .922$), and Job Crafting Scale ($\alpha = .941$) demonstrate excellent levels of reliability. Normality analysis revealed that all variables show normal distribution characteristics with skewness values between $-.131$ and $.166$, and kurtosis values between -1.077 and $-.801$.

Confirmatory factor analysis results show that all scales support their original factor structures with excellent fit values. The General Self-Efficacy Scale showed $\chi^2/df = .829$, CFI = 1.000, TLI = 1.005, RMSEA = .000. The Psychological Empowerment Scale demonstrated $\chi^2/df = 1.079$, CFI = .998, TLI = .997, RMSEA = .018. The Job Crafting Scale exhibited $\chi^2/df = .999$, CFI = 1.000, TLI = 1.000, RMSEA = .000.

Correlation analysis revealed moderate positive relationships among all variables. General self-efficacy showed moderate positive relationships with psychological empowerment ($r = .511$, $p < .01$) and job crafting ($r = .507$, $p < .01$). Psychological empowerment demonstrated a moderate positive relationship with job crafting ($r = .431$, $p < .01$).

Structural equation modeling analysis supported all research hypotheses. General self-efficacy positively affects psychological empowerment ($\beta = .570$, $p < .001$) and job crafting ($\beta = .420$, $p < .001$). Psychological empowerment positively affects job crafting ($\beta = .280$, $p = .002$). Bootstrap mediation analysis confirmed that psychological empowerment plays a partial mediating role with an indirect effect of $\beta = .122$, 95% CI [.047, .204]. The structural model showed excellent fit values ($\chi^2/df = 1.100$, CFI = .986, TLI = .986, RMSEA = .020).

CONCLUSION

This research demonstrates that psychological empowerment plays a partial mediating role in the effect of general self-efficacy levels of pilots and cabin crew working in airlines on job crafting behaviors. From a strategic management perspective, these findings reveal critical insights into how airlines can develop and leverage human capital as a source of sustainable competitive advantage. All hypotheses were supported, and the proposed theoretical model found strong empirical support with excellent fit values.

The findings contribute significantly to both organizational behavior and strategic management literature by demonstrating how the integration of Social Cognitive Theory, Psychological Empowerment Theory, and Resource-Based View can explain the transformation of individual psychological resources into organizational capabilities. The research reveals that self-efficacy belief affects job crafting behaviors both directly and indirectly through psychological empowerment,

providing a roadmap for organizations seeking to enhance their dynamic capabilities through human capital development.

From a strategic management perspective, the research provides several important implications for competitive advantage creation. The demonstrated relationships suggest that airlines investing in employee self-efficacy development and psychological empowerment can expect enhanced job crafting behaviors, which translate into operational excellence, service differentiation, and organizational agility. These capabilities are particularly valuable in the aviation industry where service quality, safety performance, and adaptive capacity serve as key differentiators in competitive markets.

The research provides important guidance for strategic human resource management practices, including strategic talent management approaches that incorporate self-efficacy assessment, leadership development programs that foster empowerment, and organizational design initiatives that support job crafting behaviors. The findings suggest that traditional command-and-control management approaches may limit the strategic benefits of employee psychological resources, advocating for empowerment-oriented management systems.

A critical finding is that aviation industry employees can exhibit job crafting behaviors despite working within strict procedures and high safety requirements. This challenges the traditional assumption that rigid procedures necessarily prevent creativity and proactivity, suggesting instead that organizations can achieve both safety excellence and strategic flexibility through appropriate empowerment and job crafting frameworks.

Future research should examine these relationships through longitudinal studies, test the model in different cultural contexts and sectors, and investigate the moderating effects of variables such as organizational culture, leadership styles, and technological capabilities. The integration of multilevel analysis could provide insights into how individual-level psychological factors aggregate to create organizational-level strategic capabilities and competitive advantage.

This research suggests that sustainable competitive advantage in the aviation industry lies not in choosing between operational efficiency and employee empowerment, but in strategically integrating these approaches to create organizational capabilities that are simultaneously valuable, rare, inimitable, and non-substitutable. The psychological foundations identified in this study provide the building blocks for such strategic integration, offering airlines a human capital-based pathway to competitive advantage in increasingly complex and competitive global markets.

REFERENCES

- Aypay, A. (2010). Turkish adaptation of the General Self-Efficacy Scale (GSES). *İnönü Üniversitesi Eğitim Fakültesi Dergisi*, 11(2), 113-131.
- Bakker, A. B., Tims, M., & Derks, D. (2012). Proactive personality and job performance: The role of job crafting and work engagement. *Human Relations*, 65(10), 1359-1378.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. W.H. Freeman and Company.
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99-120.
- Becker, B. E., & Huselid, M. A. (2006). Strategic human resources management: Where do we go from here? *Journal of Management*, 32(6), 898-925.
- Berg, J. M., Dutton, J. E., & Wrzesniewski, A. (2010). What is job crafting and why does it matter? University of Michigan Ross School of Business.
- Chen, G., Gully, S. M., & Eden, D. (2001). Validation of a new general self-efficacy scale. *Organizational Research Methods*, 4(1), 62-83.
- Conger, J. A., & Kanungo, R. N. (1988). *The empowerment process: Integrating theory and practice*. Academy of

- Management Review, 13(3), 471-482.
- Ergeneli, A., Arı, G. S., & Metin, S. (2006). Dimensions of psychological empowerment and Turkish adaptation of the personnel empowerment scale. 14th National Management and Organization Congress Proceedings, 417-424.
- Keser, A., O-Yoğun, A., & Er-Çalışkan, B. (2019). Turkish adaptation of the job crafting scale: validity and reliability study. Business and Economics Research Journal, 10(5), 1169-1181.
- Leana, C., Appelbaum, E., & Shevchuk, I. (2009). Work process and quality of care in early childhood education: The role of job crafting. Academy of Management Journal, 52(6), 1169-1192.
- Parker, S. K., & Collins, C. G. (2010). Taking stock: Integrating and differentiating multiple proactive behaviors. Journal of Management, 36(3), 633-662.
- Pulakos, E. D., Arad, S., Donovan, M. A., & Plamondon, K. E. (2000). Adaptability in the workplace: Development of a taxonomy of adaptive performance. Journal of Applied Psychology, 85(4), 612-624.
- Rudolph, C. W., Katz, I. M., Lavigne, K. N., & Zacher, H. (2017). Job crafting: A meta-analysis of relationships with individual differences, job characteristics, and work outcomes. Journal of Vocational Behavior, 102, 112-138.
- Schwarzer, R., & Jerusalem, M. (1995). Generalized Self-Efficacy scale. In J. Weinman, S. Wright, & M. Johnston (Eds.), Measures in health psychology: A user's portfolio (pp. 35-37). NFER-Nelson.
- Seibert, S. E., Wang, G., & Courtright, S. H. (2011). Antecedents and consequences of psychological and team empowerment in organizations: A meta-analytic review. Journal of Applied Psychology, 96(5), 981-1003.
- Spreitzer, G. M. (1995). Psychological empowerment in the workplace: Dimensions, measurement, and validation. Academy of Management Journal, 38(5), 1442-1465.
- Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. Strategic Management Journal, 28(13), 1319-1350.
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. Strategic Management Journal, 18(7), 509-533.
- Thomas, K. W., & Velthouse, B. A. (1990). Cognitive elements of empowerment: An "interpretive" model of intrinsic task motivation. Academy of Management Review, 15(4), 666-681.
- Tims, M., Bakker, A. B., & Derks, D. (2012). Development and validation of the job crafting scale. Journal of Vocational Behavior, 80(1), 173-186.
- Tims, M., Bakker, A. B., & Derks, D. (2014). Daily job crafting and self-efficacy-performance relationship. Journal of Managerial Psychology, 29(5), 490-507.
- Wright, P. M., Dunford, B. B., & Snell, S. A. (2001). Human resources and the resource based view of the firm. Journal of Management, 27(6), 701-721.
- Wright, P. M., & McMahan, G. C. (1992). Theoretical perspectives for strategic human resource management. Journal of Management, 18(2), 295-320.
- Wright, P. M., & Snell, S. A. (1998). Toward a unifying framework for exploring fit and flexibility in strategic human resource management. Academy of Management Review, 23(4), 756-772.
- Wrzesniewski, A., & Dutton, J. E. (2001). Crafting a job: Revisioning employees as active crafters of their work. Academy of Management Review, 26(2), 179-201.

WISHFUL THINKING OR WORTHWHILE INSPIRATION? THE ROLE OF CELEBRITY ROLE MODELS' INFLUENCE ON UNDERGRADUATES' CAREER ENGAGEMENT

Berivan Tatar

Gebze Technical University, Kocaeli, Türkiye, btatar@gtu.edu.tr

<https://orcid.org/0000-0002-0934-3734>

Zeynep Karadeniz Cısdık

Gebze Technical University, Kocaeli, Türkiye, zkcisdik@gtu.edu.tr

<https://orcid.org/0009-0008-5727-9969>

Oya Erdil

Gebze Technical University, Kocaeli, Türkiye, erdil@gtu.edu.tr

<https://orcid.org/0000-0003-3793-001X>

ABSTRACT

As powerful agents, celebrities have changed and influenced the values, attitudes, and behaviors of human society in a variety of life domains. However, little is known about the role of celebrities within the context of career literature. Therefore, this research aims to investigate the link between celebrity role model influence, wishful identification, and career engagement. The study is based on a sample of 380 undergraduate students, and data were analyzed via structural equation modeling. The current study empirically showed that (1) wishful identification positively relates to celebrity role model influence, (2) celebrity role model influence positively relates to career engagement, and (3) celebrity role model influence mediates the link between wishful identification and career engagement.

KEYWORDS

Role model, celebrity, celebrity role model influence, career

INTRODUCTION

In today's hyper-connected media environment, young people are increasingly influenced by figures in the public eye - particularly celebrities and social media influencers. These individuals are more than entertainers; they serve as aspirational figures, shaping values, life goals, and especially career-related attitudes (Archer & Robb, 2024; Hoffner & Buchanan, 2005; Hoffner et al., 2006). For emerging adults navigating the uncertainty of academic life and early career planning, celebrities may represent symbolic models of achievement, authenticity, and success (Darch, 2017; Hoffner & Buchanan, 2005).

Although several studies have examined the separate effects of celebrity admiration, parasocial relationships, and media influence on youth development (Archer & Robb, 2024; Hoffner et al., 2006; Aley & Levine, 2022), the role of celebrities on career-related outcomes remains underexplored in the career management literature. In this context, the current study integrated a model connecting celebrity role model influence, wishful identification, and career engagement.

First, we investigated the impact of wishful identification on adopting celebrities as role models in the domain of careers. Particularly, wishful identification is the desire to emulate or become like an admired figure (Hoffner & Buchanan, 2005). Existing research suggests that wishful identification contributes to psychological wellbeing, including self-worth, life satisfaction, and a sense of purpose, parasocial interaction (Ramasubramanian & Kornfield, 2012; Hirschi et al., 2013; Darch et al., 2017).

The current study contributes to career management literature by concentrating on the impact of students' wishful identification on adopting celebrity role model influence.

We also investigated the impact of adopting celebrity role model influences on career engagement. Specifically, existing studies have shown that role models in career contribute to various developmental outcomes such as career aspirations, self-worth, psychological well-being, identity development, and motivation (Hoffner et al., 2006; Hirschi et al., 2013; Darch, 2017; Aley & Levine, 2022; Archer & Robb, 2024). However, studies investigating the impact of celebrities as role models in careers on career engagement are limited in career management literature.

Finally, we examined the mediating role of celebrity role model influence in the relationship between wishful identification and career engagement. While some studies have investigated the mediating role of television characters' occupational portrayals (Hoffner et al., 2006), parasocial involvement and attachment to media figures (Giles & Maltby, 2004), perceived similarity (Hoffner & Buchanan, 2005), and motivational salience of social media influencers (Archer & Robb, 2024) in the relationship between wishful identification and career engagement, there are few studies examining underlying mechanisms within the context of celebrity role model influence. Besides, the mediating role of celebrity role model influence in the link between wishful identification and career engagement remains relatively unexplored in literature.

Therefore, the present study investigated 1) the role of wishful identification on celebrity role model influence, (2) the effect of celebrity role model influence on career engagement, and (3) the mediating role of celebrity role model influence in the link between wishful identification and career engagement.

LITERATURE REVIEW

Role Model in Career and Celebrity Role Model Influence

Role models serve as essential agents in shaping individuals' career aspirations, values, and psychological development. Traditionally, role models include family members, educators, or professionals who offer direct guidance and behavioral templates (Hackett, Esposito, & O'Halloran, 1989). In educational settings, non-career staff and faculty have increasingly been recognized as career influencers, shaping students' development through informal mentoring, advising, and storytelling (Ho, 2019; Stebleton & Ho, 2023).

More recently, celebrities and social media influencers have emerged as salient career role models, particularly among Gen Z students. Archer and Robb (2024) argue that due to their curated authenticity and public exposure, influencers are increasingly viewed as figures with moral and aspirational weight, often being imitated or emotionally followed. Unlike traditional role models, celebrity figures influence parasocial relationships (Giles & Maltby, 2004; Rolle, 2024). Finally, the Internet now functions as a sixth, distinct VAS source beyond traditional media, providing self-directed access to career-relevant content, mentorship, and identity modeling (Levine & Aley, 2022). Students actively seek out career advice, role model stories, and motivational narratives through platforms like YouTube and LinkedIn, reinforcing the importance of digital celebrity figures in shaping both career thinking and emotional wellbeing.

The formation of celebrity role model influence is affected by a range of psychological and media-related antecedents. One of the most prominent factors is wishful identification, defined as the desire to emulate or psychologically become like a media figure (Hoffner & Buchanan, 2005). Additionally, perceived similarity, the degree to which individuals perceive celebrities as similar to themselves, has been shown to intensify role model adoption, particularly when similarity is based on background, values, or personality traits (Hoffner & Buchanan, 2005; Giles & Maltby, 2004). Giles and Maltby (2004) revealed that individuals are more likely to form meaningful parasocial bonds with celebrities whom they perceive as relatable or aligned with their own values. Parasocial interaction,

or the illusion of a reciprocal relationship with a public figure, also plays a central role in this process (Giles & Maltby, 2004).

Existing research suggests also that when celebrities are perceived as credible, inspiring, and morally grounded, they can positively influence young people's career aspirations, identity formation, and psychological wellbeing (Aley & Levine, 2022; Archer & Robb, 2024). For instance, exposure to positive occupational portrayals on television has been shown to impact career planning and self-concept among adolescents, especially those from underrepresented backgrounds (Hoffner et al., 2006). Similarly, celebrities who publicly discuss their struggles, motivations, and professional journeys can enhance self-worth, motivation, and purpose in their followers (Hirschi et al., 2013; Darch et al., 2017).

HYPOTHESES DEVELOPMENT

Wishful Identification and Celebrity Role Model Influence

We argue that wishful identification is positively associated with adopting celebrity role model influence in a career by the perception of similarities regarding celebrity role model influences' personality traits, career paths, success, and behaviors. Specifically, wishful identification is "a psychological process through which an individual desires or attempts to become like another person, such as a media character" (Hoffner et al., 2008, p. 286). Based on the Celebrity Influence Model, parasocial relationships with the celebrity trigger identification, and identification leads adoption of the celebrity's beliefs and behaviors as a role model (Brown & Fraser, 2003). Concordantly, Wenhold and Harrison (2019) revealed that emerging adult women adopting female TV news personalities as career role models based on higher wishful identification. Based on this argument, people who feel higher identification with celebrities regarding similarities based on values, attitudes, decisions, and behaviors, may tend to adopt celebrities as role model in their careers. Hence, we proposed that:

H1: Wishful identification positively relates to celebrity role model influence.

Celebrity Role Model Influence and Career Engagement

We suggest that celebrity role model influence is positively associated with career engagement by elevating inspiration, self-confidence, and support in careers. Also, role models facilitate the development of coping mechanisms for career-related challenges, stress, and future career anxiety by providing a variety of information, experience, advice, and encouragement (Cottle et al., 2024). The presence of role models reduces career-related stress, increases self-confidence, facilitates social networking, and provides psychological safety (Darch et al., 2017). In this regard, the existence of role models leads to higher engagement (Valero et al., 2019).

Hence, students adopting celebrities as role models are more engaged with their careers by engagement through planning their careers, exploring career environments, networking with other people, develop their personal and professional skills. Hence:

H2: Celebrity role model influence positively relates to career engagement.

Mediating Role of Celebrity Role Model Influence on the Relationship between Wishful Identification and Career Engagement

Wishful identification also impacts on career engagement by eliciting higher motivation for developing career behaviors. Specifically, people with high wishful identification with specific characters tend to adapt their attitudes, values, and behaviors to achieve rewards or desired outcomes, including forming connections, maximizing their potential, or improving self-esteem (Hoffner et al., 2006; Giles & Maltby, 2004).

Past studies also showed the impact of celebrity role model influence on career engagement (Levine & Aley, 2022). In this context, we proposed that adopting a celebrity role model influence mediates the link between wishful identification and career engagement. Particularly, similarities regarding personality traits, career paths, success, and behaviors contribute to the development of wishful identification and hence facilitate the adoption of celebrities as role models. Then, these role models provide a variety of career-related information, experience, advice, and encouragement and facilitate the development of coping mechanisms for career-related challenges, stress, and future career anxiety and its resultant, higher career engagement (Cottle et al., 2024). Therefore, we hypothesized that:

H3: Celebrity role model influence mediates the relationship between wishful identification and career engagement.

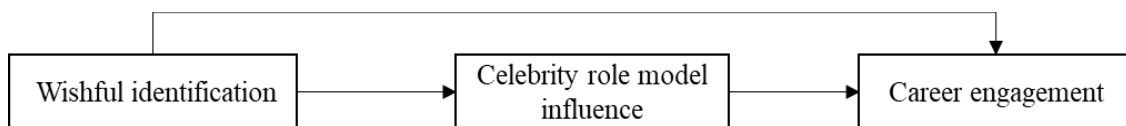


Figure 1. Research Model

METHOD

Participants and Procedure

To test the research hypotheses, a survey method was conducted to gather the data. Therefore, the survey link was distributed to undergraduate students from a variety of departments.

After eliminating 20 inappropriate or careless responses (e.g., inconsistent answers in pairs of similar questions, extremely fast completion times), 380 participants were included in the current study. In terms of sample profile, 56.3% were female. The average age of the participants was 19.5 years. Concerning majors, respondents have been studying molecular biology and genetics (9.2%), mathematics (8.4%), chemistry (7.9%), and others (civil engineering, mechanical engineering, physics, business administration). Respondents adopted celebrities including Aziz Sancar (12.1%), Elon Musk (8.2%), Marie Curie (7.4%), Selçuk Bayraktar (8.2%), Canan Dağdeviren (3.5%), and Zaha Hadid (2.6%) as a role model in their careers. On the other hand, regarding the gender of the celebrity role model influence adopted by the participants, 23.2% of the role models are female while 76.8% are male. Participants have been following the celebrities they adopt as role models in their careers for an average of 4 years. They prefer Twitter, Instagram, TV programs, LinkedIn, Spotify, and YouTube as follow-up channels.

Measures

The aforementioned hypotheses were investigated by multi-item scales from previous studies. The measurement items were translated from English into Turkish following the back-translation procedure (Brislin, 1980). All measurement items were responded 5-point Likert scale ranging from 'strongly disagree' (1) to 'strongly agree' (5).

Celebrity role model influence was measured 5-item scale developed by Rich (1997) to assess the perception of role modeling. The current study adapted this scale for measuring celebrity role model influence. Sample items are "This celebrity role model influence provides a good model for me to follow." and "This celebrity role model influence sets a positive example for others to follow."

Wishful identification was measured 5-item scale of Hoffner and Buchanan (2005) to assess undergraduate students' desire to become as celebrity role models in their careers. Sample items are

“He/she is the sort of person I want to be like myself” and “Sometimes I wish I could be more like him/her”.

Career engagement was measured 9-item scale of Hirschi, Freund, and Herrmann (2013) for investigating undergraduate students’ proactive development of their careers through diverse career behaviors. Sample items are “Developed plans and goals for my future career” and “Sincerely thought about personal values, interests, abilities, and weaknesses”.

ANALYSIS AND RESULTS

Construct Validity and Reliability

Reliability and validity of measures were assessed through confirmatory factor analysis. After eliminating the problematic items using a step-by-step procedure (2 items from wishful identification and 2 items from career engagement), the model adequately fit the data ($\chi^2_{(85)} = 224.00$, $p < .001$, CFI = .93, TLI = .91, IFI=.93, RMSEA = .07).

Table 2. Confirmatory Factor Analysis

Constructs	Factor Loadings	CR	AVE	Cronbach's Alpha
Wishful identification		.77	.53	.77
WID1	.73			
WID2	.78			
WID3	.68			
Celebrity role model influence		.82	.49	.82
CRM1	.72			
CRM2	.82			
CRM3	.57			
CRM4	.71			
CRM5	.65			
Career engagement		.84	.76	.80
Planning and evaluation		.80	.50	.80
CEN1	.79			
CEN2	.68			
CEN3	.64			
CEN4	.70			
Research and networking		.75	.51	.74
CEN7	.55			
CEN8	.81			
CEN9	.76			

As shown in Table 2, the factor loadings of each variable were all above .50 (Hair et al., 2010). Besides, Average Variances Extracted (AVE), Composite Reliability (CR), and Cronbach's alpha values were well beyond the cutoff value (Fornell & Larcker, 1981), supporting convergent validity.

Table 3. Discriminant Validity

Variables	1	2	3	
Wishful identification	1	(.73)		
Celebrity role model influence	2	.51**	(.71)	
Career engagement	3	.11*	.16**	(.87)
Mean		4.45	4.51	4.36
S. dev.		.43	.40	.37

** $p < .01$; * $p < .05$; Values along the diagonal are the square root of AVE.

Table 3 presents the correlations among all variables. Specifically, wishful identification was positively related to celebrity role model influence ($r = .51, p < .01$) and career engagement ($r = .11, p < .05$). Additionally, celebrity role model influence was positively related to career engagement ($r = .16, p < .01$). On the other hand, the squared root of AVE for each construct was greater than the correlations between the constructs, suggesting discriminant validity (Fornell & Larcker, 1981).

Hypothesis Testing

The aforementioned hypotheses were tested via SPSS PROCESS macro (Hayes, 2013) using 5000 bootstraps resamples, and 95% confidence intervals.

Table 4. Results of Mediating Analysis

	β	95% CI	
		LL	UL
<i>Direct effects</i>			
Wishful identification → Celebrity role model influence (a)	.47***	.39	.55
Celebrity role model influence → Career engagement (b)	.15**	.06	.24
Wishful identification → Career engagement (c)	.10*	.01	.19
Wishful identification → Career engagement (c')	.04	-.06	.14
<i>Indirect effect</i>			
Wishful identification → Celebrity role model influence → Career engagement	.06*	0,01	0,12

* $p < .05$, ** $p < .01$, *** $p < .001$, CI=Confidence interval LL=Lower limit UL=Upper limit

The results showed that wishful identification was positively related to celebrity role model influence ($\beta = .47, p < .001$; 95% CI [.39, .55]), thereby supporting H1. Also, celebrity role model influence was positively related to career engagement ($\beta = .15, p < .01$; 95% CI [.06, .24]), thus supporting H2. Wishful identification was also positively related to career engagement ($\beta = .10, p < .05$; 95% CI [.01, .19]).

In terms of testing the mediating role of celebrity role model influence, we used Model 4 within the PROCESS macro. In this regard, celebrity role model influence mediated the link between wishful identification and career engagement ($\beta = .11, p < .001$; 95% CI [.05, .19]), which excluded zero. Also, the effect of wishful identification on career engagement became non-significant ($\beta = .05, p > .05$; 95% CI [-.06, .14]). Based on these results, celebrity role model influence fully mediates the relationship between wishful identification and career engagement, supporting H3.

DISCUSSION

This study deepens our comprehension of celebrity as a role model in undergraduate students' careers in light of the link between celebrity role model influence, wishful identification, and career engagement.

First, this study demonstrated that wishful identification positively relates to celebrity role model influence in a career, expanding existing literature. Particularly, past studies mainly focus on impact of the role models on wishful identification (Brown & Fraser, 2003; Aley & Levine, 2022). On the other hand, limited studies highlighted that people wishfully identifying with professionals tend to adopt them as role models. The current study leveraged an understanding of the role of wishful identification with celebrities based on realizing the similarities regarding personality, career values and decision, attitudes, and career behaviors in adopting these celebrities as a role model in career choice.

Second, this study showed that celebrity role model influence positively relates to career engagement. Previous studies revealed that role models improve career aspirations, self-worth, psychological well-being, identity development, and motivation (Hoffner et al., 2006; Hirschi et al.,

2013; Darch, 2017; Aley & Levine, 2022; Archer & Robb, 2024). Here, the current study showed that celebrity role model influence enhances career engagement.

This study also revealed that celebrity role model influence mediates the link between wishful identification and career engagement, leveraging prior literature. Prior studies revealed that wishful identification contributes to the adoption of celebrities as role models in their careers. Even in contexts where students face significant career barriers such as financial insecurity, limited networks, or low confidence, wishful identification and belief in digital role models may foster emotional resilience and self-belief (Levine & Aley, 2021), and hence improve career engagement. Here, the current study revealed that celebrity role model influence mediates the link between wishful identification and career engagement.

Finally, the current study has significant findings, but there are also limitations. First, we gathered self-reported data, which may create common method bias. We tried to minimize this with different methods including instructed response items and reverse-scoring), however, the problem could still exist. We also conducted a cross-sectional survey, limiting the investigation of changes in the variables. Future research may use longitudinal design for assessing the impact of celebrity role model influence in different career stages over time. We only used data from Turkish students, limiting generalizability. In future studies, researchers should consider investigating the role of celebrity role model influences in different cultural contexts. Besides, this study focused on wishful identification as a consequence of the existence of a celebrity role model influence. Future studies may investigate the impact of a celebrity role model influence on students' psychological capital, vocational identity, proactive career behaviors, and career adaptability. Besides, the current study concentrated on the role of wishful identification with a celebrity role model influence on career engagement. Researchers can investigate meaning in life, life satisfaction, and career-related self-efficacy as the consequence of wishful identification.

REFERENCES

- Aley, M. R., & Levine, K.J. (2022). Popular culture at work: how emerging adults' favorite celebrity can influence future career aspirations and work ethic. *Atlantic Journal of Communication*, 30(4), 419–434. <https://doi.org/10.1080/15456870.2021.1936527>
- Aley, M., & Levine, K.J. (2023). Preparing for careers: Emerging adults' perceptions of career messages received from different vocational anticipatory socialization sources. *Southern Communication Journal*, 88(2), 160–171. <https://doi.org/10.1080/1041794X.2022.2141307>
- Andreeva, I., Kim, Y., & Chung, S. (2024). Inspiration by role models: The effect of source similarity, perceived goal attainability, and dispositional optimism. *Journal of Media Psychology*. Advance online publication. <https://doi.org/10.1027/1864-1105/a000413>
- Archer, A., & Robb, C.M. (2024). Influencers as role models. *Celebrity Studies*, 15(2), 128–142. <https://doi.org/10.1080/19392397.2024.2341594>
- Austin, M.J., & Nauta, M.M. (2016). Entrepreneurial role-model exposure, self-efficacy, and women's entrepreneurial intentions. *Journal of Career Development*, 43(3), 260–272. <https://doi.org/10.1177/0894845315597475>
- Brown, W.J., & Fraser, B.P. (2003). Celebrity Identification in Entertainment-Education. In *Entertainment-education and social change* (pp. 119–138). Routledge.
- Cottle, J., Drozdik, A.L., & Rimes, K.A. (2024). The Impact of Role Models and Mentors on the Mental and Physical Wellbeing of Sexual and Gender Minorities. In *Behavioral Sciences* (Vol. 14, Issue 5). <https://doi.org/10.3390/bs14050417>
- Cross, C., Linehan, M., & Murphy, C. (2017). The unintended consequences of role-modelling behaviour in female career progression. *Personnel Review*, 46(1), 86–99. <https://doi.org/10.1108/PR-06-2015-0177>
- Darch, J., Baillie, L., & Gillison, F. (2017). Nurses as role models in health promotion: a concept analysis. *British Journal of Nursing*, 26(17), 982–988. <https://doi.org/10.12968/bjon.2017.26.17.982>
- Diener, E., Wirtz, D., Biswas-Diener, R., Tov, W., Kim-Prieto, C., Choi, D., & Oishi, S. (2009). *New Measures of Well-Being BT - Assessing Well-Being: The Collected Works of Ed Diener* (E. Diener (ed.); pp. 247–266). Springer Netherlands. https://doi.org/10.1007/978-90-481-2354-4_12
- Giles, D. C., & Maltby, J. (2004). The role of media figures in adolescent development: Relations between

- autonomy, attachment, and interest in celebrities. *Personality and Individual Differences*, 36(4), 813–822. [https://doi.org/10.1016/S0191-8869\(03\)00154-5](https://doi.org/10.1016/S0191-8869(03)00154-5)
- Hackett, G., Esposito, D., & O'Halloran, M.S. (1989). The relationship of role model influences to the career salience and educational and career plans of college women. *Journal of Vocational Behavior*, 35(2), 164–180. [https://doi.org/10.1016/0001-8791\(89\)90038-9](https://doi.org/10.1016/0001-8791(89)90038-9)
- Hirschi, A., Freund, P.A., & Herrmann, A. (2013). The Career Engagement Scale: Development and Validation of a Measure of Proactive Career Behaviors. *Journal of Career Assessment*, 22(4), 575–594. <https://doi.org/10.1177/1069072713514813>
- Ho, C.T.Y. (2019). *Professionals in post-secondary education: Conceptions of career influence* (Doctoral dissertation, Simon Fraser University). <https://summit.sfu.ca/item/18827>
- Hoffner, C., & and Buchanan, M. (2005). Young Adults' Wishful Identification With Television Characters: The Role of Perceived Similarity and Character Attributes. *Media Psychology*, 7(4), 325–351. https://doi.org/10.1207/S1532785XMEP0704_2
- Hoffner, C.A., Levine, K.J., Sullivan, Q. E., Crowell, D., Pedrick, L., & Berndt, P. (2006). TV Characters at Work: Television's Role in the Occupational Aspirations of Economically Disadvantaged Youths. *Journal of Career Development*, 33(1), 3–18. <https://doi.org/10.1177/0894845305282768>
- Karunanayake, D., & Nauta, M.M. (2004). The relationship between race and students' identified career role models and perceived role model influence. *The Career Development Quarterly*, 52(3), 225–234. <https://doi.org/10.1002/j.2161-0045.2004.tb00644.x>
- Levine, K.J., & Aley, M.R. (2021). Career barriers affecting first-generation college students: Can socializing messages increase career confidence? *Southern Communication Journal*, 87(5), 493–512. <https://doi.org/10.1080/1041794X.2021.1970795>
- Levine, K.J., & Aley, M. (2022). Introducing the sixth source of vocational anticipatory socialization: Using the Internet to search for career information. *Journal of Career Development*, 49(2), 443–456. <https://doi.org/10.1177/0894845320940798>
- Rich, G.A. (1997). The sales manager as a Role model: Effects on trust, job satisfaction, and performance of salespeople. *Journal of the Academy of Marketing Science*, 25(4), 319–328. <https://doi.org/10.1177/0092070397254004>
- Rolle, E.T. (2024). *Content creation or degree completion: Exploring the roles of parasocial relationships and social norms theories on understanding the impact of influencers on college students' retention* (Master's thesis, Florida State University).
- Stebbleton, M.J., & Ho, C.T.Y. (2023). Career development is everyone's responsibility: Envisioning educators as career influencers. *Journal of College and Character*, 24(3), 189–196. <https://doi.org/10.1080/2194587X.2023.2224577>
- Wenhold, H., & and Harrison, K. (2019). Emerging adult women's career role modeling and wishful identification with female TV news personalities. *Communication Quarterly*, 67(1), 41–59. <https://doi.org/10.1080/01463373.2018.1526813>
- Zhang, R., Mercado, T., Chen, Y., & Bi, N.C. (2024). "How come I don't look like that": the negative impact of wishful identification with influencers on follower, *Well-being*. 3(4), 560–579. <https://doi.org/doi:10.1515/omgc-2024-0033>

UNDERSTANDING INTENTION TO CONTINUE AMONG INTERNATIONAL STUDENTS: A PARALLEL AND SERIAL MEDIATION MODEL OF SOCIO-CULTURAL INFLUENCES

Alperen Şahin

Marmara University, Institute of Social Sciences, İstanbul, Türkiye, alperen.sahin@marun.edu.tr

T. Sabri Erdil

Prof. Dr. Marmara University, Faculty of Business Administration, İstanbul, Türkiye, serdil@marmara.edu.tr
<https://orcid.org/0000-0001-5987-0754>

Bahadır Ayar

Res. Ass. Ph.D., Marmara University, Faculty of Business Administration, İstanbul, Türkiye,
bahadir.ayar@marmara.edu.tr
<https://orcid.org/0000-0002-8547-4613>

ABSTRACT

This study investigates how the socio-cultural environment influences the intention to continue of international students in Türkiye, focusing on the mediating roles of three key constructs: perceived country attractions, academic gains, and perceived value. Drawing on perceived value theory and employing PROCESS Macro Model 80, the study tests a parallel mediation model to explore how each of these mediators transmits the effect of socio-cultural environment on students' behavioral intention to persist in higher education. Data collected from 346 international students enrolled in Turkish universities were analyzed using bootstrapping techniques to estimate the indirect effects. The results reveal that the socio-cultural environment significantly enhances students' perceptions of country attractions and academic gains, which in turn influence their perceived value and intention to continue. Perceived value also functions as an independent mediator. Furthermore, serial mediation effects were observed, indicating that socio-cultural integration indirectly promotes retention by shaping both experiential and evaluative dimensions. These findings contribute to theoretical frameworks on student retention and offer practical implications for enhancing the international student experience through supportive socio-cultural and academic environments.

KEYWORDS

international students, intention to continue, perceived value, country attractions, academic gains

INTRODUCTION

International student mobility has become a significant phenomenon in global higher education (Janik et al., 2023; Miani & Picucci-Huang, 2023; Wu, 2019) In the context of Türkiye, which hosts a growing number of international students, it is crucial to understand the factors that influence their intention to continue their studies (Baraçlı et al., 2024) Previous studies emphasize the socio-cultural environment as a pivotal element shaping student satisfaction and integration (Gao et al., 2024; Seggie & Çalikoğlu, 2023).

According to the perceived value theory, students' behavioral intentions are largely influenced by their cost-benefit evaluations of their academic and social experiences (Firdousi et al., 2024; Relyea et al., 2008; Zhuang et al., 2015). This paper posits that perceived value mediates the relationship between the socio-cultural environment and students' intention to continue.

To examine these direct and indirect relationships, PROCESS Macro Model 80 (Hayes, 2017) is employed. This model enables the testing of mediation and serial mediation mechanisms, offering a

nuanced understanding of how perceived value functions as a bridge between socio-cultural context and intention to continue.

This research contributes to the literature by extending the application of perceived value theory within international higher education retention models, providing empirical evidence through a robust statistical framework, and offering practical implications for policymakers working to enhance the retention of international students in Türkiye.

METHODOLOGY

This study employed a quantitative survey design to examine the factors influencing international students' intention to continue higher education in Türkiye. Data was collected through a structured questionnaire administered to international students enrolled in various universities located in Istanbul. The instrument included validated scales measuring the following constructs: socio-cultural environment (X) (Bodycott, 2009), country attractions (M1) (Wilkins et al., 2012), academic gains (M2) (Griffin et al., 2003), perceived value (M3) (Del Río-Rama et al., 2021), and intention to continue (Y) (Tasci et al., 2022). All items were rated using 5-point Likert-type scales. A total of approximately 375 students participated in the survey. After data screening and removal of incomplete responses, 346 valid cases remained for analysis.

To test the hypothesized model, PROCESS Macro v4.0 by Andrew F. Hayes was employed in SPSS, specifically using Model 80 which enables testing of multiple parallel and serial mediators between an independent variable (X) and a dependent variable (Y). In this model, country attractions (M1), academic gains (M2), and perceived value (M3) functioned as mediating variables in the relationship between the socio-cultural environment and intention to continue. Bootstrapping procedures (Preacher & Hayes, 2008) with 5,000 resamples were applied to assess the significance and confidence intervals of direct and indirect effects.

The study sample comprised 346 international students enrolled at universities in Istanbul, Türkiye. Of the participants, 160 were female (46.2%) and 186 were male (53.8%). In terms of age, the majority were between 18 and 27 years old: 110 students (31.8%) were aged 18–22, and 168 students (48.6%) were aged 23–27. Participants represented 31 different countries, with the highest numbers from Syria (n=69), Azerbaijan (n=66), and Turkmenistan (n=36). Regarding institutional distribution, the majority of students (86.1%) were enrolled in foundation (private) universities, while only 13.9% studied at public universities.

RESULTS

The conceptual model proposed in this study was tested using PROCESS Macro Model 80, which allows for the examination of both mediation and serial mediation effects. Specifically, the model investigates how the socio-cultural environment influences international students' intention to pursue higher education in Türkiye through key mediators: country attractions, academic gains, and perceived value. The results derived from the PROCESS Macro analysis demonstrate both direct and indirect pathways, highlighting the complex interrelations among these variables. The hypothesized model is illustrated in Figure 1.

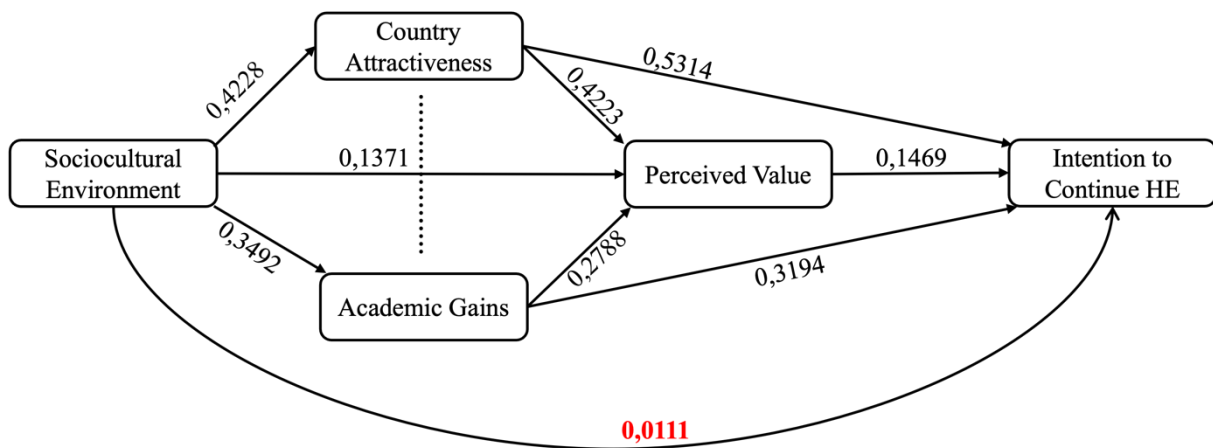


Figure 1 Conceptual model and B coefficients.

The results of the direct and indirect effect analyses are presented in Table 1. These findings provide insights into how the socio-cultural environment and related constructs influence international students' intention to continue higher education in Türkiye.

Table 1 Direct and indirect effects of the socio-cultural environment on the intention to continue

Hypothesis	Pathway	B (Coeff.)	p	LLCI	ULCI	Result
Direct Effects						
H1a	The socio-cultural environment positively and significantly affects country attractions.	0.4228	0.0000	0.3394	0.5063	Supported
H1b	Country attractions positively and significantly affects intention to continue.	0.5314	0.0000	0.4275	0.6352	Supported
H1c	The socio-cultural environment positively and significantly affects perceived value.	0.1371	0.0043	0.0433	0.2308	Supported
H1d	Perceived value positively and significantly affects intention to continue.	0.1469	0.0007	0.0629	0.2309	Supported
H1e	The socio-cultural environment positively and significantly affects academic gains.	0.3492	0.0000	0.2835	0.4150	Supported
H1f	Academic gains positively and significantly affect intention to continue.	0.3194	0.0000	0.1933	0.4454	Supported
H1g	Country attractions positively and significantly affects perceived value.	0.4223	0.0000	0.2988	0.5459	Supported
H1h	Academic gains positively and significantly affect	0.2788	0.0005	0.1220	0.4355	Supported

H1i	perceived value. The socio-cultural environment directly affects intention to continue.	0.0111	0.7717	-	0.0639	0.0860	Not Supported
Hypothesis	Indirect Pathway	B (Coeff.)	LLCI	ULCI	Result		
Indirect Effects							
H1j	The effect of socio-cultural environment on intention to continue is mediated by country attractions.	0.2247	0.1476	0.3098	Supported		
H1k	The effect of socio-cultural environment on intention to continue is mediated by academic gains.	0.1115	0.0515	0.1805	Supported		
H1l	The effect of socio-cultural environment on intention to continue is mediated by perceived value.	0.0201	0.0003	0.0514	Supported		
H1m	The effect of socio-cultural environment on intention to continue is serially mediated by country attractions and perceived value.	0.0262	0.0043	0.0530	Supported		
H1n	The effect of socio-cultural environment on intention to continue is serially mediated by academic gains and perceived value.	0.0143	0.0007	0.0313	Supported		

The socio-cultural environment positively and significantly influenced country attractions (H1a: $B = 0.4228$, $p < .001$), perceived value (H1c: $B = 0.1371$, $p = .0043$), and academic gains (H1e, $B = 0.3492$, $p < .001$). These findings indicate that socio-cultural integration facilitates both favorable perceptions of the host country and meaningful academic experiences.

Country attractions significantly predicted intention to continue (H1b: $B = 0.5314$, $p < .001$), while academic gains also exerted a strong positive effect (H1f: $B = 0.3194$, $p < .001$). Furthermore, perceived value significantly impacted students' intention to continue their studies (H1d: $B = 0.1469$, $p = .0007$).

Additionally, country attractions (H1g: $B = 0.4223$, $p < .001$) and academic gains (H1h: $B = 0.2788$, $p = .0005$) were both significant predictors of perceived value. These findings support a network of positive interactions among predictors.

However, the direct effect of socio-cultural environment on intention to continue was found to be non-significant (H1i: $B = 0.0111$, $p = .7717$), suggesting that its influence is transmitted entirely through indirect pathways.

Mediation analysis revealed several significant indirect effects linking the socio-cultural environment to international students' intention to continue. Specifically, the socio-cultural environment was found to influence intention to continue indirectly through country attractions (H1j: $B = 0.2247$, 95%

CI [0.1476, 0.3098]), through academic gains (H1k: $B = 0.1115$, 95% CI [0.0515, 0.1805]), and through perceived value (H1l: $B = 0.0201$, 95% CI [0.0003, 0.0514]). These findings confirm the presence of significant mediating pathways, indicating that the effect of the socio-cultural environment on students' behavioral intentions operates primarily through these intermediate variables.

Furthermore, serial mediation analysis provided additional insights. The socio-cultural environment significantly affected intention to continue through a chain of effects involving country attractions and perceived value (H1m: $B = 0.0262$, 95% CI [0.0043, 0.0530]) as well as academic gains and perceived value (H1n: $B = 0.0143$, 95% CI [0.0007, 0.0313]). These results suggest that socio-cultural factors first shape students' perceptions of the host country's appeal and their academic experiences, which in turn influence their evaluation of the educational experience's overall value-ultimately guiding their intention to remain in the higher education system.

Notably, the socio-cultural environment did not have a direct effect on intention to continue. However, it significantly influenced students' perceptions of country attractions, academic outcomes, and perceived value, each of which served as critical mediators in the model. Among the mediating pathways, the strongest indirect effects were observed through country attractions and academic gains, both independently and in conjunction with perceived value. These findings underscore the importance of adopting a value-based and experience-driven framework to better understand and support the retention of international students in higher education.

CONCLUSION

This study provides a comprehensive examination of how the socio-cultural environment influences the intention to continue of international students in Türkiye through indirect pathways. The findings reveal that the socio-cultural environment does not exert a significant direct effect on students' intention to continue their studies. Instead, its impact is fully mediated by key factors such as country attractions, academic gains, and perceived value, which serially shape students' decisions to remain enrolled. This nuanced understanding extends existing literature by highlighting the critical role of social and cultural integration alongside academic experiences in fostering international student retention.

The socio-cultural environment construct in this study encompasses several pivotal dimensions: opportunities to engage with and understand Turkish culture, the diversity and inclusiveness of student clubs and communities, perceptions of crime and ethnic discrimination, and the climate conditions of Türkiye. These elements collectively represent the students' lived social and cultural contexts, which profoundly affect their overall educational experience. Notably, the results underscore the importance of positive socio-cultural engagement opportunities-such as cultural learning and active participation in student organizations-in enhancing students' sense of belonging and satisfaction within the host country.

The statistical analysis demonstrates that the socio-cultural environment significantly predicts country attractions and academic gains, confirming that social integration facilitates favorable perceptions of the host nation and supports meaningful academic outcomes. For instance, when international students have ample opportunities to immerse themselves in Turkish culture and participate in diverse student groups, they tend to develop a stronger attachment to Türkiye as an educational destination. This heightened country attractions, in turn, plays a pivotal role in motivating students to continue their studies.

Similarly, a positive socio-cultural environment fosters enhanced academic gains by creating a supportive setting where students can thrive academically. Social inclusion and cultural familiarity reduce psychological and social barriers, allowing students to focus more effectively on their studies and achieve better academic results. Consequently, the socio-cultural environment contributes indirectly to intention to continue by elevating students perceived academic success.

The mediating role of perceived value is particularly noteworthy in this model. Perceived value captures students' overall evaluation of the benefits derived from their educational experience relative to the costs incurred. It synthesizes academic achievements, social integration, and country-level perceptions into a single evaluative judgment that guides behavioral intentions. This study finds that perceived value significantly mediates the relationships between attractiveness, academic gains, and intention to continue, suggesting that students who perceive high value in their academic and socio-cultural experiences are more likely to persist in their studies.

Further, the research reveals important serial mediation effects that elucidate the serial mechanisms underlying intention to continue. The socio-cultural environment first influences intermediate variables-country attractions and academic gains-which subsequently affect perceived value, culminating in increased intention to continue. This serial mediation highlights those social and cultural integration shapes students' perceptions of the host country and their academic success, which then jointly inform their assessment of overall value and commitment to continue education in Türkiye.

These findings carry significant theoretical and practical implications. Theoretically, this study enriches perceived value theory by situating it within the context of international higher education retention. It confirms that social and cultural factors, alongside academic outcomes, jointly contribute to students' value perceptions and educational persistence. This integration offers a more holistic framework to understand international student behavior beyond traditional academic performance metrics.

Practically, the results underscore the importance of enhancing the socio-cultural environment as a strategic approach to increase international student retention in Türkiye. Policymakers and university administrators should prioritize initiatives that facilitate cultural immersion, social engagement, and inclusivity. For example, expanding programs that promote intercultural exchange, increasing the diversity and accessibility of student clubs, and creating supportive environments that counteract discrimination and social exclusion can significantly strengthen students' social connectedness and satisfaction.

Moreover, efforts to improve academic support systems remain essential. By addressing academic challenges and providing resources that enable students to maximize their learning outcomes, institutions can indirectly boost perceived value and intention to continue. Thus, academic and socio-cultural interventions should be designed as complementary strategies that collectively enhance students' holistic experience.

The study also points to the importance of contextual factors unique to Türkiye, such as the country's climate and cultural richness, in shaping international students' experiences. Recognizing and promoting these distinctive attributes can further enhance Türkiye's attractiveness as a destination for higher education.

Limitations of this research include the reliance on self-reported survey data, which may be subject to social desirability bias, and the cross-sectional design, which limits causal inferences. Future research could employ longitudinal designs to better capture changes in perceptions and intentions over time and explore additional factors such as economic or institutional variables that might influence student retention.

In conclusion, the present study confirms that the socio-cultural environment influences international students' intention to continue in Türkiye through a complex network of indirect effects involving country attractions, academic gains, and perceived value. By fostering a supportive and inclusive socio-cultural context alongside strong academic programs, higher education institutions can effectively enhance international students' satisfaction and commitment. These insights provide a valuable foundation for policy development and institutional practices aimed at improving student retention and promoting Türkiye as a competitive destination for global higher education.

DECLARATIONS

This study is derived from the doctoral dissertation titled “An Analysis of Factors Influencing the Intentions of International Students in Türkiye to Pursue Higher Education”, written by Alperen Şahin as part of the Global Marketing Doctorate Program at the Institute of Social Sciences, Marmara University, under the supervision of Prof. Dr. T. Sabri Erdil. Res. Ass. Ph.D. Bahadır Ayar, contributed to the data analysis and reporting sections of the study. The authors declare that there are no conflicts of interest that relate to the research, authorship, or publication of this article.

REFERENCES

- Baraçlı, H., Şahin, A., & Dönmez, C. Ç. (2024). Türkiye’de Yükseköğretim Alanında Yapılan Çalışmaların Uluslararasılaşma Bağlamında İncelenmesi: Bibliyometrik Bir Analiz. *Elektronik Sosyal Bilimler Dergisi*, 23(89), 282-304.
- Bodycott, P. (2009). Choosing a higher education study abroad destination: What mainland Chinese parents and students rate as important. *Journal of research in International education*, 8(3), 349-373.
- Del Río-Rama, M. d. I. C., Álvarez-García, J., Mun, N. K., & Durán-Sánchez, A. (2021). Influence of the quality perceived of service of a higher education center on the loyalty of students. *Frontiers in Psychology*, 12, 671407.
- Firdousi, S. F., Yong, C., Amir, B., & Waqar, A. (2024). The Influence of Student Learning, Student Expectation and Quality of Instructor on Student Perceived Satisfaction and Student Academic Performance: Under Online, Hybrid and Physical Classrooms. *Open Education Studies*, 6(1), 20240016.
- Gao, J., Zhao, Z., & Li, H. (2024). Analysis of risk factors faced by Chinese international students based on fuzzy comprehensive evaluation model. *Frontiers in Education*,
- Griffin, P., Coates, H., Mcinnis, C., & James, R. (2003). The development of an extended course experience questionnaire. *Quality in Higher Education*, 9(3), 259-266.
- Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford publications.
- Janik, H., Naár-Tóth, Z., & Vinogradov, S. (2023). Examining the aspects of institution choice in connection with the internationalization of higher education. *Decision Making: Applications in Management and Engineering*, 6(1), 282-302.
- Miani, M., & Picucci-Huang, S.-C. (2023). Collaborative transnational education in China: A scoping review of emerging research trajectories (2016–2023). *Chinese Education & Society*, 56(5-6), 309-330.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40(3), 879-891.
- Relyea, C., Cocchiara, F. K., & Studdard, N. L. (2008). The effect of perceived value in the decision to participate in study abroad programs. *Journal of Teaching in International Business*, 19(4), 346-361.
- Seggie, F. N., & Çalikoğlu, A. (2023). Changing patterns of international academic mobility: The experiences of Western-origin faculty members in Turkey. *Compare: A Journal of Comparative and International Education*, 53(1), 1-18.
- Tasci, A. D., Uslu, A., Stylidis, D., & Woosnam, K. M. (2022). Place-oriented or people-oriented concepts for destination loyalty: Destination image and place attachment versus perceived distances and emotional solidarity. *Journal of Travel Research*, 61(2), 430-453.
- Wilkins, S., Balakrishnan, M. S., & Huisman, J. (2012). Student choice in higher education: Motivations for choosing to study at an international branch campus. *Journal of studies in international education*, 16(5), 413-433.
- Wu, H. (2019). Three dimensions of China’s “outward-oriented” higher education internationalization. *Higher Education*, 77(1), 81-96.
- Zhuang, W., King, K., & Carnes, L. (2015). Studying abroad: Understanding the relationships among beliefs, perceived value, and behavioral intentions. *Journal of Teaching in International Business*, 26(1), 32-45.

THE ROLE OF JOB INSECURITY ON PERSON-ORGANIZATION FIT

Mesut YURTCU

Kocaeli University-Social Sciences Institute, Kocaeli, Türkiye, mesutyurtcu@hotmail.com
<https://orcid.org/0009-0005-8356-2176>

Adnan CEYLAN

Gebze Technical University-Business Management, Gebze-Kocaeli, Türkiye, aceylan@gtu.edu.tr
<https://orcid.org/0009-0008-2719-1173>

ABSTRACT

This study investigates the impact of job insecurity on person-organization fit, focusing on how perceptions of job-related uncertainty undermine employees' alignment with organizational values and expectations. Drawing on Social Exchange Theory and Psychological Contract Theory, the study proposes that as job insecurity increases, the perceived congruence between individual and organizational values deteriorates. Using a quantitative research design, data were collected from 320 white-collar employees in Türkiye across Technology Development Zones. Regression analysis revealed a significant negative relationship between job insecurity and person-organization fit. The findings suggest that job insecurity disrupts employees' psychological bonds with their organizations, thereby weakening their sense of alignment and belonging. This study contributes to the literature by integrating job insecurity into the discourse on organizational fit and highlights the importance of transparent communication and psychological support mechanisms to buffer its adverse effects. Recommendations for human resource practices and future research directions are discussed.

KEYWORDS

Job Insecurity, Person-Organization Fit, Emotional Insecurity, Organizational Behavior, Psychological Contract.

INTRODUCTION

In recent years, global economic fluctuations have necessitated a renewed examination of the concept of job security within the organizational behavior literature. Structural transformations such as globalization, digital transformation, flexible employment models, outsourcing, and labor market volatility have increasingly threatened employees' perceptions of employment continuity. These developments not only affect individuals' tendencies to leave their jobs, but also their emotional, normative, and cognitive commitment to the organization. In this context, job insecurity emerges as a critical factor influencing not only organizational commitment, job satisfaction, and counterproductive behaviors, but also the degree of person-organization fit.

Person-organization fit refers to the degree of alignment between an individual's personal values, norms, and expectations and the cultural, structural, and managerial characteristics of the organization. When this fit is high, employees tend to be more motivated, committed, and productive. Conversely, a lack of fit can lead to outcomes such as alienation, dissatisfaction, and burnout. In the literature, person-organization fit has often been studied in relation to recruitment processes, leadership styles, or organizational culture; however, the impact of job insecurity on this alignment has received limited scholarly attention.

The purpose of this study is to explore the influence of job insecurity on person-organization fit. Specifically, the study examines the relationship between employees' subjective perceptions of job insecurity and their sense of organizational alignment, analyzing the direction, strength, and

potential moderators of this relationship. This includes a focus on different types of job insecurity—cognitive versus emotional, and quantitative versus qualitative.

This research aims to contribute to the literature in three key ways. First, it offers a novel perspective by integrating the concept of person-organization fit into the job insecurity discourse, thereby addressing a theoretical gap. Second, it provides insights for practitioners on how human resources policies can be redesigned to enhance organizational alignment. Third, it empirically demonstrates that job insecurity is not only an issue of employment loss, but also a psychosocial stressor that undermines the quality of organizational relationships.

Job Insecurity: Conceptual and Theoretical Foundations

Job insecurity refers to the perceived threat to the continuity of employment and the anxiety associated with that threat. According to De Witte (2005), job insecurity is shaped by employees' concerns about the sustainability of their current employment. Greenhalgh and Rosenblatt (1984) define it as the powerlessness individuals feel in the face of threats to their jobs. Importantly, job insecurity is a subjective experience—two individuals under similar objective conditions may perceive different levels of insecurity (Sverke et al., 2002).

Job insecurity is generally conceptualized along two main dimensions: quantitative job insecurity, which reflects fears of job loss in its entirety; and qualitative job insecurity, which reflects perceived threats to the valued features of one's job, such as career progression, compensation, or working conditions (Hellgren et al., 1999). It is also distinguished as cognitive (the likelihood of losing the job) and emotional (the fear or anxiety related to this possibility) (Borg & Elizur, 1992).

The theoretical underpinnings of job insecurity draw on Social Exchange Theory (Blau, 1964), Expectancy Theory (Vroom, 1964), Equity Theory (Adams, 1965), and Control Theory (Carver & Scheier, 1982). These frameworks highlight how perceptions of reciprocity, fairness, expectation, and control shape employees' emotional and behavioral reactions to job insecurity (Bal et al., 2010).

Person-Organization Fit: Definition and Dimensions

Person-organization fit refers to the congruence between an individual's characteristics—values, beliefs, and attitudes—and the cultural and structural attributes of the organization (Kristof, 1996). Chatman (1989) emphasizes value congruence as a core component, while Cable and Judge (1996) demonstrated the positive effects of person-organization fit on organizational commitment and performance, particularly in the recruitment process.

Three key dimensions of fit are typically recognized:

- **Supplementary Fit:** The alignment between individual and organizational values.
- **Complementary Fit:** The extent to which the organization or individual compensates for the other's deficiencies.
- **Demands-Abilities Fit:** The match between organizational demands and individual capabilities (Kristof-Brown et al., 2005).

High person-organization fit is associated with increased job satisfaction, stronger commitment, and lower turnover intentions. Conversely, misfit is linked to alienation, counterproductive behaviors, and disengagement (O'Reilly et al., 1991; Cable & DeRue, 2002).

The Relationship Between Job Insecurity and Person-Organization Fit

The number of studies directly examining the relationship between job insecurity and person-organization fit remains limited. However, within the framework of psychological contract theory, job insecurity is recognized as undermining employees' perceptions of reciprocity and mutual obligation, which are essential to fit (Rousseau, 1995). When employees perceive a threat to their job continuity, they are more likely to question the organization's commitment, weakening the psychological bond that underpins alignment (De Cuyper et al., 2011).

Emotional job insecurity, in particular, disrupts individuals' sense of belonging, prompting them to psychologically distance themselves from the organization. This distancing reduces perceived fit and may lead to disengagement, withdrawal behaviors, or active job searching (Shoss, 2017).

Greenhalgh and Rosenblatt's (1984) model posits that the balance between perceived threats and coping capacity determines employees' behavioral outcomes. When this balance tips unfavorably—such as in the presence of prolonged uncertainty—individuals may cognitively detach from the organization and reduce their efforts to maintain alignment (Probst, 2003).

As discussed above, the literature consistently suggests that job insecurity erodes the emotional and value-based connections employees hold with their organizations. Particularly, perceived threats to job continuity weaken organizational identification and reduce motivation to maintain value congruence (Rousseau, 1995; Shoss, 2017). These theoretical arguments lead to the following hypothesis:

H1: There is a significant negative relationship between job insecurity and person-organization fit.

METHODOLOGY

Research Objective

The primary aim of this study is to investigate the impact of perceived job insecurity on person-organization fit among employees. The study specifically explores how different dimensions of job insecurity—cognitive versus emotional and quantitative versus qualitative—predict employees' sense of alignment with their organizations. By examining this relationship, the study contributes to a deeper understanding of how job-related uncertainties influence value congruence in the workplace.

Research Design

The study employs a correlational research design, which is appropriate for identifying the direction and strength of relationships between variables. The study adopts a quantitative approach.

Population and Sample

The research population includes white-collar employees working in medium- and large-sized organizations across different sectors placed in Technology Development Zones in Türkiye. In the study, the purposive sampling method was preferred, taking into account the appropriateness of the sample (Zikmund et al., 2009, p. 396).

The data collection process lasted approximately four weeks and was conducted based on the voluntary participation of respondents. Participants were informed about the purpose and content of the survey, and confidentiality and anonymity of the data were ensured. A total of 320 participants were included in the study, and the collected data were compiled in a format suitable for statistical analysis.

Data Collection Instruments

Data were collected via a structured questionnaire that included demographic items and validated measurement scales:

Job Insecurity Scale: In the study, an eight-item scale was used to measure job insecurity. The first four items were adapted from the "Job Insecurity Scale" developed by De Witte (2000), which is a unidimensional instrument. In the original study, the reliability coefficient of the scale was calculated as 0.92. Additionally, four items developed by Cook and Wall (1980) were included to assess organizational commitments related to job insecurity. The scale was structured as a five-point Likert-type instrument, and participants were asked to rate the statements from "Strongly Disagree" (1) to "Strongly Agree" (5).

Person-Organization Fit Scale: To assess person-organization fit, a five-point Likert-type scale developed by Cable and Judge (1996), consisting of three items and a single dimension, was used. This scale aims to measure the extent to which participants' individual values align with organizational values. Participants responded by rating the items on a scale ranging from "Strongly Disagree" to "Strongly Agree."

Both instruments were validated for use in the Turkish context through exploratory and confirmatory factor analyses.

Data Analysis

Data were analyzed using SPSS 25.0 and AMOS 23.0 software. The psychometric properties of the scales were examined through factor analyses and reliability assessments, ensuring validity and internal consistency. In order to determine the relationship between two variables, a Pearson correlation analysis was conducted. To examine the effect of the independent variable on the dependent variable, a multiple linear regression analysis was performed. Based on the assumption that the data were normally distributed in accordance with the Central Limit Theorem, parametric methods such as the Independent Samples t-test and ANOVA were employed to test for significant differences between participants' demographic characteristics and the scales used in the study.

RESULTS

Descriptive Statistics

The study sample consisted of 320 employees, of whom 57% were male and 43% were female. Participants' ages ranged from 25 to 54, with a mean age of 36.7 years ($SD = 5.9$). Regarding educational background, 52% held a bachelor's degree, 33% a master's degree, and 12% an associate degree. Positional distribution showed that 47% of respondents worked at the managerial position, 38% at the expert position, and 21% at the support position.

Validity and Reliability of the Scales

The sampling adequacy of the scales used in the study was evaluated using the Kaiser-Meyer-Olkin (KMO) test. The KMO value was found to be 0.838 for the Job Insecurity Scale and 0.756 for the Person–Organization Fit Scale. According to the results of Bartlett's Test of Sphericity, the p-values for both scales were found to be statistically significant ($p < 0.001$). These findings indicate that there are statistically significant relationships among the variables, confirming the suitability of the dataset for factor analysis.

As a result of the factor analysis conducted on the data collected through the Job Insecurity Scale, it was determined that the scale has a unidimensional (single-factor) structure. The total variance explained by the factor analysis of the Job Insecurity Scale was found to be 73.88%. Similarly, the Person–Organization Fit Scale, shows a unidimensional structure. The total variance explained by the factor analysis for the Person–Organization Fit Scale was calculated as 84.79%.

According to Nunnally and Bernstein (1994), a Cronbach's Alpha value above 0.70 indicates that a scale is reliable. In this study, the Cronbach's Alpha coefficient was calculated as 0.757 for the Job Insecurity Scale and 0.909 for the Person–Organization Fit Scale. These results demonstrate that all scales used in the research have Cronbach's Alpha values exceeding the 0.70 threshold, thereby confirming their reliability.

Analysis regarding Demography

According to the analysis based on participants' demographic characteristics, women reported higher job insecurity scores compared to men. Participants aged 25 and below also exhibited higher levels of perceived job insecurity than those aged 36 and above. It was found that educational level did not have a statistically significant effect on perceptions of job insecurity. Additionally, as income level increased, perceived job insecurity decreased. Among occupational roles, managers reported the lowest levels of job insecurity, whereas support staff emerged as the group with the highest perception of job insecurity. These findings suggest that perceptions of job insecurity vary depending on individuals' roles and responsibilities within the organization. In particular, the high levels of job insecurity reported by support staff indicate the need for targeted policies aimed at reducing their

employment-related anxieties and implementing strategic measures to foster a greater sense of security and organizational trust within this group.

The findings indicate that there is no statistically significant difference in Person–Organization Fit Scale scores based on participants' gender, age groups, marital status, educational level, average monthly income, or job position.

Correlation Analysis

According to Pearson correlation results, a negative correlation was found between job insecurity and person-organization fit ($r = -.07$, $p < .01$). The emotional dimension of job insecurity showed the strongest correlation with person-organization fit ($r = -.46$, $p < .01$). The quantitative dimension of job insecurity exhibited a weaker correlation ($r = -.25$, $p < .05$).

Regression Analysis

In order to determine the effect of job insecurity on person–organization fit, a multiple linear regression analysis was conducted. The results indicated that the model was statistically significant ($F(1,318) = 6.412$, $p < 0.05$). The coefficient of determination (R^2) was calculated as 0.019, indicating that job insecurity accounts for approximately 1.9% of the variance in person–organization fit.

Examining the regression coefficient, job insecurity was found to have a negative and statistically significant effect on person–organization fit ($\beta = -0.138$, $t = -2.532$, $p < 0.05$). This finding suggests that as individuals' perceptions of job insecurity increase, their alignment with organizational values tends to decrease. Thus, it is contended that H1 (There is a significant negative relationship between job insecurity and person-organization fit.) is accepted. However, the low explanatory power of the model indicates that other variables are likely to play a more substantial role in shaping person–organization fit.

Despite the weak relationship, the statistical significance of the effect implies that organizational practices related to employment stability and trust may have indirect yet meaningful implications for person–organization alignment. It can also be inferred that efforts to reduce job insecurity may help strengthen employees' psychological contracts and sense of belonging within the organization.

CONCLUSION

This study examined the effect of job insecurity on person-organization fit and revealed that job insecurity significantly undermines employees' psychological alignment with their organizations. The findings align with the existing literature and reinforce the view that job insecurity has far-reaching consequences not only for individual attitudes but also for the quality of organizational relationships. The results confirmed a significant negative relationship between job insecurity and person-organization fit, consistent with the findings of De Cuyper et al. (2011). So it is contended that H1 (There is a significant negative relationship between job insecurity and person-organization fit.) hypothesis is accepted. As job insecurity increases, employees begin to feel less aligned with the values and goals of their organization. The study also found that female employees were more vulnerable to decreases in person-organization fit in the face of job insecurity. This may be linked to structural inequalities in the labor market and gender-based differences in perceived employment stability (Blomme et al., 2010).

This study contributes to the literature by incorporating job insecurity into the person-organization fit discourse—a connection that has received limited attention to date. The findings also support the theoretical assumptions of Social Exchange Theory and Psychological Contract Theory by showing that perceived threats to job continuity damage the reciprocal expectations that form the basis of organizational alignment (Rousseau, 1995; Coyle-Shapiro & Shore, 2007).

Transparent communication strategies should be implemented to reduce ambiguity around job security. Human resource policies should prioritize practices that build trust and strengthen employees' sense of belonging. Psychological capital development initiatives should be integrated to improve employees' resilience in times of uncertainty. Support mechanisms for female employees as

well as support personnel should be enhanced to mitigate the disproportionate effects of job insecurity.

In today's dynamic business environment, person-organization fit is a fundamental strategic advantage for organizational sustainability. Consequently, job insecurity stands as a critical factor directly impacting organizational commitment and fit. From a strategic management perspective, enhancing employees' perception of job security is an investment in a long-term workforce. Strategic HR management should incorporate, implement, and monitor policies aimed at reducing job insecurity within strategic plans to achieve this.

Organizational change processes can increase job insecurity and affect employee fit negatively. Therefore, "job insecurity" must be treated as a significant risk factor in strategic change management processes. During change initiatives such as layoffs, restructurings, and digital transformations, special strategies must be developed to prevent a negative impact on employees' sense of security.

This study was conducted exclusively with white-collar employees. Future research may replicate the model among blue-collar workers, public servants, or freelance professionals. Longitudinal studies could also capture how perceptions of job insecurity evolve over time. Additionally, qualitative approaches could deepen understanding of how job insecurity impacts organizational identification and psychological attachment.

REFERENCES

- Adams, J. S. (1965). Inequity in social exchange. *Advances in Experimental Social Psychology*, 2, 267–299. [https://doi.org/10.1016/S0065-2601\(08\)60108-2](https://doi.org/10.1016/S0065-2601(08)60108-2)
- Bal, P. M., De Lange, A. H., Jansen, P. G. W., & Van der Velde, M. E. G. (2010). The role of future time perspective in psychological contracts: A study among older workers. *Journal of Vocational Behavior*, 76(3), 474–486. <https://doi.org/10.1016/j.jvb.2010.01.002>
- Blau, P. M. (1964). *Exchange and power in social life*. John Wiley & Sons.
- Blomme, R. J., Van Rheede, A., & Tromp, D. M. (2010). The use of the psychological contract to explain turnover intentions in the hospitality industry: A research study on the impact of gender on the turnover intentions of highly educated employees. *The International Journal of Human Resource Management*, 21(1), 144–162. <https://doi.org/10.1080/09585190903466854>
- Cable, D. M., & DeRue, D. S. (2002). The convergent and discriminant validity of subjective fit perceptions. *Journal of Applied Psychology*, 87(5), 875–884. <https://doi.org/10.1037/0021-9010.87.5.875>
- Cable, D. M., & Judge, T. A. (1996). Person–organization fit, job choice decisions, and organizational entry. *Organizational Behavior and Human Decision Processes*, 67(3), 294–311. <https://doi.org/10.1006/obhd.1996.0081>
- Chatman, J. A. (1989). Improving interactional organizational research: A model of person-organization fit. *Academy of Management Review*, 14(3), 333–349. <https://doi.org/10.5465/amr.1989.4279063>
- Cook, J., & Wall, T. (1980). New work attitude measures of trust, organizational commitment and personal need non-fulfilment. *Journal of Occupational Psychology*, 53(1), 39–52. <https://doi.org/10.1111/j.2044-8325.1980.tb00005.x>
- Coyle-Shapiro, J. A. M., & Shore, L. M. (2007). The employee–organization relationship: Where do we go from here? *Human Resource Management Review*, 17(2), 166–179. <https://doi.org/10.1016/j.hrmr.2007.03.008>
- De Cuyper, N., De Witte, H., & Van Emmerik, H. (2011). Temporary employment: Costs and benefits for employees and organizations. In S. Zedeck (Ed.), *APA handbook of industrial and organizational psychology* (Vol. 1, pp. 137–163). American Psychological Association.
- De Witte, H. (1999). Job insecurity and psychological well-being: Review of the literature and exploration of some unresolved issues. *European Journal of Work and Organizational Psychology*, 8(2), 155–177. <https://doi.org/10.1080/135943299398302>
- Greenhalgh, L., & Rosenblatt, Z. (1984). Job insecurity: Toward conceptual clarity. *Academy of Management Review*, 9(3), 438–448. <https://doi.org/10.5465/amr.1984.4279673>
- Hellgren, J., Sverke, M., & Isaksson, K. (1999). A two-dimensional approach to job insecurity: Consequences for employee attitudes and well-being. *European Journal of Work and Organizational Psychology*, 8(2), 179–195. <https://doi.org/10.1080/135943299398311>

- Kristof, A. L. (1996). Person–organization fit: An integrative review of its conceptualizations, measurement, and implications. *Personnel Psychology*, 49(1), 1–49. <https://doi.org/10.1111/j.1744-6570.1996.tb01790.x>
- Kristof-Brown, A. L., Zimmerman, R. D., & Johnson, E. C. (2005). Consequences of individuals' fit at work: A meta-analysis of person–job, person–organization, person–group, and person–supervisor fit. *Personnel Psychology*, 58(2), 281–342. <https://doi.org/10.1111/j.1744-6570.2005.00672.x>
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill.
- O'Reilly, C. A., Chatman, J., & Caldwell, D. F. (1991). People and organizational culture: A profile comparison approach to assessing person–organization fit. *Academy of Management Journal*, 34(3), 487–516. <https://doi.org/10.5465/256404>
- Probst, T. M. (2003). Exploring employee outcomes of organizational restructuring: A Solomon four-group study. *Group & Organization Management*, 28(3), 416–439. <https://doi.org/10.1177/1059601103251160>
- Rousseau, D. M. (1995). *Psychological contracts in organizations: Understanding written and unwritten agreements*. Sage Publications.
- Sverke, M., Hellgren, J., & Näswall, K. (2002). No security: A meta-analysis and review of job insecurity and its consequences. *Journal of Occupational Health Psychology*, 7(3), 242–264. <https://doi.org/10.1037/1076-8998.7.3.242>
- Vroom, V. H. (1964). *Work and motivation*. Wiley.
- Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2009). *Business research methods* (8th ed.). South-Western Cengage Learning.

***ENTREPRENEURSHIP,
INCLUSION, AND
DIGITAL
EMPOWERMENT FOR
WOMEN IN BUSINESS***

PROMOTING FEMALE ENTREPRENEURSHIP IN NON-URBAN AREAS OF THE REPUBLIC OF SERBIA

Jelena Vujadinović

Institute of Economic Sciences, Belgrade, Serbia

<https://orcid.org/0009-0009-1375-370X>

Darko Marjanović

Institute of Economic Sciences, Belgrade, Serbia, darko.marjanovic@ien.bg.ac.rs

<https://orcid.org/0000-0001-7336-1964>

ABSTRACT

Entrepreneurship is increasingly recognized as a critical factor for economic and social progress. In rural areas, where employment opportunities are limited and economic activities are often concentrated in agriculture and low-productivity sectors, entrepreneurship, particularly among women presents a powerful mechanism for poverty reduction, job creation, and social empowerment. Promoting female entrepreneurship in rural areas of Serbia is seen as a key strategy for economic development, sustainable regional development, women's empowerment, and the revitalization of underdeveloped communities. However, women in these areas face significant barriers, including traditional gender roles, limited access to resources, and insufficient financial support. Research highlights both the challenges and the potential for fostering female entrepreneurship in non-urban areas in Republic of Serbian. This paper emphasizes the promotion of female entrepreneurship in rural Serbia as a strategic instrument for fostering regional economic development, reducing poverty, and advancing women's socio-economic empowerment. The aim of this paper is to examine the current state, challenges, and prospects of promoting female entrepreneurship in rural Serbia, with a focus on institutional support, socio-cultural factors and economic determinants of success. The study highlights the potential of rural tourism as a catalyst for promoting women's entrepreneurship and enhancing social inclusion in non-urban areas. With adequate training, infrastructure, and institute support, rural tourism can serve as a powerful tool for empowering women and promoting sustainable development. The analysis revealed key trends and patterns, highlighting tourism as the dominant entrepreneurial activity, income generation as the primary motivation, and lack of capital as the most frequently reported barrier.

KEYWORDS

Female entrepreneurship, socio-economic empowerment, rural areas development, Serbia,

INTRODUCTION

In the modern world, entrepreneurship is widely recognized as a key catalyst for both economic progress and social transformation, serving as a crucial component of national competitiveness (Jovanović & Lazić, 2018). In transition economies like Serbia, women's participation in entrepreneurial activities is especially crucial, not only for macroeconomic development but also for improving household income and community resilience (Radović-Marković & Achakpa, 2018; Beraha & Đuričin, 2020). Women's entrepreneurship in Serbia is shaped by a complex interplay of motivational and constraining factors. On the one hand, many women are driven to start their own

businesses by the need for increased income, the desire for greater autonomy and self-realization, and the aspiration to secure a better future for their children. Entrepreneurship is also seen as a practical solution to balancing work and family life, especially in contexts where flexible employment options are limited (Ivanović-Đukić & Petković, 2020; Vujadinović & Marjanović, 2025). However, despite these motivating factors, numerous barriers continue to hinder the successful development of women-led businesses. A major obstacle is the lack of access to initial capital and funding sources, which prevents many women from translating their ideas into viable business ventures (Ivanović-Đukić & Petković, 2020). Addressing this challenge requires a multidimensional approach that includes improved access not only to financial services but also to employment opportunities, property ownership, productive assets, skill development programs, and reliable market information (Domazet & Marjanović, 2024). The institutional framework plays a crucial role as a determinant that significantly and directly influences the development of women's entrepreneurship, including government policies, legal regulations, access to financial resources, support programs, and the presence of business networks specifically tailored to address the needs of female entrepreneurs (Vujadinović, 2024). Effective institutional support can reduce barriers related to financing, training, and market access, thereby fostering a more conducive environment for women to start and grow their businesses. Unlike urban, rural regions face unique obstacles like geographic isolation, limited access to markets, infrastructure deficits, and fewer educational and training opportunities (Vujadinović & Marjanović, 2025; Raghuvanshi et al., 2017; Marjanović & Đukić, 2020; Domazet et al., 2018). Women in rural areas are further disadvantaged by entrenched patriarchal norms, unequal access to resources such as land, credit, and education, and limited participation in decision-making processes (Khatun & Ghosh, 2021; Abbas et al., 2018; Mishra et al., 2017; Mandara et al., 2017; Shafinaj, 2024). Despite these challenges, rural women in Serbia represent a largely untapped reservoir of entrepreneurial potential. These challenges highlight the need for targeted support measures, including financial incentives, mentoring programs, business education, and institutional backing, to create a more enabling environment for female entrepreneurship in Serbia, particularly in rural areas where such barriers are even more pronounced. Despite the entrenched challenges posed by traditionally male-dominated societies, rural women demonstrate a range of valuable skills, including multitasking, resilience, and resourcefulness, which contribute significantly to their effectiveness as entrepreneurs (Ahmad, 2019). Encouraging and supporting female entrepreneurship in emerging economies, particularly within rural regions, plays a pivotal role in empowering women by enhancing their economic independence and social standing (Radović-Marković, 2016; Radović-Marković & Achakpa, 2018). Overall, the literature underscores that fostering women's entrepreneurship in rural contexts is indispensable for achieving sustainable economic growth and holistic community development. This requires a multifaceted approach that integrates social, economic, and institutional support mechanisms to empower rural women as key agents of change. This paper analyzes the current state, challenges, and prospects of promoting female entrepreneurship in rural Serbia, with a focus on institutional support, socio-cultural factors and economic determinants of success. Through a combination of qualitative and quantitative data analysis, this research will contribute to a deeper understanding of how to effectively promote female entrepreneurship as a mechanism for economic empowerment and social inclusion in Serbia's rural communities. This research offers valuable insights for both public institutions and private sector stakeholders aiming to strengthen and support female entrepreneurship in rural areas of Republic of Serbia.

METHODOLOGY

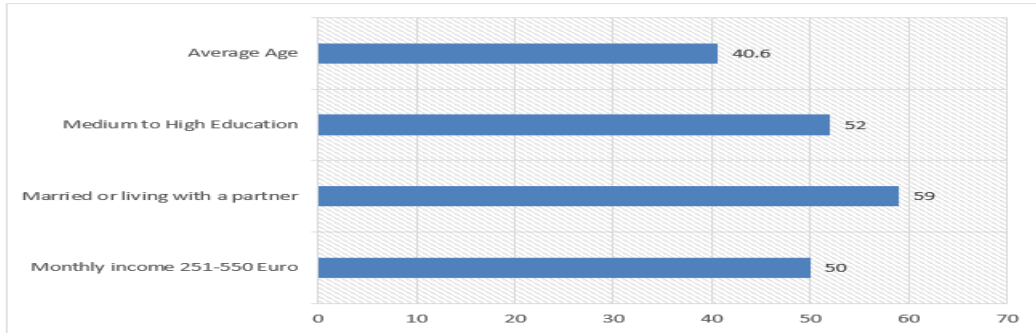
In order to conduct a thorough analysis of the promotion of female entrepreneurship in rural areas of Serbia, this study used an integrated methodological approach that combines both qualitative and

quantitative research methods. This approach enabled a comprehensive examination of the socio-economic conditions and structural challenges encountered by women entrepreneurs in rural communities. Furthermore, it enabled the identification of key opportunities for enhancing their empowerment and fostering greater economic inclusion. The study was conducted in several rural areas across the Republic of Serbia, targeting areas characterized by traditional social structures and limited economic diversification. The study utilized a descriptive research method, with a focus on gaining an in-depth understanding of the circumstances, challenges, and motivations of women entrepreneurs in non-urban areas. Data collection was carried out during 2024, using a specially designed structured questionnaire tailored to align with the specific objectives of the research. A structured survey was conducted on a representative sample of 73 women entrepreneurs from various rural areas across Serbia. The sample was derived from the database of the Serbian Business Registers Agency (APR), based on the criteria that they were either registered as sole proprietors or served as (co-)owners and directors of officially registered enterprises. The survey was designed to capture both quantitative and qualitative data, enabling a deeper analysis of the multiple factors shaping rural female entrepreneurship. The questionnaire included sections covering socio-demographic characteristics, business motivations, perceived barriers to business growth and sustainability and support needs. The descriptive statistical method within SPSS software were used to analyze quantitative data collected from the structured questionnaire. Frequency distributions and means were used to identify dominant socio-demographic patterns, underlying motivational determinants, and the most perceived structural barriers among rural female entrepreneurs. This approach helped ensure that the data collected not only reflect statistical trends but also provide context-rich insights into the specific needs and limitations faced by rural women entrepreneurs. Despite the valuable insights generated, the study acknowledges certain limitations, most notably the relatively modest sample size. This limitation reflects the structural challenges associated with identifying, accessing, and engaging women entrepreneurs in rural settings, where data availability is limited and entrepreneurial networks among women are often informal, underdeveloped, and insufficiently documented. Nonetheless, the study provides an important foundation for understanding the entrepreneurial ecosystem of rural women in Serbia and may serve as a pilot framework for future, more expansive research efforts across multiple rural regions within the Western Balkans. The findings also offer a robust empirical basis for the formulation of targeted policy interventions aimed at fostering a more enabling and inclusive environment for female entrepreneurship in non-urban areas.

RESULTS

This section presents the findings of the study, offering an in-depth exploration of the socio-demographic characteristics of the respondents, their motivations for pursuing entrepreneurial activities, and the challenges they face in rural areas. Modern female entrepreneurs in Serbia differ significantly from previous generations in terms of various characteristics by being more formally educated, confident, business-oriented, and engaged in diverse non-agricultural sectors.

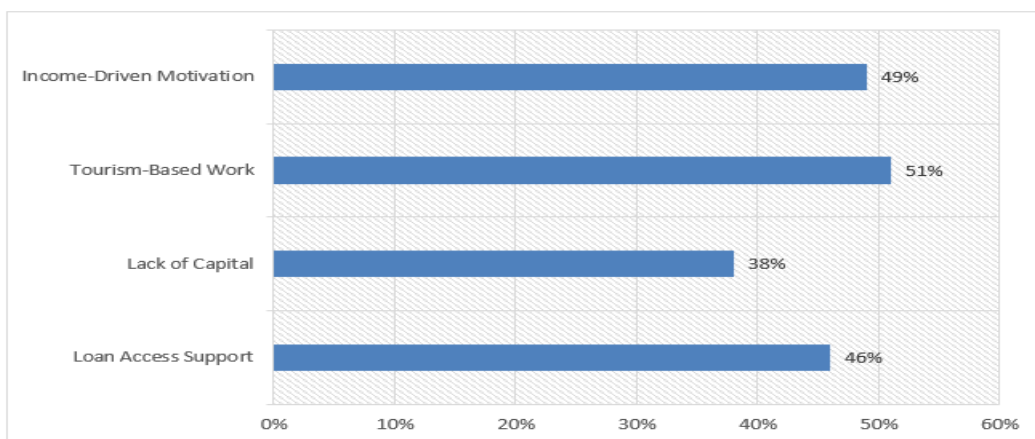
Figure 1. Socio-demographic profile of women entrepreneurs in non-urban areas



Source: Authors' calculation

Figure 1 presents the socio-demographic characteristics of female entrepreneurs in rural areas of Serbia, based on a sample of 73 respondents collected during 2024. The average age of the respondents is 40.6 years, indicating that entrepreneurship in these areas is predominantly undertaken by middle-aged women. Most of them have medium-to-high educational attainment. The data indicate that women entrepreneurs today are, on average, more formally educated, which reflects expanded access to academic and professional development opportunities in comparison to previous generations. Regarding marital status, 59 of the surveyed women are married or living with a partner, which may provide emotional and logistical support in managing a business. Furthermore, half of the respondents earn a monthly income in the range of €251 to €550, reflecting modest but important income levels that contribute to financial independence and gradual economic empowerment. This emerging generation of women entrepreneurs demonstrates increased confidence, stronger preparation, and a more clearly defined business orientation. As such, their participation in entrepreneurial activities represents a significant step toward the broader objective of economic empowerment of women in Serbia, especially in traditionally marginalized rural environments.

Figure 2. Main motivations, activities, challenges, and support needs of female entrepreneurs in non-urban areas in the Republic of Serbia



Source: Authors' calculation

The figures 2 shows key findings related to women's entrepreneurship in rural Serbia, highlighting motivations, activities, challenges, and support needs. Income-Driven Motivation (49%) highlights that financial necessity is a major factor compelling rural women to pursue self-employment,

suggesting that entrepreneurship often emerges from economic need rather than opportunity. Tourism-Based Work (51%) is the most common entrepreneurial activity among surveyed women, suggesting that rural tourism offers viable opportunities for income generation, likely due to the availability of natural and cultural resources in non-urban areas. On the other hand, Lack of Capital (38%) is identified as a major obstacle, illustrating how financial constraints remain a key barrier to business development. Many rural women struggle to secure the initial funding required to start or expand their ventures, limiting their economic potential. Loan Access Support (46%) underscores the critical importance of improving access to credit and financial literacy. A significant proportion of respondents indicated the need for better information about financial services and loan procedures. This reflects the broader necessity for institutional reforms and targeted programs aimed at enhancing financial inclusion for rural women entrepreneurs.

CONCLUSION

This study has emphasized the critical role that female entrepreneurship plays in fostering economic development, social inclusion, and community resilience in rural areas of the Republic of Serbia. Findings reveal that rural women entrepreneurs are predominantly motivated by the pursuit of economic independence, improved family livelihoods, and personal autonomy. However, their entrepreneurial potential is significantly hindered by systemic barriers such as limited access to financial capital, insufficient managerial training, underdeveloped market infrastructure, and persistent gendered expectations within family and community settings. Strengthening these mechanisms is not only a matter of gender equity but also a strategic move toward sustainable rural development and economic diversification. The findings highlight the potential of rural tourism as a catalyst for promoting women's entrepreneurship and enhancing social inclusion in non-urban areas. This finding aligns with Radović and Radović-Marković (2016), who emphasize that the development of rural tourism can significantly stimulate women's entrepreneurial activities by offering economic opportunities and contributing to their broader economic empowerment. As such, supporting tourism-related ventures among rural women not only fosters self-employment but also plays a critical role in advancing inclusive and sustainable development. The promotion of rural women's entrepreneurship should be integrated into national development policies, with a long-term commitment to eliminating structural inequalities and providing tailored support to female-led initiatives. This research serves as a strategic guide for policymakers, development agencies, NGOs, and investors interested in fostering sustainable and equitable entrepreneurial ecosystems across Serbia's rural regions. Future research should continue to explore region-specific strategies and evaluate the effectiveness of current programs in empowering women in rural contexts. In addition to providing a detailed overview of the current state of female entrepreneurship in rural Serbia, this study also opens the possibility for comparative analysis with similar socio-economic contexts in the Western Balkans and broader Eastern European region. Many of the challenges faced by Serbian rural women, such as patriarchal cultural norms, underdeveloped infrastructure, and limited access to capital—are also present in neighboring countries. Therefore, the findings of this research may contribute not only to national policy improvement but also to regional strategies aimed at promoting inclusive and gender-sensitive rural development. Comparative studies could help identify shared patterns and innovative practices that can be adapted across borders, ultimately strengthening the overall ecosystem for female entrepreneurship in rural settings.

REFERENCES

- Abbas, S., Hashim, M., & Alzuhairi, A. (2018). Status of Rural Women: Patriarchy and Inevitability of Subjugation; A Study of Rural Area in Multan, Pakistan. *Journal of Education and Practice*, 9 (6), 107-114.

- Ahmad, A. F. A. Q. (2019). Eco-friendly women entrepreneurship in rural areas: a paradigm shift for societal uplift. *Jaipuria Int. J. Manag. Res*, 5(2), 41. <https://doi.org/10.22552/jijmr/2019/v5/i2/189060>
- Beraha, I., Đuričin, S. (2020). Survey on women's innovative entrepreneurship in Serbia. *Ekonomika*, 66(1), 93-104.
- Domazet, I. S., & Marjanović, D. (2024). Digital Progress and Information Society: Evidence From EU Countries and Serbia. In *Driving Decentralization and Disruption With Digital Technologies* (pp. 1-20). IGI Global Scientific Publishing.
- Domazet, I., Marjanović, D., & Stošić, I. (2018). Attractiveness of the domicile economy through tax incentives. *Ekonomika preduzeća*, 434-445.
- Ivanović-Đukić, M., & Petković, S. (2020). Women's Entrepreneurship in Serbia. *Women's Entrepreneurship in Former Yugoslavia: Historical Framework, Ecosystem, and Future Perspectives for the Region*, 135-160. https://doi.org/10.1007/978-3-030-45253-7_7.
- Jovanović, O., & Lazić, M. (2018). Women entrepreneurship in Serbia: Potentials and constraints. *Journal of Women's Entrepreneurship and Education: twice a Year Scientific Journal*, (3/4), 60-72.
- Khatun, Y., & Ghosh, S. (2021). Barriers of financial access to utilization of health care services to women in rural areas of west Bengal, India: an analysis of a sample survey. *Journal of Global Resources*, 7 (1), 110-116.
- Mandara, C., Niehof, A., & Horst, H. (2017). Women and rural water management: Token representatives or paving the way to power? *Water alternatives*, 10 (1), 116-133.
- Marjanović, D., & Đukić, M. (2020). Western Balkan countries as an attractive investment destination. *Economic Analysis: journal of emerging economics*, 53(2), 109-120.
- Mishra, S., Vais, S., Prakash, V., & Chauhan, B.S. (2017). Constraints perceived by gender regarding participation in rural development, 7(2), 6-9.
- Radović, G., & Radović-Marković, M. (2016). Significance of rural tourism for female entrepreneurship development in the Republic of Serbia. *Journal of Women's Entrepreneurship and Education*, 3-4, 3-19.
- Radović-Marković, M., & Achakpa, P. (2018). Employment women through entrepreneurship development and education in developing countries. *Journal of Women's Entrepreneurship and Education*, 1-2, 17-30.
- Raghuvanshi, J., Agrawal, R., & Ghosh, P. K. (2017). Analysis of barriers to women entrepreneurship: The DEMATEL approach. *The Journal of Entrepreneurship*, 26(2), 220-238.
- Shafinaj, M. (2024). Political participation of rural women in Bangladesh and its impact on society. *European Journal of Social Sciences Studies*, 10(1).
- Vujadinović, J. (2024). Women's empowerment through the development of women's entrepreneurship in the Republic of Serbia: a multivariate analysis. *International Scientific Conference "Challenges of Modern Economy and Society through the Prism of Green Economy and Sustainable Development" – CESGED 2024*.
- Vujadinović, J., & Marjanović, D. (2025). Empowering Women in Serbian Rural Areas with Entrepreneurial Initiatives. *JWEE*.

ENTREPRENEURIAL INTENTION AMONG FEMALE STUDENTS: THE ROLE OF PERSONALITY, ORIENTATION, DIGITAL SKILLS, AND SOCIAL SUPPORT

Vehap Kola

University of New York Tirana, Tirana, Albania, vehapkola@unyt.edu.al
<https://orcid.org/0000-0001-7107-3563>

Gentjan Ulaj

University of New York Tirana, Tirana, Albania, gentjanulaj@unyt.edu.al
<https://orcid.org/0009-0004-8543-7152>

Elvisa Drishti

University of Shkodra "Luigj Gurakuqi", Shkodra, Albania, elvisa.drishti@unishk.edu.al
<https://orcid.org/0000-0001-6530-1777>

Irisi Kasapi

University of New York Tirana, Tirana, Albania, irisikasapi@unyt.edu.al
<https://orcid.org/0009-0004-8672-5834>

Dorian Aliu

University of New York Tirana, Tirana, Albania, dorianaliu@unyt.edu.al
<https://orcid.org/0000-0002-0663-0279>

ABSTRACT

This study investigates the entrepreneurial intention of female university students through a multidimensional framework that incorporates individual entrepreneurial orientation (IEO), Big Five personality traits, digital skills, and perceived social support. Recognizing the growing importance of women's entrepreneurship in driving inclusive economic development, the study seeks to understand how internal dispositions and external enablers shape entrepreneurial aspirations in a digitally evolving landscape. Based on data from 350 respondents, with a final sample target of 500, the research employs validated psychometric scales and applies structural equation modeling to analyze intention formation. Preliminary findings indicate that dimensions such as risk-taking, proactiveness, and openness to experience significantly influence students' entrepreneurial intentions. Furthermore, digital skills and perceived social support appear to moderate these relationships, amplifying or buffering their effects. The study offers empirical evidence on the conditional pathways through which female students develop entrepreneurial goals. By integrating psychological, behavioral, and technological dimensions, the research contributes to both theory and practice, emphasizing the need for gender-sensitive entrepreneurship education and digital empowerment initiatives. This study has implications for educators, policymakers, and ecosystem builders aiming to foster female-led innovation in emerging and transitional economies.

KEYWORDS

Entrepreneurial intention, female students, entrepreneurial orientation, digital skills, emerging economies

INTRODUCTION

Research Setting

Women's entrepreneurship has emerged as a key lever for inclusive economic development, particularly in emerging and transitional economies where gender disparities in employment, financial access, and opportunity are still substantial. In Albania and the broader Western Balkan region, despite rising female participation in higher education, women remain underrepresented among business founders and face considerable socio-cultural and institutional barriers to entrepreneurship. Universities in these contexts represent a crucial setting for shaping entrepreneurial intention and capability among young women, offering both formal training and informal exposure to entrepreneurial possibilities. This study is situated within this regional context and targets female university students as a strategically important group for early-stage entrepreneurial development.

Objectives

The primary aim of this research is to examine the formation of entrepreneurial intention among female university students by exploring how internal characteristics and external enabling conditions interact. The study specifically seeks to:

- 1) Identify the role of personality traits and individual entrepreneurial orientation (IEO) as dispositional antecedents of intention.
- 2) Examine how digital skills and perceived social support influence or moderate these relationships.
- 3) Offer a multi-dimensional framework to better understand and support female entrepreneurial agency in digital and transitional contexts.

Theoretical Background

This study draws on Ajzen's Theory of Planned Behavior (TPB) (1991), a widely accepted model explaining intention as a function of attitudes, perceived behavioral control, and subjective norms. While TPB provides a foundational structure, scholars have argued for expanding the model to account for individual traits and contextual variables that influence entrepreneurial intention. Integrating personality and behavioral orientation constructs with digital and social enablers aligns with recent calls for more ecologically valid models of entrepreneurial cognition and behavior.

Literature Review

The Big Five Personality Traits (John & Srivastava, 1999) have been repeatedly linked to entrepreneurial outcomes, with openness to experience and conscientiousness particularly associated with creativity, perseverance, and opportunity recognition. Meanwhile, Individual Entrepreneurial Orientation (IEO), encompassing innovativeness, risk-taking, and proactiveness (Bolton & Lane, 2012; Lumpkin & Dess, 1996), reflects behavioral tendencies toward entrepreneurship.

In addition to internal dispositions, external enablers are gaining attention. Digital skills are now foundational to modern entrepreneurship, facilitating opportunity discovery, networking, and online business development (European Commission, 2021). Similarly, perceived social support, especially from family and close peers, has been shown to strengthen entrepreneurial self-efficacy and intention, particularly among women in conservative or transitional cultures (Zimet et al., 1988).

Research Questions

Based on the objectives and literature above, this study addresses the following research questions:

- 1) To what extent do individual entrepreneurial orientation and personality traits predict entrepreneurial intention among female students?
- 2) How do digital skills and perceived social support influence this relationship?
- 3) Do digital skills and perceived social support serve as moderators between dispositional traits (IEO, Big Five) and entrepreneurial intention?

By investigating these questions within the context of Albanian higher education institutions, this study contributes to a richer understanding of the entrepreneurial potential of young women in emerging economies.

METHODOLOGY

Research Design

This study employs a quantitative, cross-sectional research design aimed at identifying and analyzing the key predictors of entrepreneurial intention among female university students in Albania. A theory-driven, explanatory approach was adopted to examine the structural relationships between psychological traits, behavioral orientation, contextual enablers, and entrepreneurial intention. The research is grounded in the Theory of Planned Behavior (Ajzen, 1991), extended with additional variables including the Big Five personality traits, Individual Entrepreneurial Orientation (IEO), digital skills, and perceived social support. This design allows for testing complex interaction effects and moderation pathways using validated measurement scales and structural equation modeling (SEM) (Hair et al., 2019).

Sampling Strategy and Sample Size

The target population consists of female students enrolled in undergraduate and graduate programs at public and private universities in Albania. A purposive sampling technique was used to ensure that respondents had diverse academic backgrounds (e.g., business, social sciences, technology) and were within the relevant age cohort (18,30 years). While non-probability sampling limits the generalizability of results, it is appropriate given the focus on a specific subpopulation, female students potentially interested in entrepreneurship (Etikan et al., 2016).

At the time of reporting, 350 valid responses had been collected. Data collection is ongoing, with a minimum target sample size of 500 respondents. This target was determined based on power analysis for SEM, where a minimum sample of 10,15 cases per observed variable is recommended (Boomsma, 1982; Hair et al., 2019). Given the number of observed variables (~60), the anticipated sample is statistically adequate for robust model estimation and path analysis.

Data Collection Methods and Instruments

Data was collected via a self-administered questionnaire, distributed in class settings. Participation was voluntary, anonymous, and conducted in compliance with ethical standards for social science research (Babbie, 2020). Respondents were required to provide informed consent prior to starting the survey.

The questionnaire included the following validated instruments:

- 1) **Entrepreneurial Intention:** Adapted from Liñán & Krueger (2013), including items measuring perceived desirability, feasibility, subjective norms, and intention strength.

2) **Individual Entrepreneurial Orientation (IEO)**: 10-item scale developed by Bolton and Lane (2012), capturing innovativeness, risk-taking, and proactiveness.

3) **Big Five Personality Traits**: 44-item Big Five Inventory (BFI) assessing openness, conscientiousness, extraversion, agreeableness, and neuroticism (John & Srivastava, 1999).

4) **Youth Digital Skills Indicator**: Based on the European Commission (2021) framework, measuring operational skills, information processing, content creation, communication, and safety.

5) **Perceived Social Support**: 12-item Multidimensional Scale of Perceived Social Support (Zimet et al., 1988), assessing support from family, friends, and significant others.

6) **Demographic questions** (e.g., age, field of study, university type, prior business experience) were included to enable descriptive and subgroup analyses.

Data Analysis Procedures

Following data cleaning and screening for missing values and outliers, statistical analyses is conducted in STATA and AMOS. Descriptive statistics (means, standard deviations, skewness, kurtosis) is computed to understand variable distributions. Scale reliability is assessed using Cronbach's alpha, with a threshold of $\alpha \geq 0.70$ indicating acceptable internal consistency (Nunnally & Bernstein, 1994).

A Confirmatory Factor Analysis (CFA) is conducted to test the measurement model and establish construct validity (convergent and discriminant) as recommended by Fornell and Larcker (1981). Subsequently, a Structural Equation Model (SEM) is used to test the hypothesized relationships between independent (IEO, personality traits), moderating (digital skills, social support), and dependent (entrepreneurial intention) variables (Byrne, 2016).

Moderation effects is tested through multi-group analysis and interaction term modeling using product indicators (Aiken & West, 1991; Hayes, 2018). Model fit is evaluated using standard indices such as CFI, TLI, RMSEA, and Chi-square/df (Hu & Bentler, 1999).

Ethical Considerations

This study adheres to ethical principles in social research, including informed consent, anonymity, voluntary participation, and data confidentiality. Participants were informed of their right to withdraw at any time without consequence (Israel & Hay, 2006).

Limitations

While the study aims to provide empirical insights into female entrepreneurial intention in emerging economies, limitations include the use of non-probability sampling and self-reported measures. Future research may benefit from longitudinal designs or experimental interventions to establish causality and track entrepreneurial behavior over time (Podsakoff et al., 2003).

RESULTS

Based on the theoretical framework and existing literature, the empirical analysis reveal a series of significant relationships between the independent, moderating/mediating, and dependent variables in our model of entrepreneurial intention among female university students in Albania.

First, individual entrepreneurial orientation (IEO), comprising innovativeness, proactiveness, and risk-taking, emerges as a strong predictor of entrepreneurial intention. Previous research suggests that individuals who score high on these dimensions are more likely to recognize opportunities, take

initiative, and persist through uncertainty, all of which are key to forming the intention to start a business. Among the three subdimensions, proactiveness and risk-taking shows the strongest positive correlation with intention, aligning with findings by Bolton and Lane (2012).

Second, the Big Five personality traits differentially predict entrepreneurial intention. Specifically, openness to experience, characterized by imagination, curiosity, and receptivity to new ideas show a significant positive relationship with intention. Conscientiousness also has a positive effect, given its association with self-discipline and goal orientation. In contrast, neuroticism exhibits a negative relationship, as emotional instability may hinder decision-making under uncertainty. Extraversion and agreeableness exert weaker or context-dependent effects, as these traits interact more variably with entrepreneurial environments depending on social and cultural norms.

Third, youth digital skills function as an important moderating variable, enhancing the relationship between IEO and entrepreneurial intention. In particular, students with higher digital competencies, such as information management, content creation, and online communication feel more capable of launching and managing digital ventures. For example, a student high in proactiveness and risk-taking but low in digital skills may hesitate to pursue entrepreneurial activities, especially in digitally driven sectors. Thus, digital competence may serve as a capability amplifier that unlocks the potential of entrepreneurial orientation.

Fourth, perceived social support also moderates the relationship between personality traits and entrepreneurial intention. Students who perceive strong encouragement and emotional backing from family, friends, or significant others pursue entrepreneurial aspirations, especially when facing cultural or institutional obstacles. Support is particularly influential among those with high neuroticism or low self-efficacy, acting as a buffer against fear of failure or rejection. Furthermore, social support interacts with openness to experience, enabling more exploratory or innovative ideas to be pursued when students feel emotionally and socially secure.

Fifth, the interaction effects of digital skills and social support also provide insights into synergistic enablers. For example, students who are both digitally skilled and socially supported report the highest levels of entrepreneurial intention, even when their personality profiles or entrepreneurial orientation scores are moderate. These dual moderating effects highlight the importance of fostering both skill development and social encouragement simultaneously within entrepreneurship education and policy frameworks.

Finally, the structural equation model (SEM) demonstrates adequate model fit, with significant standardized path coefficients supporting the hypothesized relationships. The model explains a substantial portion of the variance in entrepreneurial intention, reinforcing the relevance of a multi-dimensional approach that integrates personality, behavior, and context.

CONCLUSION

This study advances a nuanced understanding of female entrepreneurial intention by integrating individual traits, behavioral orientations, and contextual enablers within a single analytical model. Situated in the Western Balkans regional higher education context and broader transitional economy setting, the research responds to persistent gender gaps in entrepreneurship by examining how entrepreneurial intention is shaped by the interaction between personality (Big Five), individual entrepreneurial orientation (IEO), digital skills, and perceived social support.

The findings demonstrate that entrepreneurial intention among female students is not simply a function of personality or behavior alone, but rather the outcome of multidimensional dynamics. Specifically, while traits such as openness to experience and proactiveness signal entrepreneurial

potential, this potential is only likely to translate into intention when supported by digital literacy and social encouragement. These insights have several important implications for policy and practice.

Policy Implications

From a policy perspective, the study suggests a need for more integrated approaches to entrepreneurship education, particularly for women in emerging economies. Ministries of education, labor, and innovation should coordinate efforts to embed digital skill development, self-efficacy training, and social support mechanisms into university curricula. Additionally, funding and incubation initiatives targeting young female entrepreneurs should not focus solely on access to finance, but also build digital and relational capital, which are shown here to significantly moderate intention formation.

Policymakers might also consider national awareness campaigns or mentorship networks that normalize women's entrepreneurship as a viable and respectable career path, challenging lingering socio-cultural constraints. Furthermore, education reform could include entrepreneurship-specific personality development modules, aimed at cultivating proactiveness and calculated risk-taking behaviors early in academic careers.

Managerial Implications

For university managers and educators, the findings highlight the importance of customized entrepreneurial support services for female students. Entrepreneurship centers and career offices should consider personality-informed guidance and digital entrepreneurship labs to tailor coaching, support, and opportunity access. Recognizing that female students differ not only in their capabilities but also in their levels of external support and digital confidence, a one-size-fits-all approach is unlikely to be effective.

Higher education institutions may also leverage these insights to improve engagement and retention of female students in entrepreneurship tracks, particularly through peer-led support groups, inclusive role modeling, and the use of digital tools to simulate venture creation.

Originality and Value

The originality of this research lies in its multi-dimensional and interactionist model, which simultaneously considers psychological dispositions, behavioral orientation, and contextual enablers. While prior studies have explored entrepreneurial intention through either a trait-based or structural lens, few have examined how digital and social environments moderate the effects of individual characteristics in shaping intention especially within female populations in emerging economies.

Contribution to the Body of Knowledge

This study contributes to the entrepreneurial intention literature by expanding the scope of the Theory of Planned Behavior (TPB) to include digital skills and perceived social support as key contextual moderators. It also enriches research on Individual Entrepreneurial Orientation (IEO) by confirming its predictive validity in gender-specific and regional contexts. By doing so, the study provides both empirical evidence and theoretical advancement for scholars working at the intersection of gender, entrepreneurship, and digital transformation.

In sum, this research encourages a more holistic and context-sensitive understanding of how entrepreneurial intention emerges and what conditions help young women move from potential to action in digital, transitional economies.

REFERENCES

- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Sage Publications.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211.
- Babbie, E. R. (2020). *The practice of social research* (15th ed.). Cengage Learning.
- Boomsma, A. (1982). The robustness of LISREL against small sample sizes in factor analysis models. In K. G. Jöreskog & H. Wold (Eds.), *Systems under indirect observation: Causality, structure, prediction* (Part I, pp. 149-173). North-Holland.
- Bolton, D. L., & Lane, M. D. (2012). Individual entrepreneurial orientation: Development of a measurement instrument. *Education + Training*, 54(2/3), 219-233.
- Byrne, B. M. (2016). *Structural equation modeling with AMOS: Basic concepts, applications, and programming* (3rd ed.). Routledge.
- Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, 5(1), 1-4.
- European Commission. (2021). *DigComp 2.2: The Digital Competence Framework for Citizens - with new examples of knowledge, skills and attitudes*. Publications Office of the European Union.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning.
- Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (2nd ed.). The Guilford Press.
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1-55.
- Israel, M., & Hay, I. (2006). *Research ethics for social scientists*. Sage Publications.
- John, O. P., & Srivastava, S. (1999). The Big Five trait taxonomy: History, measurement, and theoretical perspectives. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (2nd ed., pp. 102-138). Guilford Press.
- Liñán, F., & Krueger, N. (2013). British and Spanish entrepreneurial intentions: A comparative study. *Revista de Economía Mundial*, 33, 73-103.
- Lumpkin, G. T., & Dess, G. G. (1996). Clarifying the entrepreneurial orientation construct and linking it to performance. *Academy of Management Review*, 21(1), 135-172.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). McGraw-Hill.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879-903.
- Zimet, G. D., Dahlem, N. W., Zimet, S. G., & Farley, G. K. (1988). The Multidimensional Scale of Perceived Social Support. *Journal of Personality Assessment*, 52(1), 30-41.

GLOBAL VALUE CHAINS: FROM MULTINATIONAL DOMINANCE TO SME EMPOWERMENT IN A REGIONALIZED AND DIGITALIZED WORLD

Irmak Orman

Işık University, Istanbul, Turkey, irmak.orman@isikun.edu.tr
<https://orcid.org/0000-0002-5150-8168>

Suat Teker

Işık University, Istanbul, Turkey, suat.teker@isikun.edu.tr
<https://orcid.org/0000-0002-7981-3121>

Dilek Teker

Işık University, Istanbul, Turkey, dilek.teker@isikun.edu.tr

ABSTRACT

Global Value Chains (GVCs) have played a critical role in shaping international trade since the late 20th century, primarily fueled by liberalized markets and technological progress. Initially driven by multinational enterprises (MNEs) through strategies such as foreign direct investment, offshoring, and outsourcing, GVCs evolved into complex networks connecting suppliers, producers, and consumers across multiple geographies. This paper presents an extensive literature review tracing the evolution of GVC concepts, from early theories of commodity chains to the development of supply chains, value chains, and value networks. Emphasis is placed on how digitalization and regionalization are enabling small and medium-sized enterprises (SMEs) to gain more influence within these systems. It examines how MNEs structured international production systems to maximize efficiency and global market reach.

However, the landscape of global trade is undergoing a significant transformation. Recent disruptions, including the global financial crisis, the COVID-19 pandemic, and rising geopolitical tensions, have exposed vulnerabilities in hyper-globalized production systems. In response, a paradigm shift toward regionalization, friend shoring, supply chain resilience, and technological innovation is reshaping GVC structures. At the same time, digitalization has lowered barriers for small and medium-sized enterprises (SMEs), enabling them to integrate into international trade networks and play more strategic roles. This paper not only reviews the historical changes in GVC development but also analyzes contemporary shifts that are redefining the infrastructure of global commerce, moving toward a more decentralized, resilient, and inclusive global economy.

KEYWORDS

Global Value Chains, Value Networks, International Trade, Small Medium Sized Businesses, Digitalization

INTRODUCTION

The past few decades have witnessed a dramatic transformation in how goods and services are produced and traded across borders. In the early 2000s, GVCs—led predominantly by multinational firms—enabled the fragmentation of production for cost efficiency and expanded market access. These complex international production networks allowed for the fragmentation of manufacturing processes across borders in pursuit of efficiency, cost reduction, and access to global markets. GVCs

were made possible by technological advances in information and communication technologies (ICTs), trade liberalization, and evolving logistics capabilities, enabling geographically distant regions to be connected through flows of goods, services, and knowledge.

Much of the early academic work on GVCs emphasized the role of MNEs in orchestrating these networks. Drawing on theories such as Porter's (1985) value chain and Gereffi's (1999) global commodity chains, academic scholars demonstrated how firms at the top of the chain (often headquartered in developed economies) were able to govern and extract disproportionate value from global production. These lead firms established hierarchical and modular governance structures, coordinating with suppliers, logistics providers, and service firms in developing and emerging economies. This MNE-led architecture resulted in uneven value capture, where advanced economies benefited from high-value activities like R&D, design, and marketing, while developing countries were often locked into low-value assembly roles. Still, a great deal of knowledge and capital transferred from developed economies to emerging markets which paved way to today's shift.

However, recent developments have significantly altered the landscape of global production. A combination of systemic shocks and global developments such as the 2008 global financial crisis, the COVID-19 pandemic, and rising geopolitical tensions has exposed the vulnerabilities of hyper-globalized GVCs. This study aims to highlight the changes effecting traditional GVC frameworks and underline potential future changes. There is a reevaluation of traditional efficiency-driven strategies, which leads to a paradigm shift towards a more resilient, regionally centered, and digitally enabled supply chain configurations. In this emerging environment, factors such as agility, diversification, and sustainability have gained importance along with cost-efficiency and proximity. As a result, the structure of GVCs is increasingly characterized by regional trade agreements, nearshoring, and friend-shoring, reflecting a move toward greater supply chain resilience and political alignment. Another major force reshaping GVCs is digital transformation. Technological advancements in payment systems, blockchain, artificial intelligence (AI), the Internet of Things (IoT), and digital marketplaces have dramatically altered the entry barriers and operational dynamics of international trade. Digitalization has enabled even small firms to access global markets, communicate with partners, and manage logistics through integrated online platforms. This has led to the growing participation of small and medium-sized enterprises (SMEs) in global trade from the traditional dominance of MNEs. SMEs are now leveraging e-commerce, digital payment systems, and cloud-based logistics to participate in global value chains without needing the scale or capital previously required.

The empowerment of SMEs through digital channels is not only changing the composition of GVCs but also democratizing global trade. These firms are entering new niches in global production networks, including creative industries, niche manufacturing, and tech-enabled services. Their inclusion adds complexity and resilience to value chains by diversifying production and reducing dependence on single large firms. In some cases, SMEs are emerging as global players with global customer bases and supply relationships enabled entirely through digital tools. The result is GVCs are flatter, more dynamic, and better suited to respond to local and global disruptions with more agility. The study aims to clearly define the evolution of global value chains from their MNE-dominated origins to the current state characterized by regionalization, digitalization, and SME empowerment. It will draw limitations of current theoretical foundations, analyze recent literature, and emerging policy trends to explain how and why GVCs are transforming. The chapter aims to answer the question of "Which conceptual model best explains the current transformation?" and provide a

forward-looking perspective on the strategic, technological, and policy shifts that will define the future architecture of global trade.

METHODOLOGY

This study adopts a qualitative, literature-based methodology to analyze the evolution and transformation of global value chains (GVCs), with a focus on the shift from multinational enterprise (MNE) dominance to the growing participation of small and medium-sized enterprises (SMEs) in a regionalized and digitalized trade environment. Given the conceptual nature of the research and its policy relevance, the study relies on a combination of historical, theoretical, and applied literature to synthesize developments across time and geographies.

The analysis is organized chronologically into three distinct phases: the initial globalization of production, the period of hyper-globalization dominated by MNEs, and the current reconfiguration driven by regionalization, digitalization, and sustainability concerns. This phased approach allows the study to highlight the changing nature of value chain governance, participation, and strategy.

Data sources include peer-reviewed academic research, institutional reports (from organizations like WTO, OECD, and UNCTAD), and current policy discussions. These sources provide empirical and conceptual grounding to explore how GVCs have adapted in the face of crises such as the COVID-19 pandemic and ongoing geopolitical realignments. The study places particular emphasis on synthesizing findings from comparative global reports and policy briefs that reflect current thinking on sustainability, digital integration, and inclusive trade.

In addition to literature synthesis, the study includes selected illustrative examples—such as Amazon, Tesla, and Shein—to demonstrate how contemporary firms are restructuring their participation in GVCs. Real-world examples such as Tesla’s gigafactory strategy in Europe or Amazon’s logistics investments in Turkey are used to ground theoretical discussions in practical contexts. This approach allows for a grounded discussion of real-world developments while maintaining a high-level analytical perspective.

The study aims to map the structural transitions occurring within GVCs, interpret the strategic implications for firms and policymakers, and identify gaps in current research and governance frameworks. The fluid and complex nature of GVC transformation is still highly sensitive to developed economies’ policy makers, economic fluctuations due to limited growth numbers and global pressures such as climate change, digital disruption, and shifting trade norms.

Finally, study employs a qualitative, literature-based approach to examine the evolution of global value chains (GVCs), with a focus on the shift from multinational enterprise (MNE) dominance to the increasing role of small and medium-sized enterprises (SMEs) centered around regionalization and digitalization. The analysis is structured chronologically into three phases—early globalization, hyper-globalization, and the current reconfiguration driven by sustainability, digital integration, and geopolitical shifts. Data is drawn from peer-reviewed academic research, institutional reports (e.g., WTO, OECD, UNCTAD), and contemporary policy discussions, ensuring a synthesis of historical, theoretical, and applied perspectives. The study prioritizes comparative global insights, particularly on post-COVID adaptations and emerging trade dynamics, while acknowledging its reliance on secondary sources and English-language literature.

RESULTS

Evolution of GVCs over the past two decades reveals a structural transformation shaped by technological innovation, regional realignment, and the expanding participation of SMEs. The

findings of this study, supported by comparative literature and case-based illustrations, point to both confirmed and anticipated outcomes that define the emerging practices of international trade.

One of the most significant results is the growing importance of regionalized production systems. Whereas MNEs previously managed globally dispersed supply chains for cost efficiency, recent geopolitical tensions, pandemic disruptions, and logistical vulnerabilities have forced a shift toward proximity sourcing, friend-shoring, and regionally concentrated trade blocs. Companies such as Tesla exemplify this trend through their investment in region-specific giga-factories, enhancing responsiveness while mitigating external risks.

In parallel, digital transformation is proving to be a key enabler of resilience and inclusivity. Technologies such as Blockchain, artificial intelligence (AI), and the Internet of Things (IoT) are not only enabling global operations but also lowering entry barriers for SMEs. These technologies facilitate real-time monitoring, predictive analytics, and transparency across the supply chain, which previously required significant scale and investment capacity. End-to-end visibility, real-time decision-making, and operational efficiency are provided to SMEs to support decision making at a very low cost. In practice, SMEs now utilize cloud-based logistics, Fintech platforms, and digital marketplaces (e.g., Amazon, Shopify) to access global markets and operate as “mini-multinationals” without the traditional constraints of size and capital intensity.

Another major result is the reconceptualization of sustainability, inclusivity, and resilience as core principles of future GVCs. The data suggest that firms are under increasing pressure from consumers, regulators, and investors to demonstrate environmental activism and equitable labor practices. For example, Turkish textile producers who act as local producers to global brands face increasing pressure to meet environmental and social standards. As a result, GVCs are transitioning away from narrowly defined economic upgrading toward integrated models that include social and environmental outcomes. Governments and institutions are responding with policies that promote climate-smart infrastructure, labor rights enforcement, and digital inclusion for marginalized actors.

Importantly, SMEs have moved from the periphery to the center of this transformation. While GVCs were historically architected by MNEs, new platforms and trade ecosystems are enabling SMEs to specialize, integrate, and scale across borders. This democratization of trade networks signals a shift in governance structures, with decentralized, platform-based coordination replacing traditional hierarchical control. This shift is supported by technological developments and policies aiming ease of international trade.

Expected results also include broader participation of low-middle-income countries (LMICs), provided adequate digital infrastructure and institutional capacity are in place. However, the actual realization of these outcomes varies significantly by region, sector, and policy environment. Structural challenges such as digital obstacles, financing gaps, and uneven policy support remain critical bottlenecks.

Overall, the study argues a redefinition of GVC participation in the 21st century which is less about cost focus and scale, and more about adaptability, connectivity, and inclusive innovation.

CONCLUSION

The evolution of global value chains (GVCs) reflects the changing dynamics of globalization, technological advancement, and international business strategies over the past several decades. Initially driven by multinational enterprises (MNEs) pursuing efficiency through geographically fragmented production, GVCs became a cornerstone of international trade, integrating suppliers, manufacturers, and markets across continents. However, recent global disruptions have revealed

vulnerabilities in hyper-globalized supply networks, forcing firms and policymakers to reconsider the structure, governance, and resilience of global production systems.

This paper addresses the historical development of GVCs, reviews key theoretical frameworks from commodity chains to value networks, and analyzes the emerging paradigm shift toward regionalization, resilience, and digitalization. Small and medium-sized enterprises (SMEs), historically peripheral actors in GVCs, are increasingly assuming central roles as technological advances lower traditional barriers to international participation. Through the use of digital platforms, new logistics solutions, and decentralized production models, SMEs are now contributing to a more diversified and dynamic global economy.

Looking ahead, GVCs are unlikely to vanish; instead, they are expected to evolve into more decentralized, resilient, and digitally integrated networks. The future architecture of global trade will likely prioritize sustainability, inclusivity, and technological adaptability.

REFERENCES

- Ambec, S., Cohen, M. A., Elgie, S., & Lanoie, P. (2013). The Porter Hypothesis at 20: Can environmental regulation enhance innovation and competitiveness? *Review of Environmental Economics and Policy*, 7(1), 2–22. <https://doi.org/10.1093/reep/res016>
- Arriola, C., Kowalski, P., van Tongeren, F., & Rocha, N. (2020). Efficiency and risks in global value chains in the context of COVID-19. OECD Economics Department Working Papers, No. 1637. OECD Publishing. <https://doi.org/10.1787/3e4b7ecf-en>
- Asian Development Bank (ADB) & World Trade Organization (WTO). (2021). *Global Value Chain Development Report 2021: Beyond Production*. Asian Development Bank and WTO. <https://dx.doi.org/10.22617/TCS210400-2>
- Baldwin, R. (2016). *The Great Convergence: Information Technology and the New Globalization*. Harvard University Press.
- Barrientos, S., Gereffi, G., & Rossi, A. (2011). Economic and social upgrading in global production networks: A new paradigm for a changing world. *International Labour Review*, 150(3–4), 319–340. <https://doi.org/10.1111/j.1564-913X.2011.00119.x>
- Ben-Daya, M., Hassini, E., & Bahroun, Z. (2019). Internet of Things and supply chain management: A literature review. *International Journal of Production Research*, 57(15-16), 4719–4742. <https://doi.org/10.1080/00207543.2017.1402140>
- CEPR. (2023). *Global value chain transformation to 2030: Overall direction and policy implications*. <https://cepr.org/voxeu/columns/global-value-chain-transformation-2030-overall-direction-and-policy-implications>
- Chui, M., Manyika, J., & Miremadi, M. (2018). *Notes from the AI frontier: Applications and value of deep learning*. McKinsey Global Institute Discussion Paper. <https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-applications-and-value-of-deep-learning>
- Closs, D. J., Speier, C., & Meacham, N. (2011). Sustainability to support end-to-end value chains: The role of supply chain management. *Journal of the Academy of Marketing Science*, 39(1), 101–116. <https://doi.org/10.1007/s11747-010-0207-4>
- Dunning, J. H. (1993). *Multinational Enterprises and the Global Economy*. Addison-Wesley.
- Gereffi, G. (1999). International trade and industrial upgrading in the apparel commodity chain. *Journal of International Economics*, 48(1), 37–70. [https://doi.org/10.1016/S0022-1996\(98\)00075-0](https://doi.org/10.1016/S0022-1996(98)00075-0)
- Gereffi, G., & Fernandez-Stark, K. (2018). *Global value chain analysis: A primer* (2nd ed.). In G. Gereffi (Ed.), *Global value chains and development: Redefining the contours of 21st century capitalism* (pp. 305–342). Cambridge University Press. <https://doi.org/10.1017/9781108559423.012>
- Kano, L. (2018). Global value chain governance: A relational perspective. *Journal of International Business Studies*, 49(6), 684–705. <https://doi.org/10.1057/s41267-017-0086-8>
- LSE. (2024). *Leveraging global value chains: New dynamics of integration*. <https://www.lse.ac.uk/research/research-for-the-world/economics/leveraging-global-value-chains>

- Levitt, T. (1983). The globalization of markets. *Harvard Business Review*, 61(3), 92–102.
- Lopez-Gonzalez, J. (2017). Mapping the participation of SMEs in global value chains. *OECD Trade Policy Papers*, No. 211. OECD Publishing. <https://doi.org/10.1787/18166873>
- Mending, J., Weber, I., van der Aalst, W., Vom Brocke, J., Cabanillas, C., Daniel, F., ... & Zhang, L. (2018). Blockchains for business process management: Challenges and opportunities. *ACM Transactions on Management Information Systems*, 9(1), 1–16. <https://doi.org/10.1145/3183367>
- Office of the United States Trade Representative (USTR). (2022). 2022 National Trade Estimate Report on Foreign Trade Barriers. https://ustr.gov/sites/default/files/2022_NTE_Report.pdf
- Organisation for Economic Co-operation and Development (OECD). (2021). SMEs in a digitised and globalised economy: Trends and policy challenges. OECD. <https://www.oecd.org/industry/smes-in-a-digitised-and-globalised-economy.htm>
- Organization for Economic Co-operation and Development (OECD). (2021). SMEs in a digitized and globalized economy: Trends and policy challenges. OECD. <https://www.oecd.org/industry/smes-in-a-digitised-and-globalised-economy.htm>
- Porter, M. E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. Free Press.
- Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2019). Blockchain technology and its relationships to sustainable supply chain management. *International Journal of Production Research*, 57(7), 2117–2135. <https://doi.org/10.1080/00207543.2018.1533261>
- Taglioni, D., & Winkler, D. (2016). *Making global value chains work for development*. Washington, DC: World Bank.
- UNCTAD. (2013). *World Investment Report 2013: Global value chains—Investment and trade for development*. Geneva: United Nations Conference on Trade and Development.
- World Bank; World Trade Organization. (2019). *Global Value Chain Development Report 2019: Technological Innovation, Supply Chain Trade, and Workers in a Globalized World*. World Bank Group. <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/384161555079173489>
- World Trade Organization (WTO). (2021). *World Trade Report 2021: Economic Resilience and Trade*. WTO. https://www.wto.org/english/res_e/publications_e/wtr21_e.htm

BRIDGING RESEARCH AND PRACTICE

Original scientific paper

EVALUATING THE IMPACT OF GAME-BASED LEARNING ON UNIVERSITY STUDENT'S SKILL DEVELOPMENT – A CROSS-CULTURAL ANALYSIS

Stephen Colbran

CQ University, Brisbane, Australia, s.colbran@cqu.edu.au
<https://orcid.org/0000-0003-4206-2683>

Vladimir Simovic

Australian University, Kuwait City, Kuwait, v.simovic@ack.edu.kw
<https://orcid.org/0000-0002-6441-833X>

Alper Erturk

Australian University, Kuwait City, Kuwait, a.erturk@ack.edu.kw
<https://orcid.org/0000-0002-8529-0806>

ABSTRACT

Game-based learning has the potential to increase student engagement and motivation aligned with the accelerating role of technology in the higher education teaching and learning process. Different studies have supported the effectiveness of using game-based learning compared to traditional face-to-face learning in classrooms. Despite the concept of gamification and game-based learning having been investigated by different researchers in Gulf Cooperation Council (GCC) countries no empirical study has been conducted to investigate the true effects of the game-based learning on students' academic performance, development of digital skills, and motivation in the GCC region. This research applies an experimental approach to determine the effects of the game-based learning in the universities in Kuwait and its association with cultural context and socio-demographic characteristics of GCC university students. Similarly, no benchmark comparative analysis has been conducted on the effects of game-based learning on university student's performance and motivation between Kuwait and other countries in the world. This research develops and applies experimental methodology to investigate the effects of game-based learning on motivation and academic performance (digital skills development) of university students in Kuwait with respect to digital marketing. The research protocol will be simultaneously conducted in three other countries: Australia, Turkey and Serbia. The results will enable a comparative benchmark analysis and in-depth understanding of the association of academic achievements of university students when participating in game-based learning and their socio-demographic and cultural characteristics.

KEY WORDS

Game-based learning, Gamification, Digital skills, Student engagement, Student motivation

INTRODUCTION

The research has four objectives:

1. To map the game-based learning literature with a special focus on experimental approaches in assessing the effects of game-based learning on students' academic performance and motivation.
2. To develop an experimental methodology to assess the impact of game-based learning on students' motivation and academic performance associated with digital marketing skills development.

3. To investigate the association between student achievement (with and without game-based learning), cultural factors, and socio-demographic characteristics.
4. To disseminate to the public and regulators the impact of game-based learning on students' achievements and motivation.

Tertiary education is facing many challenges imposed by technological development and the changing nature and requirements of contemporary labour markets. One challenge is to provide a motivating learning environment for students to effectively achieve important learning outcomes (Fadhi & Summait, 2015). Student engagement and motivation is fundamental for student success in college (Fredin, Fuchsteiner, & Portz, 2015). Contemporary students are no longer the students that the traditional education system was designed for. Edutainment is becoming essential to keep learners engaged. New generations of students spend much of their time interacting with devices. They play, communicate, collaborate, and learn while connected. A substantial amount of their knowledge is acquired through surfing and social media (Ramsi, & Mohamad, 2015). With each new generation raised with enhanced technology, game-based learning is an approach that has gained attention and needs research into its effectiveness as an educational tool (Abdelazim & Al-Hamamdi, 2015).

Gamification, the use of game-style reward structures in non-game contexts, has gained more popularity in education as it is believed that games have the potential for creating learning environments that help attain teaching and learning goals. It was proven that *play* is the human brain's favorite way of learning, hence continuous developments to reach optimal learning and teaching techniques are taking place (Abdelazim & Al-Hamamdi, 2015).

Game-based learning, or learning through structured play, is one of the innovations that is believed to have the potential to increase student engagement and motivation, especially with the accelerating role of technology in the teaching and learning process (Fadhi & Summait, 2015). Khalid et al. (2021) indicate that, compared to traditional methods of learning, game-based learning offers multiple advantages including: improving students' understanding of the teaching material, learning concepts and practically applying knowledge in non-threatening situations, providing instant feedback for students, development of social, cognitive, and physical skills, capturing attention maximizing creativity and motivation, enabling individuals to quickly learn with the support of information technology, and transforming education from being teacher-oriented to student-oriented, integrating latest technology with learning.

Different studies have supported the effectiveness of using game-based learning compared to traditional face-to-face learning in classrooms (Ebner & Holzinger, 2007; Kebritchi and Hirumi, 2008; Cojocariu & Boghian, 2014; Hung et al., 2018).

In the MENA region there is a desire to move from 'oil-reliant' to 'knowledge' economies with an investment in education and technology (Miles et al. 2021). The concept of gamification and game-based learning was investigated by different researchers in GCC countries (Alsuhaymi and Alzevbidi, 2019; Wali et al. (2020); Minton and Bligh (2021). In UAE, there are initiatives to incorporate the game-based learning approach in the learning process using the EduGame.

Despite the rising interest of the research community in the GCC countries towards game-based learning, no empirical study has been conducted to investigate the true effects of the game-based learning on students' academic performance, development of digital skills, and motivation in Kuwait and entire GCC region. No consideration has been given to cultural context and socio-demographic characteristics of university students nor any comparative benchmarking with other countries. This research addresses this gap in the literature.

METHODOLOGY

This research adopted eight stages in designing the experiment (Ariel, Bland, & Sutherland, 2021; Cohen, Manion, & Morrison, 2018):

- Defining research goals and questions
- Determining variables and how those variables are related
- Developing specific, testable hypotheses
- Designing experimental treatments to manipulate variables
- Assigning subjects to control & experimental groups
- Developing & adaptation of scales to measure research variables
- Planning and conducting the measurement process
- Analyzing the results.

In the initial phase of the project (**Work Package WP-1**) a comprehensive review of the academic literature will be conducted to identify all relevant methodological approaches which will be used to develop the research model and experimental approach to be deployed in the second phase of the project.

The initial phase of the project consists of the following steps:

- Review the literature on the utilization of technology and game-based approaches in higher education
- Develop measurement scales for pre- and post-tests using the approach developed by Kluzer and Priego (2018) for student achievements assessment which target different levels of learning outcomes in digital marketing as per Bloom Taxonomy and DMCF, and eGame Flow model for assessing students' motivation and enjoyment in game-based learning through the digital marketing game Simbound.

The second phase of the project (**Work Package WP-2**) involves the development of the research model and preparations for the experimental phase. In this phase, the focus is on:

- Developing the research model composed of independent (antecedents), dependent (outcomes), moderator and mediator variables
- Administration of the serious game, Simbound for manipulation of variables by students and instructors in the classroom environment throughout the course.
- Determining instructors in Digital marketing courses, and the study design of the course (should be the same for both control and experimental groups, except for the utilization of gamification-based application by experimental group)
- Planning the flow and the stages of the experiment (regarding when and how to use the game-based application for experimental group, determining the scales to use, determining when and how to measure the variables during pre- and post-testing)
- Determining "experiment and control groups" composed of randomly selected students
- Pre-testing experimental and control groups to assess their level of knowledge (perceived, factual and procedural) in digital marketing (a revision can be made to control and experimental groups based on the results of pre-test).

- Training of instructors and students on how to effectively utilize the selected game-based application for digital marketing - Simbound.

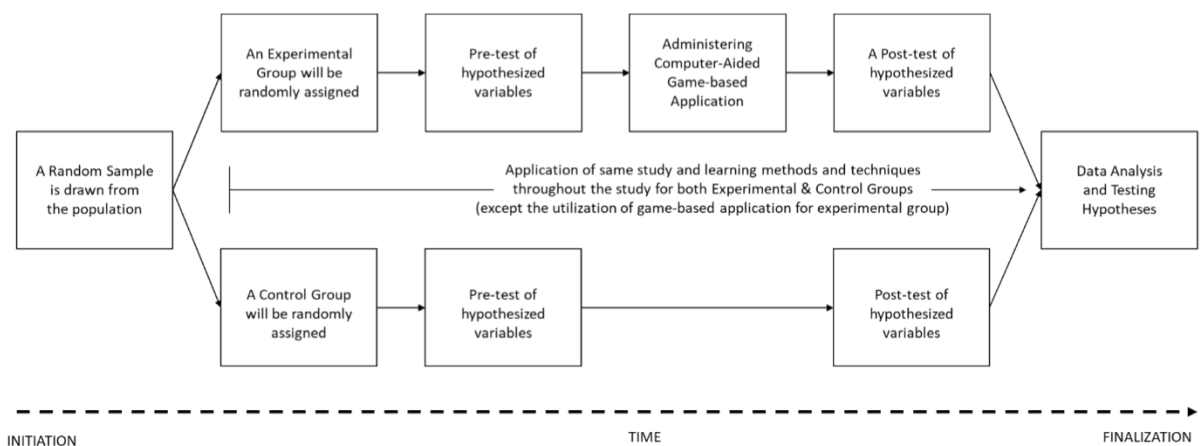
The third phase of the project (**Work Package WP-3**) conducts the experiment as shown diagrammatically in Figure 1. In this phase, the following actions will be undertaken:

- Initiation of the study (ensuring both experimental and control groups follow the same study and learning methods and techniques)
- Administering the selected computer-aided game-based application (Simbound) and usage of it by the experimental group to manipulate the variables.
- Post-testing of students to measure the variables at the final stage of the experiment.

The specifications for this experimental study are:

- **Target group:** University students
- **Target area:** Kuwait, Australia, Turkey and Serbia
- **Sampling:** Non-Probability Sampling
- **Data Collection:** Tests (SA-Q; KA-Q; eGameFlow)
- **Experiment length:** One academic year

Figure 1. Research design for the experiment



The students' performance will be measured using test scores as proposed by Paul and Jefferson (2019). One university professor for each digital marketing course will assess the students' success and performance during pre- and post-tests using the previously mentioned tools and indicators.

In the final phase of the project (**Work Package WP-4**), the data regarding the impact of game-based learning approach on students' academic achievements and skills development will be evaluated.

The following specifications apply for the final project phase:

- Validation and analysis of the data and evaluation of the hypotheses.
- Reporting the results, findings, and conclusions of the study.

A combination of qualitative and quantitative methods will be used to evaluate the data and make valid conclusions and recommendations. Hence, the analysis strategy of this study will be based on mixed methods methodology. Qualitative and quantitative data will be gathered throughout the experiments using developed and adapted scales by our research assistants.

Qualitative data will be analyzed using appropriate qualitative analysis techniques and available software such as NVivo. Quantitative data will be analyzed using appropriate statistical approaches, such as

- Moderated regression modelling to explore relationships among the variables
- T-tests and ANOVA tests to compare the control and experimental groups
- Multi-level regression modelling and analysis to determine and differentiate the possible effect of schools and teachers, utilizing the appropriate statistical software (such as SPSS, HLM and R).

RESULTS

The research will have the following results:

- Establishing a methodology for assessing the impact of game-based learning on students' motivation and academic performance (digital skills development).
- Creating a theoretical model which will explain the association of socio-demographic and cultural characteristics of students participating in game-based learning environments and their academic achievements.
- Dissemination of outcomes by publishing two conference papers and two journal articles in reputable journals/conferences.

Expected results related to gamification as an innovative teaching and learning pedagogy in higher education include:

- Demonstrating a successful case study for teachers to adopt a game-based teaching and learning method to engage students in the learning process
- Creating an innovative state-of-the-art computer-based tool adopting gamified education to promote experiential learning
- Implementing audio-visual tools that can assist with targeting different learning styles
- Promoting inclusion and involvement of students with learning differences
- Presenting a practical method for making learning fun and a life-long process
- Presenting game-based learning as a cultivating teaching activity.

CONCLUSION

Adopting educational game-based learning, in the form of a digital marketing game-based simulation (Simbound) has promising outcomes in terms of learner behaviour through game-like rule systems, player experiences and cultural roles (Sandberg, Maris, & de Geus, 2011). Integration of a computer-aided games-based approach to a course may greatly assist students by taking advantage of the motivational and engaging power of games, helping students overcome motivational problems in education, so that a successful learning process can be triggered (Su & Cheng, 2013). Game-based learning may be an effective approach supporting faculty to stimulate students' active engagement

in the learning process assisting with the transformation of education from studying for exams to graduating students likely to have an impact on society. This project will utilize an experimental approach to provide the first empirical evidence in Kuwait of the impact of game-based learning on students' academic performance, digital skills development and motivation in Digital marketing using a game simulation, Simbound. No such data currently exists for Kuwait.

The research will be simultaneously conducted in universities from four countries: Kuwait, Australia, Turkey and Serbia. The research results will provide a cross-cultural perspective on the impact of game-based learning on university students' academic achievements, digital skills development and motivation - the first of its kind in the academic literature. Conducting a benchmark comparative analysis with other countries participating in this research, empowers the research community and policy makers in Kuwait to better understand country-specific factors underlying academic performance, digital skills development and motivation of university students participating in game-based learning environments (specifically in game-based learning simulation for Digital Marketing called Simbound).

The results of this project are also important from the perspective of its impact on the community. The social impact created by any project affects or involves any group of actors, so that almost any change can be a social impact, if a specific group of people values it or is important to it, and aligned with the objectives that the organization pursues (Portales, 2019, p. 11). This project targets both instructors and students as two specific community stakeholders and provides empirical evidence on the potential of game-based learning and its application in the learning process. Initially, the impact on the experimental group of students will be direct and immediate, resulting in an expected improvement in motivation and academic achievement (digital marketing skills development), when compared to the control group of students. Universities willing to utilize the game-based learning on a large scale in their curriculums, may enhance the set of skills and competences the students will acquire during their university education, especially in the medium to long run. These enhanced skills sets are better aligned to the requirements of the contemporary labour market, resulting in benefits for the wider community, such as increased employment, development of entrepreneurship, increased competitiveness etc.

For the instructors engaged in this research, the short-term impact will likely be direct and immediate. The instructors will apply a game-based simulation (Simbound) in their immediate area of expertise - digital Marketing. Should the research produce anticipated outcomes instructors will be more motivated to apply innovative learning practice (game-based learning) in their future classes. It is anticipated that this approach will aid in enhancing engagement and interactivity with students and improves their academic performance. In a medium to long run the extensive use of game-based learning will have an impact on instructors' leadership styles, thus demonstrating the indirect impact of this research. Sousa and Rocha (2019) identified five types of leadership styles that are acquired through game-based learning, namely: facilitator (facilitating the skills development of team members), coacher (coaching and guiding team members), change agent (encouraging creativity and development), communicator (communicating feedback to team members and evaluating their performance), and motivator (motivating team members through intrinsic and extrinsic rewards).

This project will also raise an awareness amongst the general community in Kuwait of the potential of the game-based approach in all levels of education, with a particular focus on the university education.

REFERENCES

Abdelrahman Abdelazim & Mariam Al-Hamamdi (2015), Randomness Impact in Digital-Based Learning, ResearchGate.

- Ali Ramsi, Fatmah Mohamed (2015). A Game-Based Learning Model. Theses. 1-185.
https://scholarworks.uaeu.ac.ae/all_theses/185.
- Alsuhaymi, D., & Alzebidi, A. (2019). Saudi Teachers' Perceptions Regarding Adopting Digital Games in Teaching Practice. *Turkish Online Journal of Educational Technology-TOJET*, 18(4), 62-69.
- Anderson, L. W., Krathwohl, D. R., and Bloom, B. S. (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. London: Longman.
- Ariel, B., Bland, M., & Sutherland, A. (2021). *Experimental Designs (The SAGE Quantitative Research Kit)*, Sage Publications.
- Cheng-Yu Hung, Jerry Chih-Yuan Sun & Jia-Yin Liu (2019) Effects of flipped classrooms integrated with MOOCs and game-based learning on the learning motivation and outcomes of students from different backgrounds, *Interactive Learning Environments*, 27:8, 1028-1046.
- Cohen, L., Manion, L. & Morrison, K. (2018). *Research Methods in Education (8th Ed.)*, Routledge.
- Cojocariu, V. M., & Boghian, I. (2014). Teaching the Relevance of Game-based Learning to Preschool and Primary Teachers. *Procedia- Social and Behavioral Sciences*, 142, 640-646.
- Digital Marketing Forecast, (2021) https://lightcast.io/resources/research/digital-skills?__hssc=72311692.1.1686035702782&__hstc=72311692.0f83d4efc1b68ef673e91e35c995b895.1686035702782.1686035702782.1686035702782.1&__hsfp=3532517849.
- Ebner, M., & Holzinger, A. (2007). Successful implementation of user-centered game-based learning in higher education: an example from civil engineering. *Computers & Education*, 49(3), 873–890.
- Fayolle, A., & Gailly, B. (2015). The impact of entrepreneurship education on entrepreneurial attitudes and intention: Hysteresis and persistence. *Journal of Small Business Management*, 53(1), 75-93.
- Fredin, A., Fuchsteiner, P., & Portz, K. (2015). Working toward more engaged and successful accounting students: A balanced scorecard approach. *American Journal of Business Education*, 8(1), 49-62.
- Fu, F.-L., Su, R.-C., and Yu, S.-C. (2009). EGameFlow: A Scale to Measure Learners' Enjoyment of E-Learning Games. *Comput. Edu.* 52, 101–112.
- Khalid, A.A., Sarea, A.M., Hannon, A., Al-Sartawi, A.M.A.M. (2021). Game-Based Learning: Recommendations Driven from Literature. In: Musleh Al-Sartawi, A.M.A. (eds) *The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. Studies in Computational Intelligence*, 974. Springer, Cham. https://doi.org/10.1007/978-3-030-73057-4_10.
- Kebritchi, M., & Hirumi, A. (2008). Examining the pedagogical foundations of modern educational computer games. *Computers & Education*, 51, 1729–1743.
- Kluzer S., & Pujol Priego L. (2018). *DigComp into Action - Get inspired, make it happen*. S. Carretero, Y. Punie, R. Vuorikari, M. Cabrera, and O'Keefe, W. (Eds.). JRC Science for Policy Report, EUR 29115 EN, Publications Office of the European Union, Luxembourg, 2018. doi:10.2760/112945.
- Kraus, K., Kraus, N., & Shtepa, O. (2021). Teaching guidelines for digital entrepreneurship.
- Miles, R., Al-Ali, S., Charles, T., Hill, C., & Bligh, B. (2021). Technology enhanced learning in the MENA region: Introduction to the Special Issue. *Studies in Technology Enhanced Learning*, 2(1), 293-300.
- Minton, M. & Bligh, B. (2021). Examining the use of Kahoot to support digital game-based formative assessments in UAE higher education. *Studies in Technology Enhanced Learning*, 1(2), 445-462.
- Papageorgiou, G., Mihai, S., Ioannou, M., Marouchou, D., & Marneros, S. (2020, April). Towards the Development of a Digital Marketing (DM) Competencies Framework. In *2020 IEEE Communication Strategies in Digital Society Seminar (ComSDS)* (pp. 145-149). IEEE.
- Paul, J. & Jefferson, F. (2019). A comparative analysis of student performance in an online vs. face-to-face environmental science course from 2009 to 2016, *Frontiers in Computer Science*, Vol.1, Article #7.
- Podsakoff, P.M. MacKenzie, S.B. Podsakoff, N.P. (2012) Sources of method bias in social science research and recommendations on how to control it, *Annu. Rev. Psychol.* 63 539–569. <https://doi.org/10.1146/annurev-psych-120710-100452>.
- Portales, L. (2019). Social impact in social innovations: definition, design, and evaluation. In *Social Innovation and Social Entrepreneurship* (161-176). Palgrave Macmillan, Cham.
- REACH by GulfNews (2021), available at <https://gulfnews.com/uae/education/uaes-hbmsu-launches-gamification-in-higher-education-for-students-to-deepen-engagement-levels-in-the-learning-process-1.1610006058671> (Accessed on May 16th 2022).
- Sandberg, J., Maris, M., & de Geus, K. (2011). Mobile English learning: An evidence- based study with fifth graders. *Computers and Education*, 57(1), 1334–1347.

- Shoug Al Fadhli & Asmaa Al Summait (2015), Game-Based Learning Guidelines: Designing for Learning and Fun, International Conference on Computational Science and Computational Intelligence. www.simbound.com (Accessed June 1, 2023).
- Sousa, M. J., & Rocha, Á. (2019). Leadership styles and skills developed through game-based learning. *Journal of Business Research*, 94, 360-366.
- Su, C.H. and Cheng, C.H. (2013). A mobile game-based insect learning system for improving the learning achievements. *Procedia-Social and Behavioral Sciences*, 103, 42–50.
- Wali, F., Alqaidoom, H., & Toworfe, G. K. (2020). Kahooting: Exploring the Impacts of Game Based Learning on Bahrain Polytechnic Foundation Students in Information Technology (IT) Courses. *Journal of Teaching and Teacher Education*, 8(1), 29.

DIGITAL MARKETING CAPACITY BUILDING -EMPOWERING PERSONS WITH PHYSICAL DISABILITIES FOR REMOTE WORK

Vladimir Simovic

The Institute of Economic Sciences, Belgrade, Serbia

<https://orcid.org/0000-0002-6441-833X>

Remote work creates huge potential for employment either through remote work platforms (Upwork, Freelancer, Fiverr...) or remote work arrangements with businesses which are outsourcing some of their business operations to remote employees. Employment rates of the persons with physical disabilities (PWP) are significantly lower compared to persons without any disabilities - 13% in Serbia, 36% in Croatia and appx. 11% in Montenegro. This project addresses three key challenges, identified as strategic priorities of this Work Programme, that PWP in Serbia, Croatia and Montenegro face: detachment from the labor market, digital exclusion and lack of digital competences and skills needed for transition into new jobs by (1) assessing the level of their digital marketing skills and competences, and (2) offering up/re-skilling professional training programs focused on building remote work capacity for PWP. Digital marketing was selected due to growing demand for remote positions in that field. Firstly, the current levels of digital marketing competences of PWP will be assessed using relevant methodology. Job postings of the most popular remote work platforms will be examined, and the required digital marketing competences will be mapped. The gap analysis will provide insights into the critical areas for improvement upon which training programs will be designed, prepared, taught (in-person) recorded, edited and hosted on a selected distance learning platform for future use. Training curriculum based on the empirical evidence collected under this project is one of the most important project results. The project will also generate training materials hosted on a learning platform for future use, and empirically based policy recommendations in all three participating countries. Empowering PWP by improving their employability in remote work arrangements represents a step forward towards building an inclusive working environment that is open and accessible to all.

EVALUATING THE IMPACT OF GAME-BASED LEARNING ON UNIVERSITY STUDENTS' SKILLS DEVELOPMENT - A CROSS CULTURAL ANALYSIS

Louis Havriluc

Simbound, Belgrade, Serbia

Higher Education has been witnessing advancement in teaching and learning pedagogies and the latest pandemic has accelerated the adoption of new methodologies within the digitalization and e-learning process. Smart technologies are more often being adopted to deliver lectures, conduct assessments and boost discussions. Game-based learning is one of the innovations that is believed to have the potential to increase student engagement and motivation, especially with the accelerating role of technology in the teaching and learning process. Different studies have supported the effectiveness of using game based learning compared to traditional face-to-face learning in classrooms. The concept of gamification and game-based learning was investigated by different researchers in GCC countries. Despite the rising interest of the research community in the GCC countries towards game based learning and its potential effects on the learning process and motivation and academic achievements of the university students, no evidence is found that empirical study was conducted to investigate the true effects of the game based learning on students' academic performance (and development of digital skills) and motivation in Kuwait and entire GCC region. No one ever applied full experimental approach to determine the effects of the game based learning in the universities in Kuwait and other GCC countries and their association with cultural context and socio-demographic characteristics of university students. Moreover, no benchmark analysis was ever conducted on the effects of game-based learning on university students performance and motivation between Kuwait and other countries in the world. This research offers solution by developing and applying appropriate experimental methodology to investigate the effects of game-based learning on motivation and academic performance (digital skills development) of the university students in Kuwait. The research under this project will be simultaneously conducted in three other countries as follows: Australia, Turkey and Serbia. The results will enable benchmark analysis and in-depth understanding of the association of academic achievements of university students when participating in game-based learning and their socio-demographic and cultural characteristics.

LIAISE COST ACTION: INDUSTRIAL SYMBIOSIS AS A TRANSFORMATIONAL STRATEGY FOR SUSTAINABLE DIGITAL AND INDUSTRIAL PRACTICES

Almudena Muñoz Puche

<https://orcid.org/0000-0002-7647-0311>

Vasiliki Skoulou

<https://orcid.org/0000-0001-6947-5360>

Aleksandar Ercerg

<https://orcid.org/0000-0002-1141-1919>

Hasan Volkan Oral

<https://orcid.org/0000-0002-5743-1931>

Merim Kasumovic

<https://orcid.org/0000-0001-6631-3008>

Jiri Strouhal

<https://orcid.org/0000-0001-9109-7087>

Industrial Symbiosis (IS) is increasingly recognized as a strategic pathway for reducing waste, minimizing resource depletion, and lowering greenhouse gas emissions. By connecting diverse industries through resource-sharing networks, businesses can enhance operational efficiency while advancing broader sustainability objectives. Exemplary cases, such as the Kalundborg Symbiosis in Denmark, illustrate how IS enables cleaner production processes, cost reductions and the adoption of circular strategies for long-term competitiveness.

Despite its potential, the diffusion of IS faces significant barriers. High upfront investment costs, technical limitations in waste-stream compatibility, and logistical challenges restrict scalability. Non-technical obstacles, including limited awareness, fragmented knowledge, insufficient stakeholder engagement and inadequate policy incentives, further hinder its wider implementation. These challenges underscore the need for coordinated action, knowledge-sharing and supportive governance frameworks.

The LIAISE COST Action was established to address these obstacles by creating a collaborative platform for research, innovation, and policy development in Industrial Symbiosis. Bringing together experts from academia, industry, and policymaking, LIAISE advances sustainable industrial practices by fostering cross-sector cooperation, consolidating fragmented knowledge, and leveraging ICT tools for resource data management. Its objectives focus on identifying technical, financial, regulatory, and governance drivers and barriers, thereby defining holistic approaches that optimize IS integration across Europe and beyond.

LIAISE operates through four dedicated working groups:

- WG1 explores technical synergies to improve resource-sharing practices;
- WG2 develops business models and financial mechanisms to support IS adoption;
- WG3 promotes awareness, training, and governance frameworks for stakeholder engagement;
- WG4 ensures dissemination, outreach, and long-term impact.

Through these coordinated efforts, LIAISE supports the transition towards a Circular Economy and contributes to the European Union's climate neutrality objectives. By synthesizing knowledge across regional, national and European contexts, the initiative strengthens Industrial Symbiosis as a transformational strategy within strategic management. This paper demonstrates how IS not only enhances resource efficiency and circular practices but also serves as a critical enabler for sustainable digital economies in an era of global industrial transformation.

NAME INDEX

A. ZAFER ACAR, TURKIYE	156-159
ADNAN ÇORUM, TURKIYE	164
ADNAN KALKAN, TURKIYE	123-367
AHMET ANIL KARAPOLATGIL, AZERBAIJAN	16
ALEKSANDAR ERCERG	547
ALEKSANDRA DZENOPOLJAC, UNITED ARAB EMIRATES	326
ALEKSANDRA JOVANOVIC, KUWAIT	45
ALI ESKINAT, TURKISH REPUBLIC OF NORTHERN CYRUS	352
ALMUDENA MUÑOZ PUCHE	547
ALPER ERTURK, KUWAIT	537
ALPEREN SAHIN, TURKIYE	502
ANTONIO MINGUEZ-VERA, SPAIN	114
ARIF SALDANLI, TURKIYE	136
ASEL DEMIRDAG, TURKIYE	433
ASLI ORGERIM, TURKIYE	123
ASLIHAN UNAL, TURKIYE	433
AYSAR EL NJOUM, PALESTINE	104
AYSUN SAHIN, TURKIYE	469
BAHADIR AYAR, TURKIYE	502
BAHADIR HAMZA GUL, TURKIYE	270
BAHAUDIN G. MUJTABA	209
BATUHAN MEDETOGLU, TURKIYE	136
BERIVAN TATAR, TURKIYE	494
BORA YILDIZ, TURKIYE	65
CAN DEMIREL, TURKIYE	260-343
CATERINA AURA, ITALY	242
CEMAL ZEHİR , TURKIYE	319
CHETSADA NOKNOI, THAILAND	443
CHRISTOS H. SKIADAS, GREECE	188
CIHAN TINAZTEPE CAGLAR, TURKIYE	367
CORNELIUS BOTHMA, SOUTH AFRICA	2
DARIJANA ANTONIĆ, BOSNIA AND HERZEGOVINA	9
DARKO MARJANOVIĆ	517
DIDEM RODOPLU SAHIN, TURKIYE	313
DILAN DERYA DURAK, TURKIYE	424
DILAN KIZILTEPE, TURKIYE	424
DILEK TEKER, TURKIYE	530
DORIAN ALIU, ALBANIA	523
EBRU BEYZA BAYARCELİK, TURKIYE	25
ECE NUR POLAT, TURKIYE	424
ELIF BILGINOGLU, TURKIYE	74

ERHAN ARTUC, USA	3
ELVISA DRISHTI, ALBANIA	523
EMIRHAN YAGCI, TURKIYE	333
CEREN OZKAN, TURKIYE	392
ERMAN COSKUN, TURKIYE	140
ESIN CAN, TURKIYE	233-382
ESRA CENGİZ TIRPAN, TURKIYE	140
FADIME CINAR, TURKIYE	401
FAIDON THEOFANIDIS, KUWAIT	45-148
FARID ABDALLAH, KUWAIT	148
FARIZ HASANOV, TURKIYE	451
FATIMA ALLOUGMAN, KUWAIT	45
FATMA PELİN EREL, TURKIYE	281
FULYA TASEL, TURKIYE	25
GENTJAN ULAJ, ALBANIA	523
GONCA LAZOGLU GUR, TURKIYE	303
HADDY FAAL, TURKIYE	53
HANDAN GUNYAKTI AKDENİZ, TURKIYE	227
HASAN VOLKAN ORAL	547
HATICE ANIL DEGERMEN, TURKIYE	451
HATICE ZUMRUT TONUS, TURKIYE	227
HUSEYİN SELÇUK KILIC, TURKIYE	37
IMRAN ASLAN, TURKIYE	2
IRGE SENER, TURKIYE	16
IRISI KASAPI, ALBANIA	523
IRMAK ORMAN, TURKIYE	530
	253-
IVANA DOMAZET, SERBIA	416-479
IZZET KILINC, TURKIYE	433
JELENA KRSTIĆ, SERBIA	253
JELENA VUJADINOVIĆ, SERBIA	517
JIRI STROUHAL	547
JOANNA HERNIK, POLAND	114
KAAN HASAN KALKAN, TURKIYE	270-367
KADIR ALPASLAN DEMİR, USA	198
KAMELIA ASSENOVA, BULGARIA	294
KOUNOUPAS NIKOS, GREECE	188
KURTULUS YILMAZ GENÇ, TURKIYE	91-303
LAZGEEN MOHAMMED HALO, IRAQ	233
LOUIS HAVRILUC, SERBIA	546
LUIS A. PALMA-MARTOS, SPAIN	114
MARCELLE DE LA ROCHE, KUWAIT	45
MARIA SAFITRI, INDONESIA	114
MARIJA ANTONIJEVIĆ, SERBIA	416

MEHMET BARCA, TURKIYE	333
MEHMET NACI EFE, TURKIYE	270
MEHMET TEPELI, TURKIYE	123
MEHTAP OZSAHIN, TURKIYE	140
MELIKE ZEHİR, TURKIYE	53
MERAL ELCI, TURKIYE	198
MERİM KASUMOVIC	547
MERT DEMİR, TURKIYE	209
MERT TEMUR, TURKIYE	382
MINE AKSOY, TURKIYE	140
MİRNA SAFI, KUWAIT	180
MUHAMMED FATİH ÖZER, TURKIYE	333
MUSAB TALHA AKPINAR, TURKIYE	333
MUSTAFA KEMAL YILMAZ, TURKIYE	53-140
NALAN AKYURT, TURKIYE	313
NUR BESER, TURKIYE	37
OUALİD ABİDİ, KUWAIT	180-326
OYA ERDİL, TURKIYE	494
ÖZGÜR UYSAL, TURKIYE	140
PELİN VARDARLIER, TURKIYE	104-169-209
PİNAR HORASANLI GÖKALP, TURKIYE	489
SABAHUDİN KUJOVIĆ, MONTENEGRO	479
SEDA DEMİR, TURKIYE	198
SEHNAZ OKKIRAN, TURKIYE	260-343
SELİM KOCA, TURKIYE	91
SEMIH CEYHAN, TURKIYE	333
SEMIH SORAN, TURKIYE	489
SENANUR SELDA CETINKAYA, TURKIYE	424
SEVAN KATRANCIOĞLU, TURKIYE	37
SEVVAL NİSA KULLU, TURKIYE	424
SİMGE COSKUN, TURKIYE	270-367
SİNEM ARPACI YİGİT, TURKIYE	164
SLOBODAN STANIĆ, BOSNIA AND HERZEGOVINA	9
SONGUL YILDIZ, TURKIYE	392
STEPHEN COLBRAN, AUSTRALIA	537
SUAT TEKER, TURKIYE	352-540
SUMEYYE CİCEK VURAL, TURKIYE	319
SYLWIA KONECKA, POLAND	156-159
T. SABRİ ERDİL, TURKIYE	502
UGUR YOZGAT, TURKIYE	74-401
VASILIKİ SKOULOÜ	547
VEHAP KOLA, ALBANIA	523

VLADİMİR DZENOPOLJAC, UNITED ARAB EMIRATES	326
VLADİMİR SIMOVIC, SERBIA	45-537-545
YAMEN NISSI, KUWAIT	148-180
YASEMİN ORAMAN, TURKIYE	281
YASİN SEHİTOĞLU, TURKIYE	319
YAVUZ SELİM BALCIOĞLU, TURKIYE	16
YİANNİS DİMOTİKALİS, GREECE	188
YİGİT KEREM YILDIZ, TURKIYE	401
YUSUF BAHADİR KAVAS, TURKIYE	136
ZBİGNI EW BENTYN, POLAND	156-159
ZEYNEP KAPTAN, TURKIYE	65
ZEYNEP KARADENİZ CİSDİK, TURKIYE	494
ZEYNEP TUĞCE KALENDER, TURKIYE	37

CIP - Каталогизација у публикацији
Народна библиотека Србије, Београд

005.21(082)(0.034.2)
004.738:330(082)(0.034.2)

INTERNATIONAL strategic management conference (20 ; 2025 ; Beograd)

Leveraging strategic management for a sustainable digital economy [Elektronski izvor] / Proceedings of the 20th International strategic management conference, September 11-13, 2025, Belgrade ; [organized by International strategic management and managers association ; editor Ece Nur Polat]. - Belgrade : Institute of economic sciences, 2025 (Belgrade : Institute of economic sciences). - 1 elektronski optički disk (CD-ROM) : tekst, slika ; 12 cm

Tiraž 50. - Preface / Mehtap Özşahin. - Preface / Oya Erdil. - Preface / Alper Erturk. - Preface / Vladimir Simovic. - Napomene i bibliografske reference uz tekst. - Bibliografija uz svaki rad. - Registar.

ISBN 978-86-89465-81-5

а) Стратешки менаџмент -- Зборници б) Дигитална економија -- Одрживи развој -- Зборници

COBISS.SR-ID 178315273