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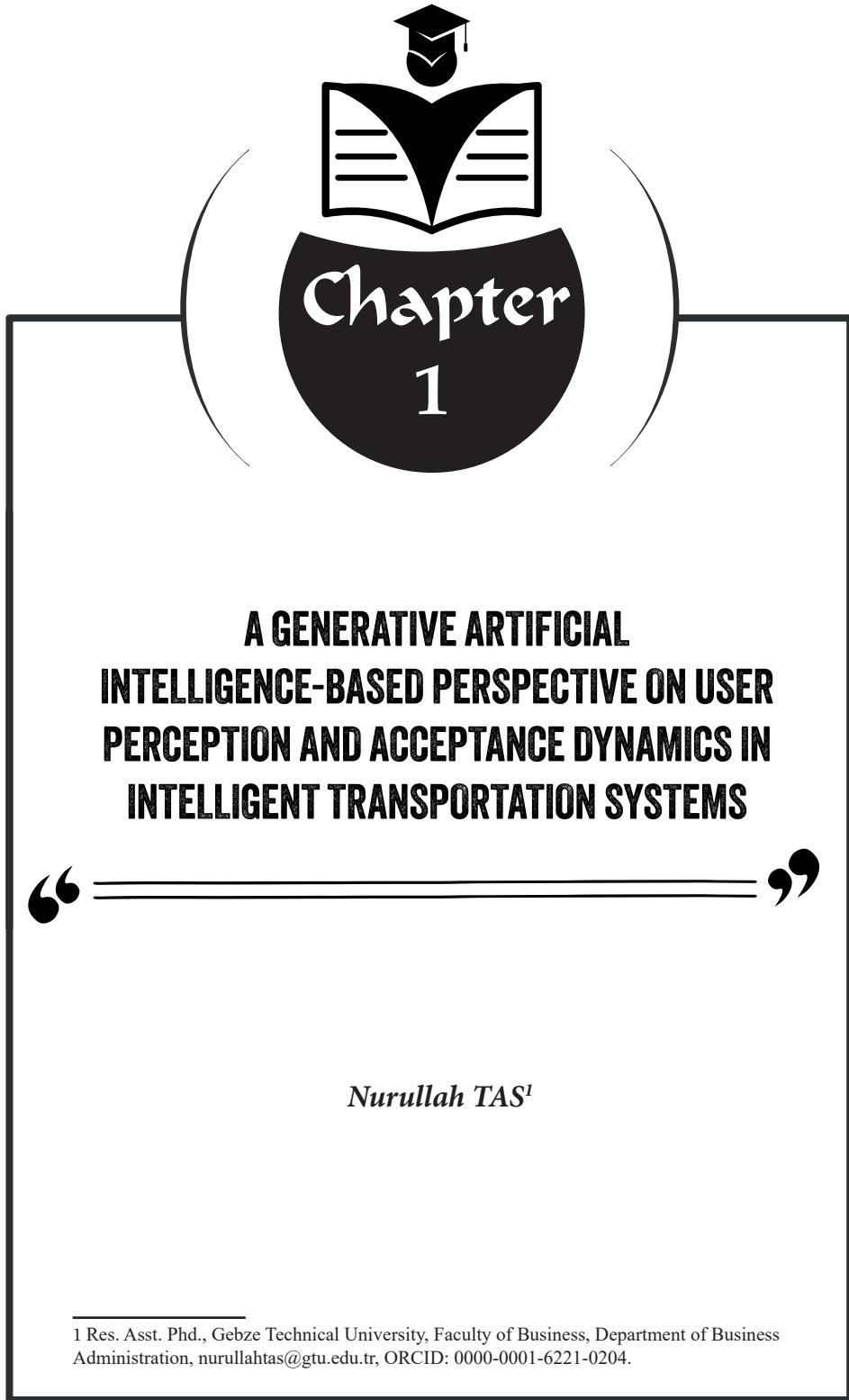
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1. INTRODUCTION

Increasing global demands for the sustainability and efficiency of urban mobility have necessitated a rapid technological transformation of Intelligent Transportation Systems (ITS). At the heart of this paradigm shift is Generative Artificial Intelligence (AI), which significantly enhances the functional effectiveness and user-centric capabilities of ITS through its capacity for real-time data analysis and personalized service delivery. Integration with big data ecosystems allows Generative AI-based solutions to improve the user experience by adapting services to diverse user needs and expectations (So et al., 2020).

However, the success of ITS is not limited to pure technological competence. The successful integration of systems into urban life depends on the crucial dynamics of user perception and acceptance. Widespread acceptance of systems plays a decisive role not only in achieving technical success but also in achieving societal gains and sustainability goals. Key determinants shaping user acceptance include the level of trust, performance expectations, and perceived risks, particularly for AI-based systems. These factors directly impact the speed of system adoption (Choudhury & Shamszare, 2024).

In this context, conceptual frameworks such as the Technology Acceptance Model (TAM) provide a fundamental reference for understanding users' acceptance processes based on perceived effectiveness and ease of use (Korkmaz et al., 2021). Furthermore, adoption processes are not limited to functionality; psychological factors such as self-confidence, perceived satisfaction, and emotional commitment also play a central role in the process (Tamilmani et al., 2019). This increases the importance of emotion-based recommendation systems, which strengthen the interaction between user experience and intelligent systems and integrate emotional commitment with functionality (Lakehal et al., 2025). Therefore, assessing user acceptance requires a holistic approach to the success of ITS.

This multidimensional framework necessitates inclusive approaches for different demographic user groups, particularly elderly and vulnerable users. Generative AI strengthens inclusivity by making ITS more accessible through its potential to provide adaptable and personalized experiences by processing contextual information (Anthony, 2023). However, the use of Generative AI in ITS also raises ethical issues such as data privacy and the potential for misuse of personal information (López-Aguilar et al., 2022). Therefore, a design philosophy based on the principles of transparency and ethical use is necessary to strengthen user trust and support innovation adoption.

Consequently, the successful integration of Generative AI-powered ITS into urban mobility depends not only on technical competence but also on a holistic understanding of user perception and acceptance dynamics.

Addressing this complex area, this study aims to focus on the mechanisms driving user perception and acceptance processes in ITS from a Generative AI perspective.

2. OVERVIEW OF USER PERCEPTION AND ADOPTION PROCESSES

Understanding user perception and adoption processes is crucial for the effective implementation and sustainability of Intelligent Transportation Systems (ITS). The Technology Acceptance Model (TAM), the pioneer of user acceptance theories, proposes that perceived ease of use and perceived usefulness are central determinants of technology adoption processes (Tamilmani et al., 2020). TAM has been widely used in various application areas and has subsequently been conceptually expanded with improved models. In particular, the Unified Theory of Acceptance and Use of Technology (UTAUT) aims to explain user interaction more comprehensively by incorporating additional variables such as social influence, facilitating conditions, and individual performance expectations (Alkawsi et al., 2020). Tamilmani et al.'s (2019) meta-analysis highlights the importance of these models in understanding user interaction with technology in dynamic and complex environments such as ITS.

The UTAUT2 model, which expands upon the original UTAUT, demonstrates that emotional commitment and value perception significantly influence user behavior by incorporating psychological and experiential concepts such as hedonic motivation, price appreciation, and habituation into the system (Cataluña et al., 2015). These theoretical approaches are directly applicable to understanding why users engage with AI-enabled applications within the ITS framework. For example, Korkmaz et al. (2021) analyzed user acceptance in autonomous public transportation systems, emphasizing the decisive role of performance expectation and trust in adoption. These findings support the need for a multidimensional and contextual approach when assessing user acceptance. Therefore, a comprehensive theoretical assessment should not focus solely on technical functionality; the context in which the technology is experienced and the psychological states of users should also be considered.

Another factor that strengthens the theoretical foundations of user acceptance are perceptual determinants such as usability, trust, and understandability. Usability refers to the extent to which users can easily and effectively use the technology and is important for seamless interaction in generative AI-based applications. Research shows that a high level of usability increases user trust and system acceptance (Choudhury & Shamszare, 2024). Furthermore, trust, a determining factor particularly in environments where

data privacy and AI-based decision-making processes are prominent, directly shapes users' approach to technology. Understandability is defined as the user's ability to comprehend the system's operating logic and increases trust and acceptance levels in direct proportion to the system's transparency (Jang & Byon, 2019).

Furthermore, social and demographic variables are external determinants that significantly influence users' perception and acceptance of technology. Factors such as age, education level, and socioeconomic status can shape technology adoption rates and user experiences (Anthony, 2023). Social influences, in particular, encompass peer groups and societal norms; the UTAUT model also suggests that individuals more readily adopt technologies that align with the normative expectations of their social environment (Sanjeev et al., 2021; Wei et al., 2025).

Ultimately, User Experience (UX) in transportation systems is a multidimensional concept that emerges from the interaction of technology, environmental conditions, and user expectations. A positive UX is crucial for increasing user satisfaction and system loyalty (So et al., 2020). Elements such as real-time data access, service reliability, and personalization enhance users' perceptions of transportation services; such personalized services can significantly increase user satisfaction (Meshkani et al., 2024). Developing UX strategies in line with findings from user perception and acceptance theories allows ITS to maximize the benefits of Generative AI technologies and ensure long-term user adoption (Cataluña et al., 2015).

3. THE ROLE OF GENERATIVE AI IN INTELLIGENT TRANSPORTATION SYSTEMS

Today, passenger information solutions based on Large Language Models (LLMs) enable users to interact with real-time traffic data and obtain information through natural language (So et al., 2020). These technological advancements significantly improve the travel experience by providing passengers with fast and accurate information about departure times, route alternatives, and potential service disruptions. The ability of LLMs to provide multilingual support significantly increases the inclusiveness of public transportation services. Supported by user-friendly interfaces, these technologies make public transportation more accessible and usable (Anthony, 2023).

Furthermore, Generative AI's ability to generate consistent and contextually meaningful responses from large data sets enriches user interaction and enables passengers to have a natural experience with the system through conversational interfaces. These interaction dynamics increase user satisfaction and support public transportation use. However, user trust is a

key determining factor in Generative AI-based systems, and establishing this trust is essential for their acceptance and widespread use. In particular, the development of metrics that measure the performance and reliability of LLMs is a focus of academic and industrial studies (Steyvers et al., 2025).

Generative AI constitutes the core component of personalized routing and recommendation algorithms. These systems analyze user preferences and past travel data to generate personalized travel recommendations based on traffic conditions, user habits, and feedback (Jian et al., 2023). This approach not only meets user expectations but also increases the efficiency of transit routes (Arnaoutaki et al., 2021). In this context, the implementation of personalized route recommendations is considered a key step in establishing a user-centric and efficient transportation framework (Jian et al., 2023).

Generative AI-supported intelligent algorithms recommend routes optimized for current traffic conditions. Systems continuously improve the user experience by offering alternative routes during rush hour or unexpected road conditions. Furthermore, generative AI can learn from user interactions, independently develop its recommendations, and adapt itself based on current traffic data. This adaptability provides a significant advantage in rapidly changing urban transportation conditions, reducing traffic congestion and increasing user satisfaction (Jian et al., 2023).

Furthermore, generative AI-based interactive transportation assistants are being integrated with mobile apps, in-car systems, and ticket kiosks to provide advanced support to users during their journeys (Li et al., 2023). Advances in AI in human-computer interaction allow assistants to understand users' natural language input and generate contextually appropriate responses (Lin et al., 2024). These assistants can predict user needs based on historical and contextual data, significantly simplifying trip planning. Therefore, interactive assistants directly link technology to the user experience in ITS, increasing satisfaction and trust; they serve as important tools that support a user-centric approach in modern urban transportation (Lakehal et al., 2025).

Ultimately, the integration of generative AI into dynamic traffic control systems is a key step in urban mobility optimization. Using real-time information from sensors, traffic cameras, and connected vehicles, AI performs predictive analyses and directs traffic flow dynamics (Miao et al., 2023). These systems can provide adaptive signal control, adjustments to public transportation scheduling, and timely warnings about traffic congestion or accidents. The distributed architecture of generative AI systems ensures resilience to potential disruptions and failures. The use of generative AI increases the operational efficiency of transportation authorities and allows them to optimize traffic management strategies based on real-time data (Yijing et al., 2023).

4. THE IMPACT OF GENERATIVE AI ON USER PERCEPTION

The integration of generative artificial intelligence (AI) technologies within the framework of Intelligent Transportation Systems (ITS) exerts profound and multifaceted effects on how users perceive and interact with these systems. The overall passenger experience is influenced by a complex interplay of factors, including transparency in AI-driven decision-making, the degree of trust users place in system outputs, the accuracy and reliability of responses provided by the system, users' individual language preferences, and the level of personalization offered to cater to specific user needs. Together, these components shape not only the immediate interaction experience but also long-term user acceptance, satisfaction, and engagement with ITS platforms, highlighting the critical importance of designing AI implementations that are both user-centric and adaptive to diverse passenger expectations.

4.1. Transparency and Explainability

Transparency and explainability are crucial for establishing user trust in AI-based applications. Especially when it comes to decision-making mechanisms that directly impact safety and comfort in ITS, users can feel apprehensive about the AI's operational logic. LLM-based generative AI systems build trust by providing clear and understandable explanations that enable users to understand the outputs. This is a crucial element for users who want to understand why systems recommend a particular route or action (López-Aguilar et al., 2022).

Explainability, on the other hand, minimizes users' perceptions of being understood and enables meaningful interaction with the system. Li and colleagues (2024) state that transparent methodologies that explain the underlying algorithmic logic of AI systems play a significant role in increasing user trust. This methodological transparency not only improves perception but also enables users to use the technology consciously and with control. Furthermore, effectively communicating the uncertainties in AI predictions strengthens users' perception of system accuracy and trust (Steyvers et al., 2025).

4.2. Trust and Response Quality

Trust in user interactions is directly related to response quality. Systems that produce highly accurate and contextually appropriate responses significantly increase user trust (Anthony, 2023). For example, the timely and accurate information provided by AI-powered transportation assistants strengthens users' positive perception of system adequacy. Conversely, inconsistent or inaccurate information can undermine trust and reduce users' reliance, especially in high-risk transportation environments.

The ability of generative AI to generate responses appropriate to the user's context and past preference data is crucial for maintaining and strengthening trust. Generative AI applications that incorporate continuous learning mechanisms continually improve response quality and foster long-term trust relationships. Therefore, perceived performance and satisfaction are important determinants of user trust formation (Choudhury and Shamszare, 2024).

4.3. Language Use and Personalization in System Interaction

Advances in spoken language processing are significantly transforming user interaction paradigms with generative AI. The ability of AI systems to understand natural language and generate appropriate responses increases accessibility in ITS and improves the user experience (Yu et al., 2024). This feature provides significant advantages for users with limited digital literacy and individuals with diverse language preferences.

Personalization is a key element shaping user perception during interactions with generative AI. Systems that provide users with tailored responses and proactive recommendations increase their sense of autonomy and satisfaction. Personalization is not limited to preferred transportation modes but also encompasses contextual and environmental factors, holistically improving the user experience. Consequently, users who interact with personalized AI applications experience increased engagement levels and a positive perception of the technology (Oliveira et al., 2020).

4.4. Expectation, Satisfaction, and Compliance

User expectations directly shape the perception and satisfaction of productive AI applications. If expectations are met or exceeded, users report high satisfaction and interact regularly with the system. Performance expectations encompass not only the perceived usefulness of the technology but also the satisfaction resulting from its use (Korkmaz et al., 2021).

If expectations are not met, satisfaction decreases, and loyalty to the ITS may decrease. Therefore, understanding user expectations is crucial in AI system design. Furthermore, compliance processes related to privacy and data security are important factors affecting user trust and loyalty. This interaction shows that AI systems should not only meet functional demands, but also be designed in harmony with user values and perceptions (Korkmaz et al., 2021).

5. THE NEW DIMENSION OF ACCEPTANCE DYNAMICS: HUMAN-MODEL INTERACTION

Current innovations in generative AI introduce a new dimension of acceptance mechanisms in the interactions between users and AI models. These interactions are restructuring the way users approach, evaluate, and adopt advanced technologies such as intelligent transportation systems. While traditional technology acceptance models (TAM) and their derivatives, particularly the Unified Theory of Acceptance and Use of Technology (UTAUT), provide a fundamental framework for understanding user adoption of new technologies, they typically focus on limited variables such as perceived ease of use and perceived usefulness. Therefore, static frameworks fail to adequately explain the dynamic and contextual nature of user interactions in generative AI-based technological environments (Bervell et al., 2021).

The development of rapidly changing and learning generative AI highlights the need for new acceptance dynamics that consider complex processes such as user expectations, emotional responses, and contextual interactions. The limitations of classical models are particularly evident in the dimensions of user trust and interaction quality, necessitating a more holistic approach to the dynamics of generative AI acceptance. Updating or expanding existing acceptance models to include variables specific to generative AI interactions is crucial for more accurately analyzing the complexity of human-machine interactions. In this context, incorporating trust, satisfaction, and perceived risk factors into user interaction assessments is essential (Choudhury and Shamszare, 2024).

Generative AI introduces new acceptance factors beyond traditional user expectations. Explainability is paramount. Users want to understand the response-generation mechanisms and decision-making processes of AI systems, as the complex operation of generative models often leads to uncertainty. Adaptability is another key acceptance factor; the ability of generative AI systems to learn from user interactions and optimize their responses increases satisfaction and adoption rates. Providing transparency and presenting AI processes to users in a clear manner fosters trust and acceptance (Ahmad et al., 2022).

Furthermore, user education and experience play a central role in increasing the adoption of generative AI technologies. Users who are knowledgeable about AI's capabilities and limitations engage more effectively and positively with AI applications. When training programs clearly present the operation of generative AI and its applications in the transportation context, users are able to use the technology effectively and maximize its potential. Furthermore, user activity plays a decisive role in acceptance. Users who can actively control outcomes tend to prefer the system more. Continuous dialogue between user and AI is crucial for aligning expectations and experience (Thakkar and Bharathi, 2023).

Furthermore, feedback processes are also important in shaping user acceptance. Generative AI applications that actively collect and integrate user feedback into system design increase both satisfaction and performance. System design elements such as usability, aesthetics, and intuitive interfaces are also directly related to user satisfaction and trust. Customizable interfaces and inclusive design principles, in particular, broaden the adoption of generative AI. Consequently, user activity, feedback processes, and the expectation of compliance foster a sense of ownership over AI-enabled functionality, strengthening acceptance dynamics (Jang & Byon, 2019).

6. STRATEGIES FOR USER ACCEPTANCE AND EFFECTIVE INTEGRATION

Promoting the widespread adoption and effective utilization of generative AI technologies within the context of ITS necessitates a comprehensive and holistic approach that carefully addresses three interrelated areas. The first area, Education and Interaction, emphasizes the importance of enhancing user understanding, fostering trust, and facilitating seamless human–AI interactions through targeted training and engagement strategies. The second area, Design Priorities, focuses on creating intuitive, user-centric, and adaptable system interfaces that accommodate diverse user needs, preferences, and accessibility considerations. Finally, Policy Frameworks encompass the establishment of robust governance structures, regulatory guidelines, and ethical standards that ensure responsible, transparent, and accountable AI deployment, while also promoting public confidence and long-term sustainability of ITS implementations.

6.1. User Education and Interaction Strategies

A key strategy for the adoption of generative AI is informing users about the technology's functionality, benefits, and limitations. Education-focused initiatives can contribute to strengthening user trust and reducing perceived risks by increasing the understandability of AI systems. Providing accessible information is crucial, especially for vulnerable groups and older populations (Anthony, 2023).

Furthermore, designing community-based interaction platforms and actively involving users in the development process can increase technological ownership. Systematic collection of feedback can support user acceptance and individual understanding (Choudhury and Shamszare, 2024). Addressing concerns about data privacy and ethical AI use is also crucial, and ensuring transparency in data processing processes and algorithmic decision-making mechanisms can strengthen user trust and facilitate adoption (López-Aguilar et al., 2022).

6.2. Design Focused on Explainability and Reliability

In the design of generative AI systems developed in an ITS environment, explainability and reliability should be key priorities to increase user trust and satisfaction. Explainability refers to the ability of AI systems to transparently communicate decision-making processes and the logic of their outputs to the user. Effectively communicating model decisions to the user is important for perceptions of trust (Steyvers et al., 2025). This can be achieved through visual displays in interfaces that explain AI logic or interactive elements that visualize data flows.

Reliability is also a key determinant of user acceptance. The consistency, accuracy, and robustness of generative models' responses increases user trust, particularly in ITS applications such as navigation and traffic management. Regular performance evaluations and continuous data-driven updates can reinforce system reliability (López-Aguilar et al., 2022). Furthermore, allowing users to set preferences such as information presentation format or level of detail (personalization) makes interaction more meaningful and can contribute to meeting the needs of different user segments.

6.3. Ethics and Policy Frameworks

The integration of generative AI into ITS requires a comprehensive policy and ethical framework. Policymakers should prioritize ethical standards governing AI deployment, focusing on principles of transparency, accountability, and fairness. Ethical frameworks should include elements such as bias reduction, data privacy, and user autonomy (López-Aguilar et al., 2022).

Collaboration between technology developers, government institutions, and civil society organizations facilitates the creation of policies that reflect user perspectives and needs. Furthermore, enabling public dialogue through platforms where users can directly share their concerns, experiences, and expectations contributes to the shaping of ethical policies and reinforces the perception of trust. Regular review of ethical standards and policy regulations ensures the safe and fair use of technology, laying the foundation for long-term acceptance and trust.

7. CONCLUSION

The successful integration of Generative Artificial Intelligence (AI) solutions into Intelligent Transportation Systems (ITS) depends on the comprehensive management of user adoption and acceptance processes. Users' ability to understand the operating logic of AI systems (explainability), trust the technology, and personalize their interaction experiences directly

impacts the effective and sustainable use of the technology. In this context, it is important to systematically consider strategies that reinforce user trust and minimize perceived risks. These strategies include training programs, community-driven feedback mechanisms, and practices focused on explainable AI design. Strategies that support the adoption of Generative AI in an IIT environment should address technological, social, and psychological dimensions in an integrated manner.

Other factors that determine user acceptance are political and ethical dimensions. Ethical frameworks built on the principles of transparency, accountability, data privacy, and fairness strengthen users' perception of trust in the technology and support the acquisition of a social license for the technology. Ensuring this ethical and legal compliance is possible through coordinated collaborations between technology developers, government agencies, and civil society organizations. These collaborations facilitate the development of policies that address user needs and concerns. Therefore, developing strategies to increase user acceptance of generative AI in ITS requires integrating technology design with policy and ethical dimensions.

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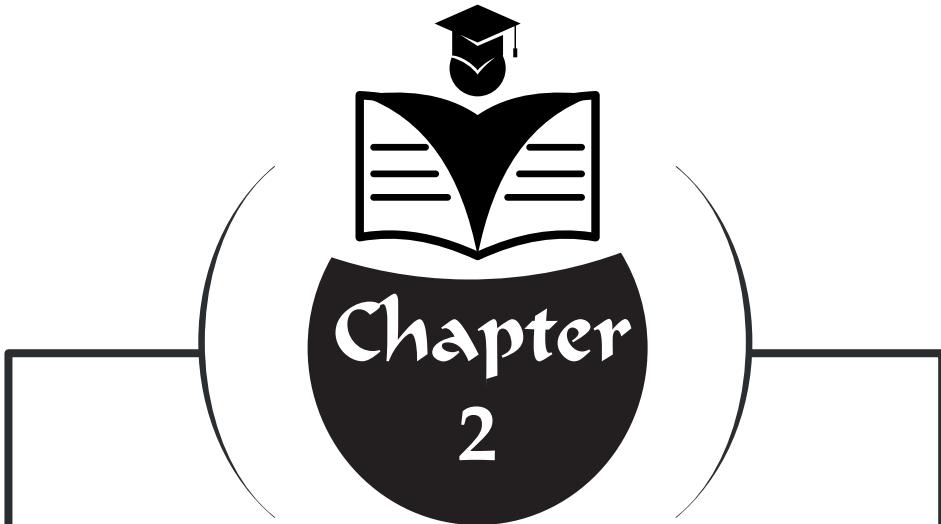
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TITLE: ARTIFICIAL INTELLIGENCE AND MANAGEMENT INFORMATION SYSTEMS: EVOLUTION, INTEGRATION AND THE FUTURE OF ORGANIZATIONAL INTELLIGENCE.

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1. Introduction.

Management Information Systems(MIS) have always played an essential role when it comes to organizational decision making, data management, and process coordination. Artificial Intelligence (AI) integration has broadened the scope of MIS, which historically was focused on the effective management and distribution of information within organizations. This has allowed for the implementation of intelligent systems that can predict market trends and consumer behavior as well as the extraction of deeper insights from large datasets (Shawn et al 2024; Rainer et al). AI-powered MIS do more than just store and display data; they also analyze, forecast, learn, adapt, and occasionally even generate recommendations on their own.

An important development in the development of modern corporate infrastructures is the incorporation of Artificial Intelligence (AI) into Management Information Systems (MIS), which radically alters organizational operations and decision-making paradigms (Gandomi et al. 2015). The symbiosis between AI and MIS enables the automation of intricate operations, improves the accuracy of predictive analytics, and encourages a proactive approach to strategic planning as firms traverse an increasingly data-driven market. AI integration has broadened the scope of MIS, which has historically concentrated on the effective management and distribution of information within organizations. This has allowed for the implementation of intelligent systems that can predict market trends and consumer behavior as well as the extraction of deeper insights from large datasets.

The demand for intelligent systems has increased due to the growing complexity of corporate environments, which are marked by digitalization, global competition, and an overwhelming amount of data. Thanks to AI's capabilities like machine learning, natural language processing, predictive analytics, and intelligent automation, MIS is now strengthened. These innovations turn MIS into strategic intelligence engines, going beyond their conventional administrative functions. Beyond predictive analytics, AI has a revolutionary effect on corporate processes in fields like financial planning, human resources, and customer relationship management (Van Esch P et al. 2019). AI-powered chatbots and virtual assistants, for example, enhance customer service by giving instant, personalized responses to requests, hence improving customer happiness and loyalty

Some businesses, like Google and Amazon.com, have tried to develop extremely ambitious uses of AI, such as drone deliveries, autonomous cars, and unattended retail checkout. While some of these “moon shots” have been successful, despite significant investments, some extremely ambitious programs, such as cancer treatment, have so far mostly failed (Benbya et al

2020). By automating employee engagement programs, performance reviews, and candidate screening, artificial intelligence (AI) solutions in HR help with talent acquisition and management (Creamer et al. 2020). Furthermore, more precise forecasting, budgeting, and financial analysis are made possible by AI-driven financial planning tools, which promote sustainability and strategic financial management.

This chapter examines the relationship of AI and MIS, providing an understanding on how AI has evolved, how it integrates into MIS environments, and how it is reshaping the future of organizational management. It begins with the overview on the historical development of both fields, then examines the roles, advantages, challenges and future implications of AI-driven MIS. The main objective is to help scholars, practitioners, and students understand how AI transforms MIS from simple reporting tools into a powerful collaborating tool capable of increasing human managerial abilities.

LITERATURE REVIEW

1. EVOLUTION OF MIS AND AI

1.1. EVOLUTION OF MANAGEMENT INFORMATION SYSTEMS

Efe 2024 refers to MIS as the study and use of information technology to support and enhance business processes, decision-making, and organizational performance is the emphasis of the management information systems (MIS) discipline (Laudon & Laudon, 2016). It includes the planning, execution, administration, and utilization of information systems for gathering, processing, storing, and sharing data inside a company. MIS ensures that information systems are in line with corporate objectives and strategies by integrating concepts from computer science, information technology, and business management. Systems analysis and design, database administration, network infrastructure, information security, and business analytics are important MIS domains that all endeavor to maximize the efficacy and efficiency of organizational operations.

MIS originally emerged in the 1950s and 1960s alongside computer technology advancements. Payroll processing and other monotonous clerical activities were the main emphasis of early systems. MIS underwent multiple phases of development over the years:

a) Transaction Processing Systems (TPS)

A transaction processing system is a computerized system that completes and processes the everyday routine operations required to run a business, including payroll, personnel record keeping, hotel reservations, sales order

entry, and shipping (Laoudon 2017). TPS were the earliest systems designed in order to automate these daily business routines transactions. They were focused on efficiency and accuracy.

b) Management Reporting Systems(MRS)

Businesses started using computers to provide standardized reports for middle management in the 1970s. Instead of focusing on analysis, these systems prioritized information delivery and presentation.

c) Decision Support Systems(DSS)

Systems that enabled managers to test scenarios, examine data interactively, and use models and analytical tools to make strategic decisions were introduced in the 1980s.

d) Executive Information Systems (EIS)

Systems designed specifically for senior executives were developed during this time, providing dashboards, summaries, and trend analysis for strategic decision-making.

e) Enterprise Resource Planning (ERP) and Cloud MIS

In the 1990s the ERP systems were used for integrating MIS throughout the entire firm. Later, cloud computing made it possible for scalable, adaptable MIS that could be accessed from any location or device.

These days, MIS are highly integrated across departments, dynamic, and cloud-based. However, since the arrival of AI, MIS have expanded to include adaptive, predictive, and insight-generating functions that go well beyond their initial intended purpose.

1.2. EVOLUTION OF ARTIFICIAL INTELLIGENCE

According to Efe 2024, Super Artificial Intelligence (Super AI): Also referred to as Artificial Superintelligence (ASI), Super AI is a level of artificial intelligence that outperforms human intelligence and capability in all domains, such as emotional intelligence, creativity, and problem-solving (Bostrom, 2014). Super AI uses enormous processing power, sophisticated algorithms, and the capacity to learn and adapt on its own to outperform the most brilliant human minds in every effort. In addition to comprehending and interpreting complex data, this type of AI anticipates and innovates beyond human capabilities, resulting in previously unheard-of breakthroughs and possibly significant effects on society, technology, and a number of academic fields.

The study of artificial intelligence began in the 1950s. In 1956, a multidisciplinary program at Dartmouth introduced the phrase artificial intelligence. Researchers from a variety of disciplines, including scientists, mathematicians, and philosophers, participated in the program, which sought to investigate the prospect that computer intelligence may mimic humans (Benbya et al). Early AI systems relied on logic and predefined rules.

AI shifted toward systems that could learn patterns from data. This phase was known as machine learning. It emerged between the 1980-2000. The neural networks also emerged at this period enabling AI to improve in performance over time without explicit instructions. Digital systems, sensors, and the internet became more and more common during the course of the decade, giving machine learning specialists access to a variety of data types for training. The breakthrough in neural network architectures especially deep learning permitted AI to excel in image recognition, language processing and prediction.

Large Language Models (LLMs) such as generative pre-trained transformers (GPT), Google Gemini, and Microsoft Copilot enabled AI to generate human-like text, synthesize information which act as interactive information assistants.

1.3. CONVERGENCE OF AI AND MIS

Stoykova et al. 2023 stresses on the fact that a number of cumulative technological developments in terms of software availability and hardware requirements have generated interest in AI research and development. Large language models, pre-trained transformers, open-source neural network models, and the ability to adjust these models have made it possible for end users to construct AI-driven apps. The convergence of AI to MIS was not an accidental event, it was driven by several modern realities such as large data generated by enterprises making it very difficult to analyze manually, the need for improved decision making, digital transformation pressures and the rise in human AI collaboration. By using AI tools, it enables to automate pattern recognition and insight extraction making it easy to analyze the large quantity of data generated by the enterprise. Also it provides real time support for decision making in a fast paced environment.

Thus AI's expertise naturally aligns with MIS informational functions creating a more hybrid intelligence model where machine and humans can work together in order to achieve organizational goals efficiently and effectively.

2. INTEGRATION OF AI TO MIS

The integration of AI to MIS involve the combination of advanced computer abilities with traditional organizational information structures to achieve intelligence, automation and collaboration. AI now fit in deeply into

MIS both technically and functionally changing the way the data is processed and decisions are made (Dwivedi et al., 2021). An AI driven MIS generally consist of several interrelated layers. The foundational data layer which is where raw information is gathered from internal sources such as Enterprise Resource Planning (ERP), Human Resource Management Information System (HRMIS) and Customer Relation Management (CRM) platforms, as well as external databases, market feeds and Internet of Things (IoT) sensors, illustrating the rapid increase of organizational data (Brynjolfsson et al., 2017). Laying above all this, we have the data processing layer. Here data is cleaned, organized and structured preparing it for machine learning and other AI algorithms that requires high quality inputs (Jordan et al., 2015).

At the core is the AI and analytical layer where machine learning models, deep learning algorithms, natural language processing systems, predictive analytics and generative AI models are used to produce insights and automated thinking (Kaplan et al., 2019). These outputs enter in to the MIS application layer which includes dashboards, decision support systems, reporting tools and workflow applications that makes AI generated insight usable for managers (Davenport et al., 2018). The final user interface layer supports human AI interaction through chatbots, visualization dashboards and explainable AI tools that helps managers understand why the system makes certain recommendations (Adadi et al., 2018). Together, all these layers ensure that AI strengthens MIS capabilities without replacing their main functions.

Additionally, AI significantly improve MIS operations throughout the entire company. In decision support systems it identifies patterns, perform simulations and provide real time recommendations improving accuracy and high level of responsiveness in managerial decision making (Shrestha et al., 2019). In knowledge management AI automates knowledge extraction, classifies documents and personalizes recommendations improving organizational learning and efficiency. AI in the area of human resource MIS supports talent acquisitions, predicts employee performance analyzes workforce trends and assesses employee sentiment using neutral language program techniques (Huang et al., 2021). In the financial department MIS, AI is used to detect fraud assessing risks and optimize portfolio (Porter et al., 2015), while in supply chain MIS benefit from AI driven demand forecasting, logistics optimization and inventory automation (Tao et al., 2019). These applications demonstrate how AI transforms MIS from some static information base repositories to a proactive decision partners.

Furthermore, organizations integrate AI in to MIS through a variety of platform models. Cloud based AI which is widely used by organizations offered by providers such as Google cloud, AWS and Azure enables scalable and cost efficient AI integration. On site or premise AI systems offer higher security and control making them suitable for institutions with strict data regulations

such as government and finance (Voigt et al., 2017). Edge AI processes data near the source such as in IoT enabled manufacturing or logistics systems reducing latency and improving real time decision making (Kairouz et al., 2021). Recent studies show that there is an increase in the number of firms who adopt hybrid models that combines cloud flexibility with onsite security achieving an optimal balance between performance and privacy.

Finally, AI are not seen to replace managers within MIS rather it increases the capacities managers in carrying out their day to day functions. In modern organizations AI provides analytical insights that managers validate, predictions that managers interpret, automated processes that free managers for more strategic work and alerts if there is disturbance or hindrance for an immediate managerial investigation (Barredo Arrieta et al., 2020). This shift signals the evolution of a new era where MIS changes from a static system of record to an intelligent collaborator, enabling humans and AI to work together to achieve improved organizational performance and strategic advantage.

3. AI TECHNOLOGIES RELEVANT TO MIS

AI encompasses a variety of technologies that enhances the analytical, operational and decision making capabilities of management information systems. Trying to understand these technologies allows organizations to identify how AI can be integrated into various MIS functions to create more intelligent and adaptive systems. Benbya et al. (2020) identifies that there are several types of AI systems and they are divided into categories. The first category based on intelligence the idea of intelligent machines that is, machines that can learn, adapt, and reason like humans is at the heart of philosophical discussions about artificial intelligence (Lake B et al. 201). AI types based on such an idea fall in general into three categories: artificial narrow intelligence, artificial general intelligence and artificial super intelligence.

On the other hand, A second typology is based on technology, it differentiates between the technologies embedded into the AI systems which include machine learning, (its subclasses deep learning and reinforcement learning), natural language processing, robots, various automation technologies (including robotic process automation), and rule-based expert systems (still in broad use although not considered a state of the art technology). One recent survey¹³ says that all the modern AI technologies (machine learning, deep learning, natural language processing) are either currently being used or will be used within a year by 95% or more of significant users of AI (Deloitte, 2020). Table 1 below provides brief definitions and domain of uses of AI technologies.

Technology	Applications on MIS
Machine learning: one of the most widely used AI technologies within MIS	<ul style="list-style-type: none"> -Demand forecasting in supply chain systems -Credit scoring and fraud detection in financial MIS -Predictive maintenance in manufacturing MIS
Deep learning: A type of machine learning that can learn without human guidance	<ul style="list-style-type: none"> -Quality inspection in factories -Warehouse inventory monitoring -Facial recognition in security MIS -Smart logistics routing
Neural networks: Algorithms that mimic the functioning of the human brain in order to identify underlying links in a batch of data	<ul style="list-style-type: none"> -Credit and loan application evaluation -Weather predictions
Natural language processing: A computer software able to comprehend the nature of human language Spoken or written	<ul style="list-style-type: none"> -Chatbots embedded in customer service MIS -Document text analysis for contracts and reports - AI assistants that help managers query MIS using natural language
Rule based expert systems: Human experts are the source of a set of logical norms.	<ul style="list-style-type: none"> -Insurance underwriting -Credit approval
Robotic process automation: Systems that automate structured digital tasks and interfaces	<ul style="list-style-type: none"> - Automating data entry -Extracting information from unstructured documents -Streamlining workflows like invoice approval or HR onboarding -Integrating cross functional MIS processes
Robots: Automatically operated machines that automate physical activity, manipulate and pick up objects	<ul style="list-style-type: none"> -Factory and warehouse tasks

Table 1: AI technologies and domains of application**Source:** Benbya et al. 2020

4. BENEFITS OF AI INTEGRATED MIS

The integration of AI into MIS gives us a significant strategic and operational advantage that reshapes how organizations create value and manage information. One of the most important benefit is the enhancement of decision making. AI strengthen MIS by creating predictive and on to the

point insights based on large scale datasets enabling managers to anticipate future trends rather than relying only on historical records (Brynjolfsson et al., 2017). Machine learning models integrated in MIS opens hidden patterns, stimulate scenarios and suggest optimal course of action which improves accuracy and supports strategic responsiveness. These analytical capability provides organizations with competitive advantage through faster insight generation, improved forecasting accuracy and greater agility in responding to environmental changes (Porter et al., 2015).

To continue with, operationally AI integrated MIS automate repetitive and high volume tasks such as data entry, reporting and basic communication workflow there by reducing manual errors and mistakes freeing employees to focus on higher level strategic activities (Huang et al., 2021). Automation increases the speed and consistency of MIS outputs improving the reliability of budgeting, auditing and risk assessment processes. Another major operational benefit is real time monitoring. AI integrated MIS provide continuous monitoring of the business operations identifying malfunctions, inefficiencies or risks before they occur or escalate (Jordan et al., 2015). For example, in manufacturing environment AI integrated MIS can identify malfunction instantly and trigger the attention of managers or take corrective actions reducing operational waste.

Also, apart from operational gains AI-MIS integration enhances human AI collaboration. Rather than replacing managers, AI increases their ability by filtering irrelevant information pointing out key insights and providing simulations that support more informed judgement (Shrestha et al., 2019). In doing so it supports personalized decision making by sizing the insights based on the manager's role, preferences and context. More so, the use of AI based chatbots and intelligent assistants can accelerate employees training and onboarding enabling new staff to engage effectively with MIS functionalities. However, because of the system's ability to self-train and adapt to new training data, we are starting to witness autonomous systems that can complete tasks without any human participation at all. Think about financial trading that is automated. Companies may execute transactions considerably more quickly with it than with systems that rely on humans because it relies solely on algorithms. Similarly, in production environments, robots are carrying out certain duties on their own. Through these combined benefits AI turns to change MIS from systems of record to system of intelligence supporting higher organizational performance.

5. CHALLENGES AND RISKS OF AI INTEGRATED MIS

Despite its many advantages, the integration of AI into MIS introduces a range of ethical, organizational and technical challenges that organizations must carefully manage.

Benbya et al., (2020) stresses on the fact that many AI systems are merely experimental and never put into production which is one of the main issues with AI in businesses today. Developing a pilot AI project is very simple and serves just to show that the technology is conceptually feasible. Contrarily, deployment calls for a range of skills and duties that might not be readily available. Integration with current technology architectures and legacy infrastructure, modifications to business procedures and organizational culture, staff reskilling or upskilling, significant data engineering, and methods for managing organizational change are a few examples. Compared to pilots, full production deployment typically takes a lot longer and costs a lot more.

Ethical concerns particularly algorithmic bias present significant risks. Since AI models learn from past data they may reproduce discriminatory patterns or biased decisions if the training data is unbalanced or mistaken (Barredo Arrieta et al., 2020). Such biases can manifest in recruitment systems, credit scoring or customer evaluation tools threatening fairness and organizational legitimacy. A related challenge is how open AI systems are. They are often described as the “black box” problem. If managers cannot understand why an AI system produces a particular recommendation they may distrust the outputs or have difficulty in justifying decisions (Adadi et al., 2018).

Another major problem is data privacy and security. AI enhanced MIS process a large amount of sensitive data increasing exposure to cyberattacks, breaches and unauthorized access. Organizations must comply with data protection regulations such as the GDPR and CCPA which if failure to comply could result in substantial financial and legal penalties (Voigt et al., 2017). Organizational challenges further complicate AI adoptions. Many employees lack the digital literacy and analytical skills required to work effectively with AI driven MIS leading to skill gaps that hinders the system effectiveness (Devenport et al., 2018). In addition, employees and managers may resist AI adoption due to fear of job displacement, increased monitoring or changes to their traditional working processes.

The question of responsibility comes up when AI is used to improve or even automate decision-making processes. When a driverless car is involved in a collision, who is at fault? Who is in charge of granting parole to an offender who then commits another crime? In algorithmic trading, who is accountable for a significant financial loss? These are only few of the cases where the accountability boundaries are blurred. It will be necessary for managers to proactively concentrate on the factors and procedures that could cause harm. They also need to carefully consider how they engage the different actors that directly or indirectly interact with the outcomes produced by the AI system (AI developers and designers, business users, institutions), and clarify responsibility and legal liability upfront. Technical limitations also restrict the efficiency of AI-MIS integration. Legacy MIS infrastructure

may require a significant improvement in order to support modern AI tools making integration costly and complex. Poor data quality such as incomplete, inconsistent or outdated data can affect the accuracy of AI predictions and compromise decision making (Jordan et al., 2015). Finally, maintaining AI driven MIS requires continuous model updates, system monitoring and readjustments to ensure reliability. These technical, organizational, ethical and compliance challenges illustrate that the full potential of AI integrated MIS can only be realized through responsible implementations.

6. FUTURE DIRECTIONS OF AI IN MIS

The future of AI in MIS is shaped by emerging technologies and evolving organizational needs that will continue to redefine how information systems support decision making. One major advancement is the expansion of edge AI and federated learning which enable data processing to occur closer to devices rather than in a centralized server therefore reducing latency and improving privacy especially in IoT enhanced MIS applications (Kaiouz et al., 2021). These developments also allow real time insights in environments such as manufacturing, logistics and healthcare. Another key evolution is the shift toward autonomous decision making systems in which AI can perform low level operational decision autonomously such as adjusting inventory levels or triggering maintenance alerts making MIS move beyond decision support into decision automation (Dwivedi et al., 2021).

As AI systems gain influence the demand for transparency will grow making explainable AI (XAI) a critical component of future MIS. XAI tools will allow managers to understand the reasoning behind AI outputs improving trust accountability and compliance with ethical standards (Adadi et al., 2018). Additionally, generative AI will play an increasingly important role by producing human like reports, summaries and strategic insights turning MIS into conversational systems capable of reasoning and creating knowledge (Kaplan et al., 2019). Another promising development is the integration of digital twins which simulate organizational environments processes to support scenario testing and complex planning in supply chain, energy and engineering contexts (Tao et al., 2019).

Lastly, the future points toward hybrid human AI decision ecosystems where humans and intelligent systems collaborate seamlessly. In such an environment AI handles heavy data analytical tasks while humans provide ethical judgement, creativity and contextual reasoning. MIS will evolve into platforms that support this symbiotic model fostering continuous learning and adaptive intelligence across the organization.

7. CONCEPTUAL FRAMEWORK: THE HUMAN-AI-MIS COLLABORATION MODEL

The human-AI-MIS collaboration model provides a conceptual representation of how artificial intelligence, information systems and human expertise interact in modern organizations. At its foundation is the data layer which collects structured and unstructured data from internal systems such as ERP and CRM tools as well as external sources including IoT devices and market databases (Brynjolfsson et al., 2017). This is followed by the data processing layer which ensures data quality through cleaning and structuring so that it can be effectively used by AI models (Jordan et al., 2015). The AI intelligence layer is central to the model; here machine learning algorithms, NLP engines, deep learning systems and generative AI tools analyze data to produce insights predictions and recommendations (Kaplan et al., 2019).

These insights are then delivered through the MIS application layer which includes dashboards, reporting interfaces and decision support systems that translate AI outputs into actionable knowledge (Davenport et al., 2018). Finally, the human manager layer represents the interpretive and judgmental role of managers who evaluate AI suggestions, assess ethical implications and make final decisions. A critical feature of the model is the feedback loop through which human's correct inaccuracies, adjust system rules and provide contextual knowledge that improves future AI performance (Shrestha et al., 2019). This continuous exchange creates a collaborative environment where humans and AI jointly contribute to organizational intelligence.

CONCLUSION

Artificial intelligence is fundamentally transforming management information systems by enhancing organizational intelligence, automating processes and enabling more accurate and timely decision making. AI shifts MIS from systems that primarily store and present information to a system capable of learning, predicting and recommending actions. This transformation brings extensive benefits in strategic planning, operational efficiency and human machine collaboration. However, it also presents challenges related to transparency, data security, organizational readiness and technical complexity (Barredo Arrieta et al., 2020; Voigt et al., 2017). The future of AI in MIS will be defined by advancements in edge computing, explainable AI, generative AI and digital twin technologies all of which will help organizations build more adaptive and intelligent systems (Tao et al., 2019).

Ultimately, AI does not eliminate the role of human managers but enhances it. As organizations adopt intelligent MIS, the emphasis will shift toward hybrid decision environments where humans provide contextual understanding and ethical judgment while AI manages complex analytics. This collaboration between AI and human decision makers represents the future of organizational intelligence and will define the next generation of management information systems.

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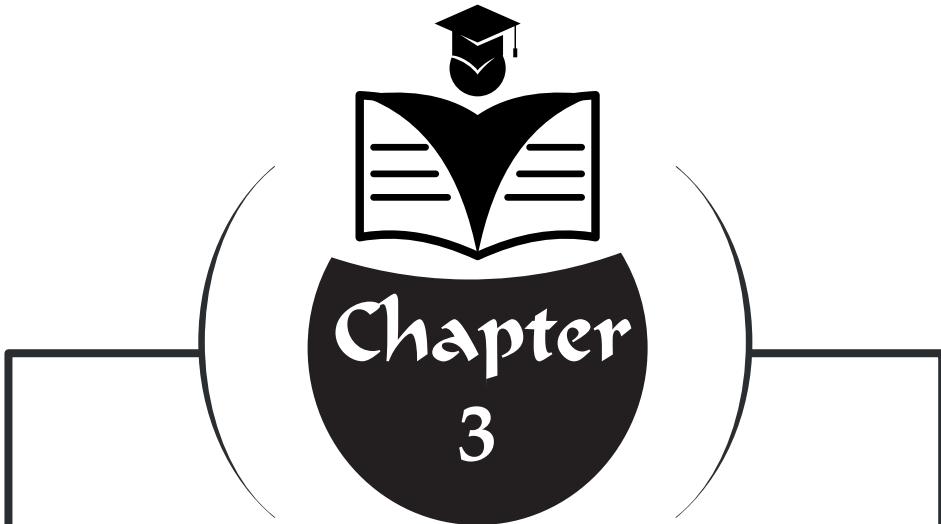
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EXPLORING THE ROLE OF PIERRE BOURDIEU'S HABITUS IN ACCOUNTING LITERATURE: A SYSTEMATIC REVIEW

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1. Introduction

Accounting Practices have historically been viewed as a “technical” and “functionalist” area of study. Historically, researchers have concentrated on the “how” of accounting rather than the “why.” The “why” of accounting practices is closely tied to the social/cultural context in which accounting operates. Therefore, the Sociological Framework of Pierre Bourdieu’s Theory of Habitus, Capital, and Field, as well as other related constructs, provide a useful lens for understanding how accounting practices operate. Bourdieu’s Theory of Habitus defined as “a system of durable, transposable dispositions,” (Hopwood & Miller, 1994) helps to explain how accountants develop habits of thought, behavior and professional practice that enable them to function effectively as members of the accounting community (Spence & Carter, 2014). Although Bourdieu’s ideas are very influential in many areas of social sciences (i.e. Sociology, Education, Cultural Studies), they have been somewhat fragmented and underdeveloped in Accounting Research.

While Accounting is primarily a Technical Discipline, it is also a Social Practice influenced by power relationships, institutional logic and professional identity. As an example, the habitus of auditors may lead to a propensity for auditors to be risk-averse, whereas the habitus of management accountants may be oriented toward strategy development due to their role and position within the organization (Aburous & Kamla, 2022). Bourdieu’s Concept of Capital (Economic, Cultural, Social, Symbolic) enables researchers to understand how resources and legitimacy are created and contested within the accounting profession. However, although Accounting Researchers have identified that Bourdieu’s Theory of Habitus provides insight into the accumulation of knowledge and the reproduction of dominant ideologies in accounting; few researchers have utilized all three concepts (habitus, capital and field) together (Malsch, Gendron & Grazzini, 2011).

Although Bourdieu’s Theory of Habitus has contributed to our understanding of accounting practices, the research community has had difficulty utilizing the full range of Bourdieu’s theoretical aspects. Researchers have frequently applied the concept of habitus in isolation, and rarely in conjunction with either of the other two key components of Bourdieu’s theory (capital and field).

One of the most important gaps in the literature regarding Bourdieu’s Theory of Habitus is the inconsistent and sometimes superficial application of Bourdieu’s concepts. Researchers frequently reference Bourdieu’s theories descriptively, and fail to examine the relationship between the various components of his theory (Malsch, Gendron & Grazzini, 2011). In addition, while there is a substantial amount of research that focuses on how habitus affects individual accountants, there is significantly less research that

investigates the impact of institutional habitus on accounting firms, regulatory agencies or professional organizations (Page et al., 2021). A lack of research in this area prevents Bourdieu's Theory of Habitus from providing insight into larger scale patterns of continuity and change in accounting practices. Finally, Bourdieu's Theory of Habitus represents a highly interdisciplinary concept that has been successfully applied in numerous disciplines including economics, organizational studies, and sociological studies of markets and economy (Hilgers & Mangez, 2014), however, the potential of this theory has been poorly realized in accounting research.

The motivation behind this review is to identify and analyze all of the prior research that utilizes Bourdieu's Theory of Habitus. The intent of this review is to synthesize the prior research in order to clarify the conceptual contributions of Bourdieu's Theory of Habitus, to highlight the methodological strengths and weaknesses of the prior research and to suggest new avenues of research. This review will contribute to both researchers and practitioners in that it will enhance theoretical debates as well as offer practical insights into how accounting professionals and institutions can better understand the social forces that influence their practices. Further, by linking accounting research to a broader sociological dialogue, this study will contribute to a more self-reflexive and socially situated way of investigating accounting phenomena.

The remainder of this paper is organized as follows: section 2 describes the methodology used in this systematic review, outlining the procedures for selecting studies and analyzing the data. Section 3 presents the results of the systematic review, divided into four sub-sections that describe the trend in the use of Bourdieu's Theory of Habitus in accounting research, the ways in which the concepts of habitus and capital are being applied in accounting, the theoretical understandings of habitus and capital and the use of Bourdieu's theory across disciplines. Section 4 provides the implications of the results of this systematic review and section 5 summarizes the contributions of this study and suggests possible avenues for further research.

2. Methodology

2.1. Systematic Literature Review Design

This systematic literature review followed the PRISMA guidelines in order to assure that the design of this study would be rigorous and transparent in the process of identifying relevant studies (Page et al., 2021). The five electronic databases selected for this study were chosen because they represent the major sources of literature that pertain to the discipline of accounting, and to the discipline of sociology. The databases were ranked according to the number of citations in the Web of Science database, which is a comprehensive index of high-impact social science research. The second-ranked database was Scopus, which is known for its wide coverage of journals and its robust

citation analysis tools. The third-ranked database was Science Direct, which is known for its specialization in accounting and business journals. The fourth-ranked database was Springer Link, which is known for its interdisciplinary perspectives from sociology and organizational studies. Google Scholar was used as a supplementary database to capture gray literature and emerging studies that were not yet indexed in the traditional databases.

The search terms were variations of “Pierre Bourdieu” or “Bourdieu” combined with “habitus” and “accounting,” and excluded review articles, surveys and meta-analyses so that only original research was considered. All searches for the Web of Science and Scopus databases were conducted to find the title, abstract and keyword of the article. Similarly, Science Direct and Springer Link used the same filters as above; however, Science Direct and Springer Link only allowed for the results of Research Articles and Journal Content. Google Scholar was searched using the same broadened title search as above; however, the non-research publication was excluded from the results.

2.2 Analytical Framework

The analytical framework adopted by this study includes three dimensions to analyze the data collected. The first dimension will assess the extent to which the concept of Bourdieu has been implemented within accounting research including empirically based studies that have operationalized the concepts of habitus, capital and field. The second dimension will evaluate the level of theoretical application of the concepts identified in the first dimension; i.e., whether the studies are utilizing the theories developed by Bourdieu in a holistic way or only applying selected components of the theories. The third dimension will provide an opportunity to identify possible cross-disciplinary opportunities through comparative analysis of the utilization of the theories developed by Bourdieu within sociology, education and organizational studies in comparison to accounting research to identify potential areas of transferability.

2.3 Inclusion/Exclusion Criteria

A study would be considered eligible to be included in the review if it referenced Bourdieu’s habitus in relation to accounting studies, was peer reviewed and written in English. The study did not place any restrictions on the time period in order to ensure that all possible contributions to this emerging area of research could be captured. Studies were excluded from the review if they were not empirical studies, focused primarily on accounting, or if they merely referenced habitus without providing further explanation of how it was being utilized in the study. The methodological quality of the studies was also a major consideration with preference given to articles that demonstrated a high degree of theoretical development related to the utilization of Bourdieu’s theory.

2.4 Study Selection Process

Initial database searches resulted in a total of 497 records, of which 145 were unique and therefore were removed from the list of duplicate records and unrelated records (i.e. non-English language records). Following removal of the duplicate and unrelated records, a title and abstract review of the remaining records excluded 89 studies. Therefore, the remaining 56 studies were reviewed in their entirety. A review of the 56 studies revealed that 10 studies did not meet the inclusion/exclusion criteria and therefore were removed from the analysis; thus, the 46 studies remained for synthesis. The PRISMA Flow Diagram is presented below and displays the process followed in selecting the studies included in the analysis.

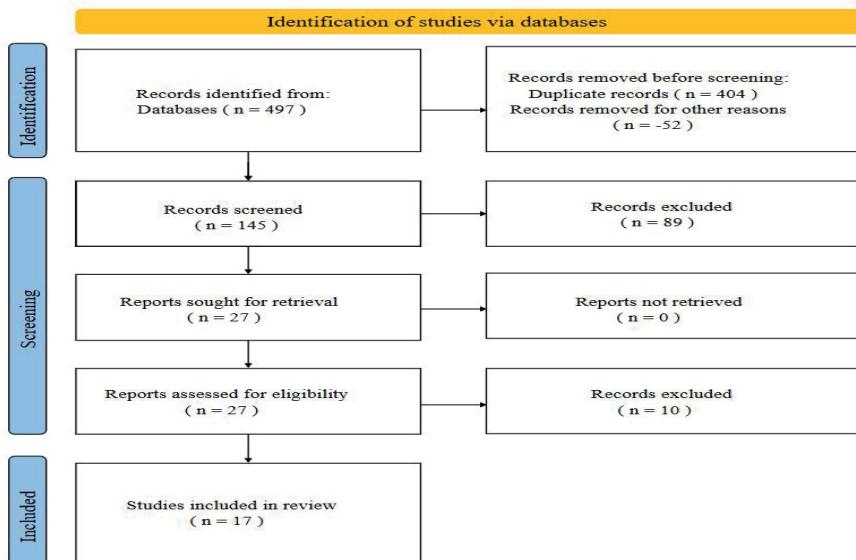


Figure 1
PRISMA flowchart of study selection

Potential biases include database selection bias, as Google Scholar's algorithm may prioritize certain publications, and linguistic bias due to the English-only criterion. To mitigate these, cross-referencing citations and consulting interdisciplinary databases were employed. Nevertheless, the niche nature of the topic inherently limits the pool of studies.

3. Results

3.1 Research Trends

Interest in Bourdieu's habitus was evident prior to 2015 when six studies laid the foundation; however, since then, there were occasional, yet ongoing, interest in the next few years. There were three studies published during the

year 2015-2016, which may indicate that researchers were gradually beginning to consider using Bourdieu's habitus as a conceptual lens in accounting research. Interest dropped off significantly between 2017 and 2019 when only one study was published in 2018, which could suggest that researchers may have encountered some level of difficulty in applying habitus to the context of accounting research due to either methodological or theoretical challenges.

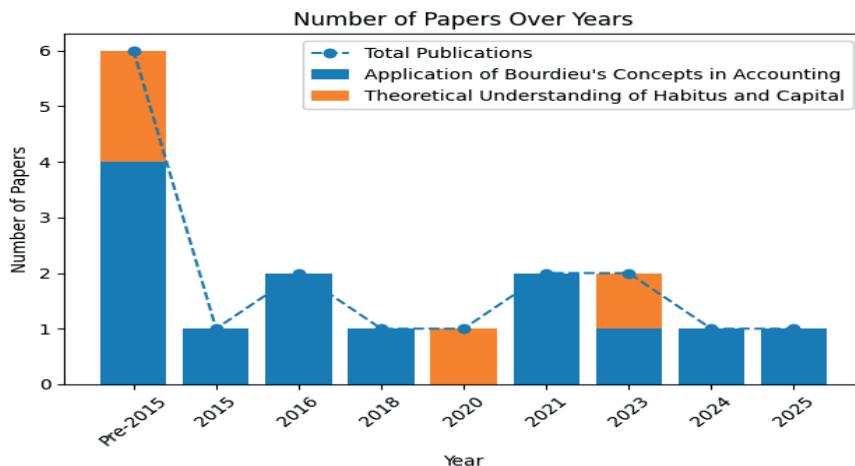


Figure 2

Research trends in the domain of Pierre Bourdieu's concept of habitus in the accounting literature

There appears to be an increasing amount of research into Bourdieu's habitus since around 2020-25 (seven studies) including two in 2023 and one study each in 2024 and 2025. This increase in research is consistent with a larger trend towards increased usage of sociological theory in accounting research in order to explore professional socialization and institutional relationships of power. The distribution of the studies also shows that there has been a shift in the emphasis of studies from mostly theoretical discussions to more applied empirical studies, as many of the later studies have begun to operationalize habitus in order to understand how habitus influences specific accounting practices and or professional environments.

There have been changes in the thematic focus of the studies based upon the temporal pattern of publication. Studies that were published prior to 2015 were primarily concerned with developing an understanding of the application of Bourdieu's concepts to the accounting profession. These studies established the connection between habitus and professional norms. Since 2020, studies have begun to explore Bourdieu's habitus more theoretically, particularly as it relates to the relationship between habitus and capital in the accounting field. The progression of the studies from exploratory applications

to more theoretically integrated applications represents the development of the literature, and it demonstrates that the literature is becoming more mature and sophisticated. However, the fact that so few studies have been conducted regarding the use of Bourdieu's habitus in accounting research, relative to the number of studies that have used his theory in other social science disciplines, indicates that there is much potential in accounting research for the continued use of Bourdieu's habitus.

3.2 Uses of Bourdieu's Conceptual Framework in Accounting Research

The primary fields where the work of Bourdieu has been employed as an analytical tool are in two forms of accounting: Corporate Accounting and Political Accounting. In addition to illustrating the functions of habitus, capital and field within both unique and specific accounting environments; the literature within these contexts also provide insight into how the social structures of the environment influence the professional practices of accounting professionals and the institutional norms in those settings. The below table (Table 1) illustrates a taxonomy of the way in which Bourdieu's ideas have been used in each of the accounting domains.

Table 1 Taxonomy of Bourdieu's Concepts in Accounting Research

Application Context	Key Bourdieuian Concepts	Sources
Corporate Accounting	Cultural capital, habitus, field power	Aburous (2016).
Political Accounting	Field, habitus, capital (tax policy)	Kraal (2013).

The research on Corporate Accounting has used Bourdieu's theoretical framework to assess the use of Cultural Capital and Habitus in relation to the Social Hierarchy of Elite Professional Accountants. In her study of the Post-Colonial corporate environment Aburous (2016), demonstrated how Accounting Elites create and enforce Institutionalized Rule Structures which are based upon their accumulated Cultural Capital. This study demonstrated the Mechanisms of Social Reproduction through Habitus; furthermore, it demonstrated that Elite Groups have maintained control over the Accounting Standards and Methodologies. The study also demonstrated the application of Field Power in understanding the Symbolic Struggles between various Accounting Factions for Legitimacy and Influence.

In Political Accounting Research, Bourdieu's concepts were used to understand the development and implementation of Tax Policies. Kraal (2013), used the Triad of Field, Habitus, and Capital to understand how Paul Keating

maneuvered the Tax Policy Arena. The study demonstrated that Tax Reform was determined by the Interactions of the Institutional Fields (Government & Professional Bodies); as well as the Embodied Dispositions (Habitus) of the Decision Makers involved. Economic and Symbolic Capital also had a role in this area of study; as they represented the ways Politicians Strategically Utilize their Resources to achieve their Policy Objectives, while at the same time, Maintaining their Positional Authority within the Field.

Studies of both corporate and political accounting illustrate the relational aspects of Bourdieu's framework. Unlike the studies that treat habitus, capital, and field as separate entities, these studies demonstrate that habitus, capital, and field are related to one another in determining accounting practices. For example, it is difficult to fully understand the habitus of a corporate accountant without examining her/his position in a professional field and/or her/his access to different types of capital. Similarly, research in political accounting demonstrates that the outcome of tax policy depends on the interaction between the institutional structure (field) of the tax policy process and the internalized dispositions (habitus) of the policy actors.

A comparative review of the uses of Bourdieu's concepts in the two areas of research reveal similarities and differences in how the concepts have been operationalized. Both areas of research have employed habitus to describe durable dispositions, but the corporate accounting research has emphasized the role of cultural capital and symbolic domination, whereas the political accounting research has emphasized the strategic mobilization of economic and political capital. These differences represent the varying levels of power present in the two areas of research and suggest that Bourdieu's framework can be flexibly applied to different accounting environments while still maintaining theoretical consistency.

There are many qualitative studies using Bourdieu's theoretical framework (Bourdieu, 1986), but there are few quantitative studies. For example Hamilton and Ó hÓgartaigh (2009), Lehner (2025) and Sadaka, Stoner and Nehme (2024) use case study methodology to examine habitus in accounting. Additionally, Cardona (2014) uses an interpretive lens to examine how management accountants convert cultural capital (technical expertise) into social capital (client trust). However, given the relatively few number of empirical studies that have utilized this theoretical framework, future research may benefit from comparative studies examining how habitus is exercised across national or institutional boundaries. Future research may also benefit from longitudinal studies that trace the evolution of accounting fields and the development of the capital structures that support them.

3.3 Theoretical Framing of Habitus and Capital in Accounting Literature

The theoretical framing of habitus and capital in accounting literature demonstrates both conceptual richness and selectivity in applying Bourdieu's theoretical framework. Some studies have applied Bourdieu's theoretical frameworks in a rigorous manner (e.g. Sadaka, Stoner & Nehme, 2024), while other studies have adapted Bourdieu's framework to fit their particular context and thus resulted in varying interpretations of these fundamental concepts. The subsequent analysis integrates how habitus and capital have been theoretically developed across the various studies reviewed below.

Table 2 Theoretical Dimensions of Habitus and Capital in Accounting Research

Theoretical Dimension	Key Characteristics	Representative Studies
Habitus as Dispositional Matrix	Focuses on internalized norms guiding accounting practices; emphasizes durability and transposability	Hamilton & Ó hÓgartaigh (2009); Sadaka, Stoner & Nehme (2024); Lehner (2025).
Capital as Field- Specific Resource	Examines economic, cultural, and symbolic capital in accounting professions; highlights conversion between capital forms	Cardona (2014); Sadaka, Stoner & Nehme (2024).
Habitus-Capital Interdependence	Analyzes how capital accumulation shapes habitus formation and vice versa	Hamilton & Ó hÓgartaigh (2009); Cardona (2014); Sadaka, Stoner & Nehme (2024).

The first dimension, Habitus as Dispositional Matrix, illustrates how accounting professionals internalize field-specific norms through socialization (Sadaka, Stoner & Nehme, 2024; Hamilton & Ó hÓgartaigh, 2009; Lehner, 2025). For instance, (Sadaka, Stoner & Nehme, 2024) and (Hamilton & Ó hÓgartaigh, 2009) demonstrate how early career experiences become internalized as durable dispositions. Furthermore, Hamilton and Ó hÓgartaigh (2009) and Lehner (2025) demonstrate how habits of behavior can be transferred across different contexts (for example, from auditing to

advisory). In terms of alignment with Bourdieu's original formulation of habitus as "a structured and structuring structure" that operates beneath conscious awareness, all three studies align very closely with this definition.

The second dimension, Capital as Field-Specific Resource, defines the types of capital that exist in accounting fields. For instance, Sadaka, Stoner and Nehme (2024) demonstrates that cultural capital (credentials such as CPA certification) is a primary factor that determines hierarchical status among professionals working in audit firms. On the other hand, Cardona (2014), examines the process through which cultural capital (the expertise) is transformed to social capital (trust from clients) in the case of Management Accountants. Both of these examples display the competitive process of acquiring capital as dominant groups continue to retain valuable resources to maintain their superior position in the field.

The third dimension, Habitus-Capital Interdependence, illustrates the interdependent nature of habitus and capital. In addition, the studies by Sadaka, Stoner and Nehme (2024) and Cardona (2014) illustrate that disparate amounts of capital create disparate habituses in accounting subgroups (Big Four vs. mid-tier employees). In addition, this interdependency corresponds with Bourdieu's dialectical perspective of habitus as creating practice that reproduces or transforms capital distribution in a field.

It is also important to note that there is considerable disagreement amongst researchers about how they operationalize Bourdieu's theory. For example, while Sadaka, Stoner and Nehme (2024) adhere to Bourdieu's relational epistemology, Lehner (2025) abstracted habitus as an independent cognitive construct from field dynamics. These disagreements also reflect ongoing negotiations in accounting research, as well as the tension between sociological theory and disciplinary requirements. The table serves as a methodological guide to assist future researchers in placing their conceptual contributions relative to existing theoretical frameworks.

Methodologically, the studies reviewed were all based on qualitative methodology. Cardona (2014) utilized a combination of interviews and field observation to identify the relationships between habitus and capital. The qualitative methodologies used to study the relationships between habitus and capital resonate with Bourdieu's emphasis on praxeological knowledge; however, they leave many avenues open to using additional methods (e.g. network analysis of capital flow) to examine and develop these theoretical propositions.

3.4 Bourdieu's Theory in Other Disciplines: Comparative Implications for Accounting Scholarship

Bourdieu's theoretical framework has been examined in various disciplines outside of accounting, such as sociology, education, and organizational studies.

By examining the application of Bourdieu's theories to these disciplines, we can gain insight that can inform accounting scholarship. The comparative analysis will illustrate the theoretical similarities and adaptations of Bourdieu's concepts to these disciplines, and it will provide evidence of the flexibility of Bourdieu's concepts and potential areas for increased involvement in accounting research.

Table 3 Interdisciplinary Applications of Bourdieu's Theory

Discipline	Key Focus Areas	Bourdieuian Concepts Employed	Representative Studies
Sociology	Cultural reproduction, social stratification	Habitus, cultural capital, field	Lourenç & Sauerbronn (2018); Seneviratne & Martino (2021).
Education	Pedagogical practices, academic achievement	Institutional habitus, symbolic capital	Ejiogu, Ambituuni & Ejiogu (2021); Finau & Chand (2023).
Organizational Studies	Professional identities, institutional logics	Field power, capital conversion	Lupu & Empson (2015); Saliya & Jayasinghe (2016).

Bourdieu's conceptual model is often utilized in sociological research to analyze the relationship between social class and the process of cultural reproduction/stratification. Seneviratne and Martino (2021) demonstrate how habitus acts as a mediator between consumers' social class and their patterns of consumption, thus illustrating the durability of the class-based dispositions of those consumers. Like Seneviratne and Martino (2021), Lourenço and Sauerbronn (2018) examines how dominant groups utilize the mechanism of cultural capital to preserve their privileged status through institutionalized acknowledgment of certain types of knowledge. Overall, both studies illustrate how fields impose structural limitations on individuals; however, they also demonstrate how habitus can be a productive force that aids researchers in examining professional socialization and the reproduction of elite networks in the accounting profession.

Research in education has similarly adapted Bourdieu's concepts to investigate pedagogical practices and academic performance. Finau and Chand (2023) introduce the concept of institutional habitus to study how schools convey class-based expectations to students. Ejiogu, Ambituuni and Ejiogu (2021) examine how symbolic capital functions in university admissions.

These applications demonstrate the utility of habitus for examining tacit, embodied knowledge—an insight particularly relevant for accounting education research. For instance, the institutional habitus of accounting programs could shape students' professional identities and career aspirations in ways that reproduce existing hierarchies within the field.

Organizational studies and Bourdieu's theoretical work are being used to study professional identity and organizational logic. Saliya and Jayasinghe (2016) investigated the power relationships in a field and how they affect the legitimizing of new management methods, while Lupu and Empson (2015) examined the ways in which professionals convert their capital as they navigate the changes in an organization. Both studies show the contested nature of fields and how capital is strategically deployed, and this could be beneficial to the study of accounting and its changes to regulatory environments or the development of new accounting technology. Accounting research into how accounting professionals deal with institutional pressure would also find the use of field-level battles for legitimacy and resources to be useful.

Several patterns were found through a comparative analysis that could help guide accounting research. First, compared to accounting research, studies in other disciplines more often utilize Bourdieu's theoretical framework in a holistic way and look at the interaction of habitus, capital, and field. Secondly, studies in other disciplines have a greater emphasis on the temporal aspects of habitus formation and field structure, with studies using a longitudinal design to see how dispositions and field structures evolve over time. Thirdly, the methodological diversity in studies using different types of methodologies such as mixed-methodology studies and comparative case studies allow for a richer representation of Bourdieu's theoretical concepts. Accounting research could use similar methods to gain a clearer picture of the dynamic, relational characteristics of Bourdieu's theoretical framework.

Despite a high degree of similarity in how Bourdieu's theoretical framework has been applied in different disciplines as shown in the comparative analysis, the literature review identified many discipline-specific adaptations that may not be applicable to an accounting context. Examples include the large number of references to class-based habitus in the sociology and education literature which reflects the original purpose of Bourdieu's work which focused on social stratification, but accounting research may focus on professional or organizational habitus. Further examples include the focus on the battle for control at the field level in organizational studies, which will require modification to reflect the unique regulatory and technical constraints of accounting fields. These variations suggest that while interdisciplinary insight can provide guidance to accounting research, any application of Bourdieu's theoretical framework will need to be tailored to meet the needs of an accounting context.

In addition to illustrating the possibilities for interdisciplinary transferability of knowledge, the table provided above highlights the value of accounting research using Bourdieu's theoretical framework in a more comprehensive way. Interdisciplinary insights used in future studies will have the ability to help create a more detailed understanding of the role of habitus in accounting contexts and help foster more general sociological debates about professional practices and institutional changes.

4. Discussion

By combining the findings from the studies included in this literature review, several patterns emerge that illustrate the ways in which Bourdieu's habitus functions in accounting contexts. The studies collectively show that habitus is a primary mechanism through which accounting professionals internalize and reproduce norms, values, and power structures unique to their respective workplaces (Sadaka, Stoner & Nehme, 2024). A direct example of this pattern emerges from studies that examined corporate accounting, where cultural capital and institutionalized dispositions influence all aspects of accounting firm operations (audit risk assessment and the hierarchical structuring of accounting firms) (Aburous, 2016; Cardona, 2014).

The two viewpoints illustrate contradictions in the conceptualization of habitus — some studies conceptualize habitus as a relatively fixed, durable collection of dispositions that aligns with Bourdieu's original concept (Sadaka, Stoner & Nehme, 2024), while others conceptualize habitus as a more flexible cognitive structure that can adjust to varying organizational circumstances (Lehner, 2025). The differing perspectives reflect the continuing debate in accounting research about whether a researcher should prioritize preserving theoretical purity versus being pragmatic in applying theoretical frameworks to address empirical realities.

The implications of the findings reported here are significant and affect both theory and practice. From a theoretical perspective, the findings support the idea that accounting researchers should treat Bourdieu's theoretical framework as a unified construct and consider the interdependent mechanisms of habitus, capital and field rather than studying each as separate constructs. Studies examining habitus in conjunction with other variables as found in sociology's study of cultural reproduction (Seneviratne & Martino, 2021) and organizational studies' examination of the field-level battles for power (Saliya & Jayasinghe, 2016), are examples of what accounting research could benefit from by conducting similar relational studies (for example, studies examining how technological innovation such as AI or blockchain impacts the capital structures and habitual practices of accounting fields). Practically, the findings suggest that professional accounting organizations and educational institutions should critically examine the impact of training programs and certification

processes on promoting or inhibiting particular types of cultural capital, and therefore, potentially creating inequality within the accounting profession (Sadaka, Stoner & Nehme, 2024; Ejiogu, Ambituuni & Ejiogu, 2021).

Significant methodological limitations exist in the generalizability of these conclusions, stemming primarily from the fact that the review was limited to English-language publications. Therefore, it is possible that a substantial amount of non-English scholarship utilizing Bourdieu to understand accounting contexts were excluded from the review (e.g. Francophone or Latin American research traditions where Bourdieu's work has had considerable influence). Database selection bias is likely to have exacerbated this limitation, given that Google Scholar's algorithm-based citation weighting will likely give preference to English-language references over non-English references. Furthermore, due to the qualitative methodology employed in the majority of studies included in the review, the broader patterns associated with habitus at the institutional or country level are less well understood. These methodological limitations suggest that the current synthesis may be biased towards certain geographic or methodological perspectives and therefore may underestimate other applications of Bourdieu's framework.

Therefore, future research should attempt to address these methodological limitations by pursuing a number of strategic avenues of inquiry. There exists a compelling need for comparative studies examining how habitus functions differently among various accounting disciplines (e.g. auditing versus management accounting), and/or among differing national professional cultures; the current body of literature predominantly represents Anglo-American accounting contexts. Using longitudinal study designs would allow researchers to measure the temporal progression of accounting habitus as it responds to changes in regulations or technology disruption, thereby providing a time-series view of habitus development as opposed to the snapshot views provided by most prior studies. Researchers employing mixed-methodology approaches, including combining ethnographic observations with quantitative social network analysis, may provide greater empirical operationalization of the relational aspects of Bourdieu's theory, particularly in measuring how capital flows through accounting fields. In addition, accounting research should continue to engage more substantially with recent developments in Bourdieusian sociology, such as the concept of "habitus clive" (divided habitus) which examines individuals experiencing multiple institutional logics—including those related to sustainability reporting and digital transformation.

Finally, there are several understudied areas that offer substantial opportunity for developing new research agendas based upon the ideas developed here. For example, the role of embodied habitus in accounting

practice-how physical posture, speech patterns, aesthetic preferences, etc., signal professional legitimacy-has received virtually no attention, despite the extensive precedent in sociology (Seneviratne & Martino, 2021) and organizational studies (Lupu & Empson, 2015). Similarly, the gendered aspects of accounting habitus and capital accumulation require additional research as the majority of the reviewed literature failed to consider the extent to which patriarchy within the accounting profession affects women's career advancement opportunities. Future research should investigate these relationships while engaging in a manner that maintains a high degree of fidelity to Bourdieu's primary theoretical constructs, thereby avoiding the dilution of the explanatory power of his framework when adapted to accounting contexts.

5. Conclusion

To sum up, this systematic review is an example of how researchers have applied Pierre Bourdieu's concept of habitus in the context of accounting literature; and it is a demonstration of how the concept of habitus provides accounting researchers with insights into the social and cultural dimensions of accounting practices. Researchers have used habitus to examine (1) how accountants internalize professional norms through habitus; (2) how capital influences hierarchical structures within the accounting field; and (3) how institutional structures reproduce or challenge power dynamics existing within the accounting field.

Although researchers using Bourdieu's framework illustrated the potential of his theory in accounting literature, they also noted inconsistencies in how researchers applied habitus in conjunction with related concepts such as capital and field. The implications of this synthesis are not limited to improving theories of accounting. The results of this synthesis indicate that both accounting educators and professional organizations should assess the processes of socialization in accounting education and professional development and consider how those processes create inequalities and limit innovation. Furthermore, comparisons between interdisciplinary fields may suggest that accounting research could benefit from applying more holistic and dynamic theories of habitus than are currently employed in accounting research by adopting frameworks similar to those employed in sociology and organizational studies. Accounting researchers should focus on conducting longitudinal and comparative study designs to assess the evolving nature of accounting habitus as the accounting field adapts to changes caused by technological and regulatory disruptions. Accounting researchers who address the gaps identified above will be able to increase the theoretical rigor of accounting research while participating in broader sociological discussions regarding professional practice and institutional change.

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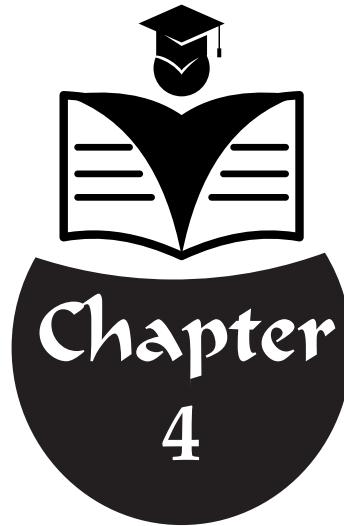
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A SYSTEMATIC WORKFLOW FOR PANEL DATA ANALYSIS: MODEL SELECTION AND ASSUMPTION TESTING

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1. INTRODUCTION

Panel data analysis is a powerful empirical method that is increasingly applied in many sub-disciplines of social sciences such as economics, business, and finance, as well as in health sciences. By combining observations of the same units over time, it can simultaneously utilize both cross-sectional and temporal information. This makes panel data analysis a more flexible, explanatory, and powerful framework compared to other statistical methods. Thanks to this multi-dimensional structure, researchers can test causal relationships more reliably by controlling for differences that are often overlooked within individual units. They can also examine behavioral or structural changes that occur over time in detail. Therefore, panel data models have become one of the fundamental methods that enhance analytical power in both academic and applied research.

One of the main aims of this study is to introduce the theoretical foundations and application stages of panel data analysis with a systematic approach, providing researchers with a step-by-step workflow. Numerous models and tests exist in the literature related to panel data analysis. However, the order in which these methods should be ordered, which assumption should be checked at which stage, and how the results should be interpreted are not sufficiently clearly presented in most studies. Therefore, it is clear that researchers need a practical guide in addition to theoretical knowledge. This study addresses this need in the literature by presenting a comprehensive methodological roadmap for panel data models, ranging from assumptions and estimation processes to diagnostic tests and model selection.

Furthermore, the purpose of this study is to demonstrate how to apply panel data analysis using the R program, which is easily accessible and free for researchers. R is an increasingly preferred software in panel data applications, with its open-source structure, powerful packages, and wide user base. Accordingly, all steps are shown in detail in the book chapter using the *plm* package and related functions. All stages of the analysis process, from defining the data structure to cross-sectional dependence tests, F-test, Hausman test, heteroskedasticity and autocorrelation tests, and final model estimation with robust standard errors, are presented practically. Thus, readers will not only gain theoretical knowledge; It is also aimed to enable easy panel data modeling in the R environment using a real dataset.

Finally, the panel data workflow described in this study provides a general framework that researchers can use in a wide variety of panel data

applications across different disciplines. Checking the assumptions of panel data analysis, selecting the appropriate model, and correcting assumption violations using the correct methods are critical for the reliability of empirical results. This study presents these processes in a clear, systematic, and understandable way, offering researchers a comprehensive and practical guide to panel data analysis.

2. THE CONCEPT OF PANEL DATA

A data structure created by repeatedly collecting information from the same observation units over a specific time period is called panel data. This data type includes both cross-sectional and time-series characteristics. Thus, it allows researchers to simultaneously examine the changes and behavioral differences of units over time. Unlike cross-sectional data that only consider a single period or time series that only analyze time-dependent trends, panel datasets allow for more comprehensive inferences thanks to the combination of two dimensions (Hsiao, 2022; Baltagi, 2008; Frees, 2004; Atlı & Sinan, 2012). This structure provides the opportunity to observe both how each unit changes within itself over time and to what extent it differs when compared to other units. In this respect, panel data analysis allows for more reliable testing of causal relationships between variables. Thus enabling the control of heterogeneity between variables and the inclusion of ignored individual effects in the model. Furthermore, panel data analysis allows time-dependent dynamic effects and structural differences between individuals to be considered together in the same model. It has found wide application in many disciplines, from social sciences to economics, financial analysis to health economics (Frees, 2004; Davies & Lahiri, 1995, 1999). This approach, which is frequently used in big data analytics today, increases the accuracy and generalizability of research by modeling the multidimensional relationships of variables (Baltagi, 2008).

2.1. Panel Data Types

Panel data can be classified in several ways depending on the characteristics of the observational units and the length of the time dimension. These classifications directly influence how the dataset is analyzed, the selection of appropriate models, and the estimation techniques employed (Frees, 2004; Hsiao, 2022). In general, panel datasets are evaluated along two

fundamental dimensions: balanced versus unbalanced panels, and short versus long panels.

2.1.1. Balanced and Unbalanced Panels

A panel dataset is called a balanced panel if it contains complete observations for each observation unit within the same time interval. For example, a dataset where data for five hospitals from 2015–2020 is fully available for each year is a balanced panel. Balanced panels facilitate the application of statistical models in data analysis and simplify interpretation.

Conversely, an unbalanced panel exists when some units have missing observations during certain periods. Unbalanced panels are quite common in socioeconomic research and complex sectors such as healthcare. Data gaps can arise from institution closures, units not reporting data, or differences in periodic measurements. Unbalanced panel datasets require careful consideration of heterogeneity and missing data issues during the analysis phase (Hsiao, 2022; Baltagi, 2008).

2.1.2. Short and Long Panels

Panel datasets can also be classified according to the length of the time dimension. Panels that include a large number of observational units (N) but cover a relatively short time period (T) are defined as short panels. In the social sciences, annual datasets on countries, firms, or regions typically fall into this category (Frees, 2004).

Conversely, if the observation period is long but the number of observation units is relatively small, this type of data structure is classified as long panel. Long panels are particularly useful for examining the dynamic behavior of units, long-term habits, or the effects of policies over time (Hsiao, 2022). However, issues commonly associated with time-series data such as serial dependence and autocorrelation tend to become more pronounced in long panels and therefore require careful diagnostic evaluation (Baltagi, 2008).

3. PANEL DATA MODELS

Panel data models make it possible to analyze unit-specific heterogeneity (such as firms, countries, or sectors) together with time-varying observations. By accounting for these individual-specific differences, panel models yield

more accurate estimates of relationships among variables and reduce the bias that would arise from omitted unit effects.

3.1. Pooled OLS

In panel data analysis, the pooled OLS approach is one of the most fundamental estimation methods. It combines all observations in the dataset into a single structure and applies standard OLS methods. This approach assumes that the model coefficients are identical across all units and time periods, and it does not explicitly account for unobserved individual-specific effects. Pooled OLS provides consistent estimates when individual effects are absent or, even if present, unrelated to the explanatory variables. However, when individual effects are correlated with explanatory variables, the coefficient estimates obtained from this method become biased and often offer lower efficiency compared to panel data models.

3.2. Fixed Effects Model

The fixed effects model is a fundamental approach that aims to control for heterogeneity in panel data that is unobservable and does not change over time, such as among units like individuals, firms, or regions. In this model, each unit is assumed to have a fixed but unobservable effect, and this effect is not time-dependent. Therefore, the fixed effects model allows for estimating a relationship that is specifically free from the effects of factors that "varies over time but remain constant among individuals." (Xu et al., 2007).

$$Y_{it} = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \beta_k X_{kit} + \varepsilon_{it}, \quad i=1, \dots, N; t=1, \dots, T$$

In this specification, Y_{it} denotes the dependent variable for unit i in period t ; X_{it} represents the independent variables; α_i is the fixed and unobservable unit-specific effect; and ε_{it} is the error term of a normal distribution with zero mean and constant variance. The fixed effects approach typically relies on the within transformation, which removes unit-specific fixed effects by subtracting the time mean of each variable from its observed values. Through this transformation, unobserved heterogeneity that remains constant over time is effectively eliminated from the model.

The fixed effects model is preferred when there is a strong indication of latent differences between units in the panel data structure that are not directly observable and cannot be included in the model. This approach is particularly based on the assumption that these latent differences are related to the

independent variables and therefore, their exclusion from the model could lead to bias in predictions. Furthermore, the fixed effects model offers a significant advantage in analyses where the aim is to isolate the impact of structural elements that do not change over time, such as policies, sectors, regions, or firms (Baltagi, 2008; Wooldridge, 2010).

For instance, in empirical studies of the energy sector whether focusing on electricity producers, oil companies, or renewable energy firms persistent and unobservable characteristics such as technological capacity, market structure, or corporate culture may influence financial outcomes or environmental indicators. By controlling for these time-invariant features, the fixed effects model enables researchers to identify the underlying relationship between the variables more accurately. In contrast, the pooled OLS approach assumes homogeneity across firms and ignores such individual-specific effects, which may this leads to inconsistent and biased predictions.

3.3. Random Effects Model

The random effects model assumes that unit-specific constant terms are random and can be represented within the error term. In this framework, heterogeneity between units is treated as random and considered unrelated to the explanatory variables. Thus, both within-time and between-time variation contribute to the model. The random effects model assumes that the unit-specific constant effects are not entirely fixed but are randomly distributed and are a component of the error term, and is mathematically represented as follows.

$$Y_{it} = \alpha + \beta X_{it} + u_i + \varepsilon_{it} \quad i=1, \dots, N; t=1, \dots, T$$

Here, u_i represents the unit-specific random effect. The random effects approach relies on the assumption that unobserved unit-specific components do not systematically vary with the independent variables, making it a less restrictive alternative to fixed effects estimation. The RE approach is typically preferred when the observational units are considered to be randomly drawn from a larger population and therefore represent only a subset of that population. Another this modelling framework enables both within-unit and between-unit variation to be examined simultaneously. because while the FE model removes between-unit variation through constant terms, the RE model preserves this variation, allowing for richer inferences about differences between units (Baltagi, 2008).

To illustrate the model more clearly, we rely on the same example from the energy sector. In this context, there may be unobservable but time-invariant differences among electricity producers, oil companies, or renewable energy firms such as technological capacity, corporate culture, or long-term investment strategies. If the researcher can reasonably assume that these unobserved firm-specific characteristics are uncorrelated with the independent variables that is, they do not exhibit a systematic relationship with the regressors then the random effects model provides a more suitable analytical framework.

4. ASSUMPTIONS FOR PANEL DATA MODELS

In panel data models, assumption violations such as heteroskedasticity, autocorrelation, multicollinearity, and data quality issues may lead to biased parameter estimates and misleading inferential results. Indeed, the literature frequently emphasizes that outliers, missing data, and high correlation patterns can violate the fundamental assumptions of the model (Sinan & Alkan, 2015; Alkan, Atakan, & Alkan, 2015; Alkan et al., 2015). Therefore systematically testing assumptions and where necessary, applying appropriate corrective methods is an integral step in panel data analysis.

4.1. Cross-Section Dependence

In panel data analysis, one of the basic assumptions of the model is that the units in the cross-section are independent of each other. However, this assumption often fails in real-world applications. It is common for error terms to exhibit correlation across units, particularly when units are exposed to shared economic, sectoral, or institutional shocks. When an exogenous shock affects a panel dataset, it becomes important to determine whether this shock influences all units in the same direction or with similar intensity. This phenomenon is referred to in the literature as cross-section dependence or inter-unit correlation.

For example, global risk events such as pandemics, natural disasters, or epidemics can similarly shape the economic indicators of countries or businesses. In such a case, the assumption of independence between units is violated, and estimates may become biased and inconsistent when using classical panel data methods (Pesaran, 2021). Therefore, testing for cross-section dependence is essential for specifying appropriate panel data models and selecting suitable estimation methods. Cross-sectional dependence is most

frequently assessed using the Breusch–Pagan LM statistic and the Pesaran CD statistic.

4.1.1. Breusch–Pagan LM Test

The Breusch-Pagan LM test is one of the earliest and most classic methods developed for detecting cross-sectional dependence in panel data models. This test is considered a more suitable option in panel structures where the number of units (N) is relatively low and the time dimension (T) is long. A significant limitation of this test is that it can produce erroneous results when N is large. Therefore, the Pesaran CD test was developed.

4.1.2. Pesaran CD Test

Pesaran's CD test is currently the most widely applied tool for identifying dependence across units within a panel framework. It performs particularly well when N is large and both N and T are large. When the absence of cross-sectional dependence is assumed, the test statistic takes the following form:

$$CD = \sqrt{\frac{2T}{N(N-1)} \sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij}}$$

In this expression $\hat{\rho}_{ij}$ refers to the correlation of the residual components corresponding to units i and j (Pesaran 2021).

4.2. Autocorrelation

Autocorrelation arises when error terms exhibit dependence over successive time intervals. Such persistence in the error structure can distort coefficient estimates and lead to incorrectly specified standard errors. Therefore, detecting autocorrelation and applying appropriate corrections are essential for ensuring the reliability of both time-series and panel data analyses (Wooldridge, 2010). In panel data settings, the Wooldridge Test, used to examine the presence of first-order autocorrelation in panel data analysis, is one of the most common and reliable methods. The test statistic for the null hypothesis that there is no first-order autocorrelation in the model is as follows:

$$F = \frac{(\sum_{i=1}^N \sum_{t=2}^T \hat{e}_{i,t-1} \hat{e}_{it})^2}{Var(\sum_{i=1}^N \sum_{t=2}^T \hat{e}_{i,t-1} \hat{e}_{it})}$$

Here, \hat{e}_{it} denotes the residual for unit i at time t , obtained from the fixed-effects model. N corresponds to the number of units in the panel, whereas T reflects the length of the time dimension. $\text{Var}(\cdot)$ indicates the variance of the specified expression, calculated in a way that ensures the test remains robust to heteroskedasticity. The decision rule is based on the comparison of the computed F-statistic with its corresponding p-value. Rejection of the null hypothesis indicates the presence of first-order autocorrelation (serial correlation) in the model (Wooldridge, 2010; Baltagi, 2008).

4.3. Heteroscedasticity

Heteroskedasticity is the condition where the variance of the error terms varies across observations. In other words, it means that the error terms have different variances over units or time periods. In practice, violations of this assumption namely heteroscedasticity are frequently observed. In the fixed effects model, heteroscedasticity often arises from the structure of the panel data error term and typically manifests as unit-specific differences in variance. This issue can adversely affect the statistical significance of parameter estimates (Wooldridge, 2010). Even when the coefficient estimates remain consistent, heteroscedasticity leads to biased and inconsistent standard errors, undermining statistical inference such as hypothesis testing and confidence intervals.

Diagnosing heteroscedasticity is therefore essential for ensuring the validity of estimates in panel data models. Several econometric procedures have been developed to test for this issue across units. Among these, the Modified Wald Test (Adapted Wald Test) is a panel-specific method designed to test whether the variances of the errors (obtained from fixed-effects residuals) are equal across units. In addition, classical cross-sectional diagnostic tests such as the Breusch–Pagan Test are commonly adapted to the panel data setting. These adaptations provide powerful tools for assessing whether error variances are homogeneous or vary across units.

The test statistic for the Adapted Wald Test follows a Chi-square distribution and evaluates whether the N unit-specific variance estimates are equal to a common variance. The statistic is generally formulated as follows (Greene, 2000; Baum, 2000):

$$W = \sum_{i=1}^N \frac{(\hat{\sigma}_i^2 - \hat{\sigma}^2)^2}{\text{Var}(\hat{\sigma}_i^2)}$$

Here, $\hat{\sigma}_i^2$ denotes the estimated error variance for unit i ; represents the common variance estimate for all units in the panel (the pooled variance); and $\widehat{Var}(\hat{\sigma}_i^2)$ is the estimated variance of the variance estimator for unit i .

5. SYSTEMATIC WORKFLOW OF PANEL DATA ANALYSIS

In panel data analysis, selecting the correct estimator and making valid inferences requires systematically testing specific assumptions arising from the two-dimensional nature of the data. The analysis process relies on a series of diagnostic tests and model selection, typically progressing through seven key stages (Baltagi, 2008; Gujarati & Porter, 2009; Wooldridge, 2010; Hsiao, 2022).

5.1. Data Structure and Stationarity Check

The analytical process begins with a precise definition of the variables contained in the panel dataset. In panels containing long time series, stationarity checks should be performed, similar to the assumptions of classical time series analysis. Panel unit root properties of the variables are examined through Levin, Lin and Chu (2002), Im, Pesaran and Shin (2003) and Fisher-type tests to assess whether stationarity holds at levels or after first differencing.

5.2. Cross-Sectional Dependence (CD) Test

Cross-sectional dependence is one of the most critical assumptions in panel data analysis. This test examines whether error terms are correlated across units a situation frequently encountered in real-world settings due to common shocks, such as global financial crises or macroeconomic disturbances. The Pesaran CD Test is widely used to detect such dependence.

5.3. Fundamental Model Selection: Detection of Unit Effects

The suitability of the pooled OLS approach depends on whether unobserved unit-specific effects are present. Since these effects capture time-invariant heterogeneity across units, their existence is commonly tested using the F-Test. The null hypothesis posits that individual effects do not contribute to the model, thereby supporting the pooled OLS estimator. Rejection of the F-test at conventional significance levels indicates the presence of systematic unit effects. In such cases, the Pooled OLS estimator becomes biased and

inconsistent because it fails to account for unobserved heterogeneity. Due to this methodological necessity, it is essential to switch to specific panel data methods such as Random Effects or Fixed Effects to accurately model unobservable unit heterogeneity.

5.4. Choosing Between Fixed Effects (FE) and Random Effects (RE)

After confirming the existence of unobservable individual unit effects, the Hausman Test is applied to select the most appropriate panel data estimator (Hausman, 1978). The purpose of this test is to determine whether there is a systematic correlation between individual effects and explanatory variables. The null hypothesis assumes that this correlation does not exist; in this case, both Fixed Effects (FE) and Random Effects (RE) estimators are consistent, but the RE estimator is preferred because it is more efficient. However, if the p-value of the test statistic obtained from the Hausman Test is below the significance level (H_0 is rejected), it is concluded that there is a correlation between individual effects and explanatory variables. Under this endogeneity condition, the RE estimator becomes inconsistent, while the FE estimator remains consistent and is therefore chosen as the basic estimator of the model. Thus, the Hausman Test plays a critical role in determining the estimator that provides the optimal balance between consistency and efficiency.

5.4.1. Hausman Test

The Hausman test plays a central role in choosing between fixed and random effects approaches. The test examines whether the coefficient estimates obtained from the two models differ statistically and, if the difference is significant, reveals which approach provides more consistent results. In this context, the test's primary function is to help decide whether to prefer the fixed effects model or the random effects model. The test statistic, calculated under the assumption of a chi-square distribution, is defined as follows:

$$H = (\hat{\beta}_{FE} - \hat{\beta}_{RE})' [Var(\hat{\beta}_{FE}) - Var(\hat{\beta}_{RE})]^{-1} (\hat{\beta}_{FE} - \hat{\beta}_{RE})$$

Here, the coefficient vectors estimated under the fixed effects and random effects specifications are denoted by $\hat{\beta}_{FE}$ and $\hat{\beta}_{RE}$ respectively. Their associated variance-covariance matrices are given by $Var(\hat{\beta}_{FE})$ and $Var(\hat{\beta}_{RE})$.

The basic assumption in the Hausman test is that the coefficients obtained using the random effects approach statistically agree with the estimates

obtained from the fixed effects model. This assumption states that unobservable unit-specific components do not have a systematic relationship with the explanatory variables. However, if the test statistic is found to be significant ($p < 0.05$), this assumption is invalidated, and it is concluded that unobservable unit effects should be considered fixed. Therefore, in such a case, it is considered more appropriate to continue the analyses within the framework of the fixed effects model.

If the null hypothesis is not rejected (that is, the test statistic is insignificant), the RE model is chosen, indicating that the unobserved effects can be treated as random and that the RE estimator provides more efficient estimates. Thus, when the p -value falls below 0.05, the FE estimator is selected; otherwise, the RE estimator is preferred, guiding the appropriate choice of model in panel data analysis (Bayraktutan and Demirtaş, 2011)

5.5. Diagnostic Tests and Management of Assumption Violations

After estimating the selected model (FE or RE), the classical assumptions that influence the efficiency of the estimator and the validity of the standard errors must be examined. The key diagnostic checks include:

- Heteroscedasticity
- Autocorrelation

These diagnostics ensure that the chosen estimator remains reliable and that appropriate corrections are applied when violations occur.

5.6. Alternative/Dynamic Model Estimation

If the analysis involves a dynamic structure such as including a lagged dependent variable the standard FE or RE estimators become inconsistent. In such cases, Dynamic Panel Data (DPD) models are employed, typically using estimators such as Arellano–Bond or system GMM, to obtain consistent parameter estimates.

5.7. Interpreting and Reporting Results

Once all diagnostic tests and model selection procedures have been completed, the final estimation results should be interpreted. In the FE model, the coefficients reflect within-unit effects, as the between-unit differences have been removed. Results must be reported transparently, including the

relevant test statistics and the steps taken to address any violations of model assumptions.

6. APPLICATION OF PANEL DATA ANALYSIS STEPS ON GRUNFELD DATA

The Grunfeld dataset, which is readily accessible in the *plm* package, is one of the most frequently used datasets for illustrating panel data applications. It contains annual investment data for 10 large American firms over a 20-year period, spanning from 1935 to 1954, and forms a balanced panel with a total of 200 observations (Grunfeld, 1958). In this dataset, the dependent variable is the firm's annual investment expenditure (*invest*, in \$1,000), while the explanatory variables include the firm's market value (*value*, in \$1,000) and its fixed capital stock (*capital*, in \$1,000). Additionally, each observation identifies the firm (*firm*, coded 1–10) and the corresponding year (*year*, 1935–1954).

The Grunfeld dataset was chosen for this study to demonstrate panel data methodologies in a practical and understandable manner. The dataset provides an ideal framework for applying and comparing pooled OLS, Fixed Effects (FE), and Random Effects (RE) models. Furthermore, its inclusion of cross-firm heterogeneity and time-series features makes it a valuable resource for examining the practical application and advantages of panel data models.

Step 1: Examining the Data Structure and Defining It as Panel Data

To correctly perform estimations and diagnostic tests in panel data models, it is essential to convert the dataset into an appropriate panel data format. For this purpose, the dataset was first imported into the R environment using the *plm* package, after which a panel structure was defined by specifying the cross-sectional unit (*firm*) and the time dimension (*year*). Carefully examining the data structure, verifying variable types, and accurately constructing the panel indices are critical steps, as they affect all subsequent procedures, including panel unit root tests, model estimations, and diagnostic checks. After loading the *plm* package in R, the following command is used to prepare the dataset for panel data analysis. The dataset is then ready for conducting stationarity tests in the next stage.

```
pg <- pdata.frame(Grunfeld, index = c("firm", "year"))
```

Additionally, possible linear relationships between independent variables were evaluated using correlation analysis within a panel data frame. This step is important for assessing the potential presence of multicollinearity. Multicollinearity, defined as a situation in which explanatory variables exhibit high pairwise correlations, reduces the reliability and interpretability of regression coefficients (Sinan & Alkan, 2015; Gujarati & Porter, 2009). Since this issue can also arise in panel data models, controlling for multicollinearity is an essential part of the analysis. The fact that all correlation coefficients are less than 0.80 indicates that there is no significant linear dependence problem between the variables (Gujarati & Porter, 2009).

```
cor_matrix <- cor(Grunfeld[, c("value", "capital")])
cor_matrix
```

Correlation analysis of the Grunfeld data reveals a moderately positive correlation between the independent variables market value and fixed capital stock ($r = 0.4887$). None of the correlation coefficients exceed the 0.80 threshold, indicating that the model does not have a serious multicollinearity problem. This result confirms that using independent variables together in panel data analysis is not statistically detrimental.

Step 2: Cross-Sectional Dependence Test

Cross-sectional dependence is a critical factor affecting the fundamental assumptions of classical panel estimators and first-generation panel unit root tests, making it an important diagnostic test to examine in the early stages of the modeling process. The Pesaran CD test is a frequently used diagnostic tool for examining cross-sectional dependence. A rejection of the null hypothesis indicates the presence of dependence between units in the dataset, necessitating the use of second-generation panel unit root tests. Since the Pesaran CD test requires model error terms, the analysis process is initially started using a pooled OLS approach, and then the test is performed on the resulting residuals. Relevant R codes are as follows:

```
model_pool <- plm(inv ~ value + capital, data = pg, model = "pooling")
pcdtest(model_pool, test = "cd")
```

The analysis yielded a test statistic of $z = 2.11$, corresponding to a p-value of 0.035. These findings invalidate the null hypothesis at the 5% significance level. Therefore, it is concluded that the error terms between units in the panel dataset are not independent of each other, and a statistically significant cross-sectional dependence structure exists. This finding suggests that common factors such as macroeconomic conditions or sector-specific shocks affect firms simultaneously. Since the analysis results revealed the existence of cross-sectional dependence, it is considered a more appropriate approach to use second-generation methods such as the CIPS test proposed by Pesaran (2007) instead of first-generation panel unit root tests in the stationarity investigation (Pesaran, 2007). However, the primary aim of this study is to illustrate the systematic workflow of the panel data modeling process; therefore, the application section focuses on model selection and assumption testing rather than providing a detailed technical implementation of unit root testing procedures.

Step 3: F-Test Between Pooled OLS and Fixed Effects Models

The first fundamental question in panel data analysis is whether unobservable individual-specific effects (such as firm-level fixed characteristics) should be incorporated into the model. For this reason, the Pooled OLS model is initially compared with the Fixed Effects (FE) model. This comparison is traditionally carried out using the F-test.

Hypotheses:

H_0 : No fixed effects are present (Pooled OLS is valid.).

H_1 : Fixed effects exist (FE model is required.).

```
pool_model<- plm(inv ~ value + capital, data = pg, model = "pooling")
fe_model<- plm(inv ~ value + capital, data = pg, model = "within")
f_test <- pFtest(fe_model, pool_model)
f_test
```

To assess the presence of unit-specific fixed effects in the panel dataset, the Pooled OLS and Fixed Effects models were compared using the F-test. The F-test yielded a statistic of 49.177, indicating a significance level of $p < 2.2 \times 10^{-16}$. This finding clearly demonstrates that the null hypothesis is invalid at the 5% significance level. Under the null hypothesis, there are no firm-specific fixed effects and that all units can be represented by a common intercept. The results show that the pooled approach does not provide a

sufficient framework for the analysis and that using a fixed effects estimator is a more appropriate method.

Step 4: Choosing Between Fixed Effects (FE) and Random Effects (RE) Models

Since the F-test findings revealed that unit-specific effects in the panel structure could not be ignored, the pooled OLS approach was excluded from the analysis. From this point on, the modeling process requires a choice between fixed and random effects approaches. The determining factor in this choice is whether the unobservable individual components are systematically related to the explanatory variables. The presence or absence of this relationship directly affects which estimator provides consistent results. The fixed effects approach assumes that individual effects may be related to the explanatory variables, while the random effects model assumes that there is no correlation between these two structures. Due to this fundamental difference in assumptions, the appropriate model selection was evaluated using the Hausman test.

Hypotheses:

H_0 : Individual effects are independent of the explanatory variables (the RE estimator is consistent).

H_1 : Individual effects are correlated with the explanatory variables (the FE estimator should be preferred).

```
fe_model <- plm(inv ~ value + capital, data = pg, model = "within")
re_model <- plm(inv ~ value + capital, data = pg, model = "random")
hausman_test <- phtest(fe_model, re_model)
hausman_test
```

The Hausman test was used to compare the consistency of fixed and random effects approaches. The obtained test statistic is $\chi^2 = 2.3304$, with a corresponding probability value of 0.3119, which is above the 5% significance level. This finding indicates that there is insufficient statistical evidence against the null hypothesis. The null hypothesis states that individual effects are not systematically related to the explanatory variables, and under this condition, the random effects estimator provides both consistent and efficient results. In this context, since no significant link was found between individual effects and explanatory variables, it was deemed appropriate to use the random effects model in the analyses.

Step 5: Heteroskedasticity and Autocorrelation Tests

In panel data models, the reliability of standard errors is just as important as the consistency of the coefficient estimates. Following the selection between the Fixed Effects (FE) and Random Effects (RE) estimators, it is necessary to examine the assumptions underlying the model's error structure. In particular, the presence of heteroskedasticity non-constant error variance across units and autocorrelation correlation of error terms within the same unit over time should be tested. When these assumptions are violated, coefficient estimates remain consistent; however, conventional standard errors become biased and unreliable, compromising statistical inference. The Adapted Wald Test is widely used in the literature to detect heteroskedasticity in panel data models. However, in some cases this test cannot be directly implemented in the R environment. For this reason, the Breusch–Pagan Lagrange Multiplier Test, which is a valid and commonly applied alternative, was used in this study to assess heteroskedasticity.

```
re_model <- plm(inv ~ value + capital, data = pg, model = "random")
het_test_re <- plmtest(re_model, type = "bp")
het_test_re
```

The Breusch–Pagan (BP) test was applied to examine the variance structure of the error terms in the regression model. The test statistic calculated was $\chi^2 = 798.16$, and the corresponding probability value was found to be $2.2e^{-16}$, which is well below the 5% significance level. In this context, it was concluded that the variance of the error terms in the model varies and that a significant heteroskedasticity structure exists.

In panel data analysis, the independence of error terms over time is considered a critical assumption, especially for ensuring reliable standard error estimations. However, the fact that economic and financial series often exhibit non-stationary characteristics makes the problem of serial correlation within units common. This situation necessitates a separate test of the suitability of the model's error structure. The preference for the random effects model over the fixed effects approach, based on Hausman test findings, prevented the application of the Wooldridge autocorrelation test developed for the fixed effects model. Therefore, the Breusch–Godfrey/Wooldridge panel serial correlation test, which is compatible with the random effects model, was used in the analysis process.

```
library(lmtest)
pbg_test_re <- pbgtest(re_model)
pbg_test_re
```

To examine the error structure of the Random Effects model, a panel Breusch–Godfrey/Wooldridge series correlation test was applied. The null hypothesis of the test assumes that the unit-specific error terms of the model do not exhibit serial correlation within units. The obtained test statistic of $\chi^2=69.95$ and the p-value of $p=1.856\times 10^{-7}$, which is extremely low, indicates that the null hypothesis is strongly rejected. In this context, it is understood that the unit-specific error terms in the panel dataset do not move independently over time, and therefore, a statistically significant serial correlation structure exists in the model. Although this does not directly impair the consistency of the coefficient estimates, it eliminates the reliability of the standard errors calculated under classical assumptions. Therefore, it was deemed appropriate to use cluster-robust standard error estimations, which are robust against serial correlation, in the continuation of the analysis process.

Step 6: Estimating the Final Random Effects Model with Robust Standard Errors

In the diagnostic tests performed in the previous steps, it was determined that the error terms contained both heteroskedasticity and intra-unit serial correlation. In this case, since the reliability of classical standard errors is reduced, statistical inferences may yield erroneous results even if the estimated coefficients remain consistent. Therefore, as suggested in the panel data literature, the final model estimation was performed using cluster-robust standard errors that are robust to both heteroskedasticity and autocorrelation. Clustered-by-firm standard errors are the most suitable method, especially for the Random Effects model.

```
library(sandwich)
re_model <- plm(inv ~ value + capital, data = pg, model = "random")
robust_vcov <- vcovHC(re_model, method = "arellano", type = "HC1",
cluster = "group")
re_model_robust <- coeftest(re_model, vcov = robust_vcov)
re_model_robust
```

The results of the Random Effects model, estimated using robust standard errors, show that all independent variables in the model are statistically significant. According to the Random Effects model estimated using robust standard errors, investment is positively and significantly explained by firm value and capital stock. The resulting estimation equation is as follows:

$$\widehat{inv}_{it} = -57.8344 + 0.1098value_{it} + 0.3081capital_{it} + \widehat{u}_i$$

According to the estimation results obtained with robust standard errors, a one-unit increase in firm value increases investment expenditures by approximately 0.11 units ($\beta=0.1098$, $p<0.001$), while a one-unit increase in fixed capital stock increases investment by approximately 0.31 units ($\beta=0.3081$, $p<0.001$). These findings reveal that firms with higher market capitalization have stronger financial capacity and investment opportunities; and that firms with high capital accumulation can better support investment behavior thanks to their production infrastructure. The term \widehat{u}_i in the model represents the effect of firm-specific and time-invariant structural characteristics, showing that investment decisions are also influenced by persistent heterogeneity at the firm level. The fact that all coefficients are significant confirms that investment expenditures are strongly and consistently explained by both market value and capital stock variables.

7. CONCLUSION

This study, systematically addresses model selection, hypothetical diagnostic processes, and robust estimation approaches in panel data analysis within a workflow framework. The ability of panel data methods to simultaneously utilize both temporal and cross-sectional information allows researchers to control for unit-specific heterogeneity, capture dynamic structures, and examine causal relationships more reliably. The study explains the theoretical foundations of classical panel data models; it emphasizes that fundamental diagnostic tests such as the F-test, Hausman test, heteroskedasticity, and autocorrelation tests are critical for the accuracy of the analysis and the reliability of model selection. Furthermore, structural problems, such as cross-sectional dependence, which are significant in the modern panel data literature, are discussed, and evaluations of methodological approaches to be applied in the presence of such dependencies are presented.

The application performed on the Grunfeld dataset strengthens the practical aspect of the study by demonstrating how panel data analysis can be carried out step-by-step. It was determined that Pooled OLS is insufficient in

the model selection process, that the presence of individual effects is important, and that, according to Hausman test findings, the random effects model offers a suitable framework. Estimating with robust standard errors after detecting violations of assumptions such as heteroskedasticity and autocorrelation has increased the reliability of the results and concretely demonstrated why diagnostic tests are a priority step in panel data analysis. This study, by bringing together both the theoretical framework and the applied approach, serves as a guiding and holistic guide for researchers who want to perform panel data analysis.

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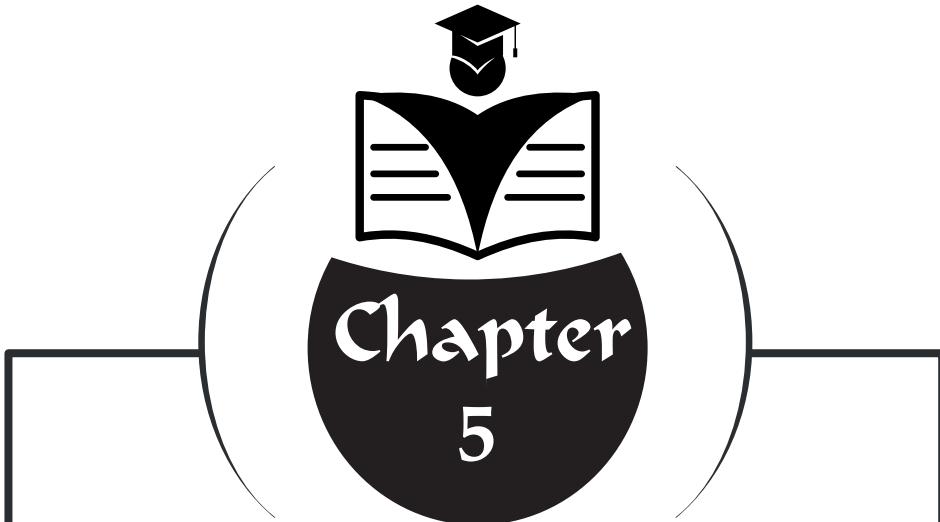
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**STAKEHOLDER RELATIONS WITHIN
THE FRAMEWORK OF GOOD GOVERNANCE
PRINCIPLES: AN ANALYSIS OF THE ISTANBUL
METROPOLITAN MUNICIPALITY STRATEGIC PLAN**

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1. INTRODUCTION

The rapid urbanization, technological transformation, and increasingly complex societal needs of the 21st century have necessitated a fundamental paradigm shift in the traditional understanding of public administration. The transition from the classical bureaucratic model to New Public Administration and subsequently to governance-oriented approaches has redefined the roles of local governments. In this process, local governments have gone beyond being merely service providers; they have become key actors in urban welfare, sustainability, and democratic participation. Strategic management stands out as one of the most critical tools in this dynamic environment, enabling local governments to direct limited resources to priority areas, develop a future vision, and respond effectively to societal demands. In Turkey, strategic planning, which has become a legal requirement with the Public Financial Management and Control Law No. 5018, serves as a fundamental institutional compass, allowing municipalities to measure their performance within a framework of accountability and transparency.

Istanbul, a global megacity with significant geopolitical importance, represents the most comprehensive and complex service network in Türkiye in terms of local government practices. The strategic plans prepared by the Istanbul Metropolitan Municipality (IMM) are not only policy documents that provide solutions to the city's chronic problems, but also demonstrate how governance principles are internalized at the local level. In particular, an examination of the themes and thematic areas of the IMM Strategic Plan reveals that topics such as transportation, urban transformation, social justice, and environmental sustainability are directly linked to institutional governance relationships. The concretization of strategic goals through target cards and their linkage to governance mechanisms reflects the institution's strategic thinking capacity and implementation capability. In this context, an analysis of the IMM's strategic priorities reveals not only a municipality's service map but also a vision for the future resilience and development of a modern city.

The main objective of this article is to analyze the target cards and governance relationships within the IMM Strategic Plan and to reveal the extent to which this plan aligns with the principles of urban development and good governance. Although numerous studies exist in the literature on strategic planning in local governments, the need for an in-depth examination of the structural link established between strategic themes and governance dynamics in the IMM example remains relevant. This study, which utilizes content analysis and document review techniques from qualitative research methods, seeks to answer the questions: *To what extent does the strategic plan encourage participation at the local level? and "How aligned are the identified thematic areas with urban priorities?* Following the introduction, the following sections will present, respectively, a conceptual framework,

an analysis of the institutional structure, and detailed evaluations of the components of the strategic plan, and will offer policy recommendations for improving strategic management capacity in local governments.

This study is derived from the thesis entitled 'Good Governance Practices and Municipalities' prepared by Alparslan Erdi Satılmış under the supervision of Prof. Dr. Yüksel Demirkaya. In order to maintain the academic depth of the text while maximizing clarity of expression and stylistic fluency for the reader, artificial intelligence technologies were utilized as a methodological tool during the editorial editing phase.

2. MANAGEMENT

In the dictionary, the concept of management is defined as the act of managing, handling, and administration (Turkish Language Association Dictionaries, 2025). In the literature, it is observed that the concept of management is defined in various ways. A general definition of management can be framed as activities based on the principle of cooperation carried out by more than one person wishing to achieve a specific purpose (Yalçın, 2010). It is stated that the essence of management is based on human relations as a social entity and, as a concept brought about by the state of living together from the family to society, it ensures continuity in a harmonious and coordinated sense (Aşgın, 2008).

It is argued that in order to speak of management, one must refer to three concepts: the ruled, the ruler, and the common goal. Accordingly, a community must first exist; the concept of management emerges through a political entity holding legitimate power, and it is stated that there must be a common goal that this community strives to reach. The coexistence of this tripod is quite important for the definition of the management concept (Tekeli, 1996). Certainly, many more definitions and descriptions of the concept of management can be made, as the concept is a natural phenomenon of organizational efforts and the advancement of administrative systems that have been ongoing since the early times of humanity.

It is an undeniable truth that it is not quite possible for any system or order to progress healthily without a management mechanism. It is a strong argument to predict that without management, many negative events would occur within societies and in their relations with other societies. Alongside this truth, it is inevitable that concepts will change and transform as time progresses, and the meanings contained within the concepts will differentiate. New management approaches and techniques are being developed to meet the needs of the age (Demirkaya, 2015:16). This is because the change of time essentially means the change of societies. It is known that as societies change, citizens move to redefine their relationship with the concept of management (T.R. Prime Ministry State Planning Organization, 2007).

As a reflection of this change, regarding access to information and documents in the public sphere, the view of citizens has shifted from a favor to a demand and ultimately has become a legal right of these citizens (T.R. Prime Ministry State Planning Organization, 2007). Essentially, this transformation expresses a transition in the concept of management, and as a result of this transition, it is seen that management is not merely a unilateral concept but one where mutual communication is quite important, giving birth to the concept of governance which develops in integration with modern times.

3. GOVERNANCE

The concept of governance is defined as the common use of administrative, economic, and political authority in official and private organizations. Governance is one of the administrative concepts that has been continuously discussed from the last quarter of the 20th century to the present and is believed to produce effective results, particularly in administrative participation (Ekinci abd Karakoyunlu, 2020; Eryiğit and Sarıca, 2018). The fact that the usage spectrum of the term governance, which has become one of the discussion topics of democratization and modernization in management in terms of social and political theories, extends from business management to economics, politics, and public administration, and expands to local, national, and international administrations, has made it difficult to define the said concept through a single meaning (Güzelşarı, 2003).

It is observed that there are different thoughts regarding the emergence and origin of governance (Varki, 2008). In terms of the transition to Turkish, while it is stated that the word governance is translated as *yönetişim* and was synonymous with government in the past, there have been those who trace it back to the 18th century, stating that the roots of the concept are included in the content of 'enlightenment management based on civil society' (Varki, 2008). It is also among those stated that governance comes from the Greek verb *kubernân*, passed into English as governance, and that this word was used as the Latin *gubernare* meaning to administer, guide, and rule in the Middle Ages, and as governance from the mid-fourteenth century (Bariş, 2020:418). Alongside this information, there are also views that the word *yönetim* (management) and consequently *yönetişim* (governance) exist in our language as a root. According to these views; governance is not English in origin but is formed by the combination of the Turkish words *yönetim* (management) and *iletişim* (communication) (Fidan, 2011:6). It is stated that it emerged with the addition of the reciprocity suffix to the word *yönetim* (Okçu, 2011). These discussions should be seen as academic richness. In terms of the scope of our article, it would be appropriate to focus on the use of the word *yönetişim* in the Turkish academic sense and the international usage history of the concept.

The concept of governance was first used in a report prepared by the World Bank in 1989 with the aim of solving Africa's development problem (Cingi, 2021). Essentially, it is observed that after the World Bank defined the existing situation in Africa as a governance crisis in 1989, governance was updated and adopted by other international organizations (Zabcı, 2002). This report was announced and published by the World Bank as Sub-Saharan Africa: From Crisis to Sustainable Growth (The World Bank, 1989). The relationship of the said report with the article lies in its expressions regarding the creation of a balance between the ruler and the ruled, or in other words, between the service provider and the class served, in terms of the management mechanism (Firidin and Uzun, 2018).

It is observed that the World Bank outlined the principles and practices that would form the content of the governance model with this report (Firidin, 2017). Without going into a clear definition within the report, it is stated that the concept of governance consists of elements such as an active public service, a modern legal system through an independent judiciary, an audit and accountability system effective on the use of public funding, an independent auditor responsible to the legislature, a public administration respectful of the rule of law and human rights, a free press, and a pluralistic institutional structure (Uzel, 2006). Governance is defined in this and similar ways within the literature. Even if the theme of governance is subject to positive or negative criticism within its own background, it has established a place for itself as a concept and has found a place in many researches, academic writings, and various reports in subsequent dates.

From the 1990s onwards, the term governance became more prominent as a concept in Organization for Economic Cooperation and Development (OECD) reports, the United Nations (UN) Conference on Environment and Development held in Rio de Janeiro in 1992, the 1994 Cairo Conference on Population and Development, the Copenhagen World Summit for Social Development held in 1995, the UN Second Conference on Human Settlements (HABITAT II) held in Istanbul in 1996, the 2000 New York Millennium Summit, and the 2002 Johannesburg World Summit on Sustainable Development (Rio+10) (T.R. Prime Ministry State Planning Organization, 2007). Specifically, the World Bank, which first pointed to the concept of governance in 1989 (Özgül and Agah, 2004:91), included the definition of governance in the study titled Governance and Development published in 1992. According to this report, good governance (governance and good governance are used synonymously) was used synonymously with sound development management and defined four areas of governance: Accountability, legal framework for development, information, and transparency (The World Bank, 1992). It would be appropriate to examine one of these conferences and summits as an example to scrutinize governance, analyze the impact of the concept in international arenas, and

grasp its importance. For this reason, to show the impact and continuity of the concept of governance, the Habitat-II Conference, which introduced the concept of good governance to our Turkish language (Good Governance Handbook, 2008:3), and its effects are examined below:

Twenty years after the Habitat-1 Conference (1996), the Habitat-II meeting held in Istanbul was attended by 3,000 delegates from 171 countries and 2,500 non-governmental organizations (Arlı, 2010). It appears as one of the important conferences organized at the international level in terms of participation level and decisions taken. One of the most important data to be considered in the twenty years that passed after the Habitat-1 Conference is the transformation of the world population's urbanization rate from 37.9% to 45.1%. It is seen that nearly half of the world's population has entered the urbanization process. For this reason, this summit is also called the City Summit. This degree of increase in the urbanization rate in the world has certainly set sail for new management understandings. This situation showed itself in the Habitat Conference and was reflected in the topics and steps to be taken during the conference.

The Habitat-II Conference is a conference that reasons regarding human settlements and housing problems on a global scale and is organized based on the law, society, institution, economy, and management required for states to struggle with problems (TOKİ, 1999). Within the sessions held at the conference, resorting to solutions for resolving housing needs, coping with poverty, carrying social communication to advanced levels, and sustainability issues were discussed (Yaylı and Gönültaş, 2018). Handling the problems that may arise with increasing urbanization in this way and determining action plans focused on needs will minimize the adaptation time of individuals to city life and make significant contributions to the peace of cities.

Two important documents (Istanbul Declaration and Habitat Agenda) emerged as a result of the Habitat-II Conference, whose main outputs were cities being the engines of global growth, considering urbanization as an opportunity, local governments engaging in activities more strongly, and realizing the importance of participation (Republic of Turkey Ministry of Environment and Urbanization, 2024).

The Istanbul Declaration consists of fifteen articles. In the first of these articles, it was stated that government representatives came together to make human settlements safer, healthier, and more livable with the aim of producing sufficient housing for every individual; and it was underlined that the goals and principles of the Istanbul Declaration are of great importance to the participating countries. It was promised that the participating states would show the necessary effort for the realization of the goals within the Habitat Agenda (TOKİ, 1999). The main theme of the conference was recorded as

adequate shelter for all and sustainable human settlements in an urbanizing world (TOKİ, 1999). When looking at the 15 articles of this declaration in general (TOKİ, 1999), it is observed that articles were created regarding;

- Improving the standards of human settlements,
- Living standards and areas of freedom being for all people,
- Giving importance especially to developing countries regarding increasing the quality of life in human settlements,
- While settlement opportunities are global, states and various localities must know how to produce solutions to problems in accordance with their own realities,
- The strength of the link between rural and urban development; meeting basic needs such as health, shelter, and education for women, children, and youth required for a sustainable life; expanding affordable housing supply from meeting adequate housing needs; and other similar issues.

It is seen that the Istanbul Declaration contains important articles. It should be emphasized that these articles are written down and known by government and civil society wings. Conference participants who signed the said article committed to the realization of these articles. These commitments should be evaluated as an advantage for both countries and citizens. Individuals who are integrated with urban culture in the new living environment and local administrators who will manage individuals paying attention to the articles expressed in this context can be tried as a way out for difficult processes. Because undoubtedly, the issues mentioned in these fifteen articles constitute one of the most important sub-titles of the new management understanding. It is known that the phenomenon of migration from rural to urban areas deeply affects not only people's lifestyles but also the management systems of countries.

The Habitat Agenda - Global Plan of Action, another document of the conference, was recorded within the framework of themes such as adequate shelter for all, sustainable human settlements in an increasingly urbanizing world, capacity building, and international cooperation and coordination (TOKİ, 1999).

Based on these main themes, participants listing the commitments discussed in the agenda in separate articles brought many issues to the agenda through this conference: It is seen that issues such as evaluating all humanity according to the principle of equality, human settlements being quite necessary for the complete elimination of poverty, sustainable development being an indispensable element for human settlements, mutual understanding being at the forefront for increasing quality of life, the importance of the family unit

being quite significant, and people needing to act respectfully towards the rights of others are listed within the document (TOKİ, 1999).

Following this listing, it is seen that various ways are proposed for problems based on the main themes. When all articles are examined, the following general opinions can be mentioned;

- Local administrators and non-governmental organizations must act together regarding the elimination of housing needs and the observance of human rights. Indeed, it is seen that 2,500 non-governmental organizations attended the meeting for this reason.
- In order for individuals not to be in a needy position in an urbanizing world, local administrators and non-governmental organizations must act together to increase the number of accessible individuals, and countries must act in cooperation in the international arena.
- Comments can be made that individuals should be supported in every field, including social, economic, and financial areas, on the path of sustainable urbanization by resolving housing needs, and this support should be done on the basis of cooperation.

The Habitat-II Conference, which was instrumental in introducing governance to the Turkish language, is important for understanding and defining governance and evaluating it on the axis of this historical background. Even when merely the names and contents of the articles and sections are examined, it is seen how governance based on participation emerged through mutual plans, collaborations, and projects instead of the single-handed management understanding dominant in modern times.

The term governance, which has increasingly made a name for itself and gained weight since the 1990s, has tried to underline focusing more on civil society/non-governmental organizations while defining the public sphere. Accordingly; non-governmental organizations will determine the goals in the social sphere and perform the act of realizing these goals. In addition, the state or public administration will use its traditional political authority to increase the freedom capacity required for social goals to be determined and realized by non-governmental organizations (Şaylan, 2000).

Governance is a complex and multidimensional concept that is the subject of multidisciplinary scientific research within different theoretical and methodological frameworks (Korkmaz, 2020). The diversity of definitions and various interpretations in different fields seem to support this argument. For this reason, there are many types of governance in academic literature. Among the most common governance types in the literature are models such as statist governance, state-centric governance, the Dutch governance school model, good governance, and global governance (Korkmaz, 2020:80).

4. GOOD GOVERNANCE

The concept of good governance was introduced to our language as the equivalent of good governance (English) during the preparatory works of the Habitat-II Conference (Good Governance Handbook, 2008:3). Good governance, which means processes and structures that can guide socio-economic and political relations in a transparent, participatory, and responsible manner, has been defined by various international organizations as follows;

- **According to the World Bank, Good Governance:** Good governance is an integral part of sound economic policies. For economic development to occur due to the market and government being functional, it is essential that an efficient and accountable administration and a predictable, transparent policy are followed by the public sector. The World Bank's increasing interest in audit practices is an important part of our efforts regarding promoting fair and sustainable development (The World Bank, 1992).

- **According to the OECD, Good Governance:** Governance is the way in which governments, the private sector, and civil society interact to solve societal problems and implement public policies. Effective governance requires open and transparent processes, accountability, and broad participation in decision-making processes. (OECD, 2023).

- **According to the United Nations Development Programme (UNDP), Good Governance:** It is the exercise of administrative, political, and economic authority at all levels to manage a country's affairs. Good governance comprises mechanisms, processes, and institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations, and mediate their differences (Tülüceoğlu, 2016).

The European Union touched upon the issue of good governance practices within the **White Paper** document published in 2001 (Firidin and Uzun, 2018). The European Union's general attitude towards governance can be examined through the work titled *European Governance: A White Paper* published by the European Commission in 2001. There are many suggestions regarding governance in this work (Akkahve, 2004). It is seen that these are gathered under four main headings;

- Participation and openness coming more to the agenda,
- More implementation of policies and regulations,
- Global governance (The Union symbolizing the concept of governance at the global level),
- Communication with institutions becoming the focal point again on the management surface.

Good governance is a concept that harbors a set of principles and

fundamentals within itself to make governance better (Yıldırım Ö. K., 2018). Governance and good governance features express an ideal type, what ought to be (Ökmen et al., 2004). It is stated that the reason for adding the phrase good to governance is that the term governance has new principles and it is done to attract the attention of the world management conjuncture (Firidin and Uzun, 2018). Indeed, the World Bank mentioned governance as governing, state administration in the report titled *Governance and Development* published in 1992 (Korkmaz, 2020:81-82). The definition of good governance developed for the formulation of good state administration - good governing concepts, and the concept was largely integrated with development policy and specifically the development problem in underdeveloped countries (Korkmaz, 2020:82). The World Bank explained the governance assessment as the manner in which power is exercised in the management of a country's economic and social resources for development (Korkmaz, 2020:82).

In its broad sense in the literature, the concept of good governance refers to removing the distance between the state and society (Küçükkahyaoğlu, 2019). Because in the governance formulation, it appears as preventing the distance that may occur between the state and society and ensuring a managerial mechanism that observes cooperation. When evaluated in this context, good governance has been put forward as one of the keys to participation, cooperation, development, and leading a quality life. Along with this, the state, whose reason for existence is to serve its citizens, using its administration in a citizen-focused manner, fulfilling international standards while administering the state, and reaching a social structure where institutions are trusted are seen as the main goal of good governance (Şahin M., 2018).

4.1. Good Governance Principles

It can be said that there are three basic universal principles of good governance, and these can be summarized in broad strokes as follows (Kızıltaş, 2005);

- **Rule of Law:** In other words, the state being administered in accordance with predetermined rules, limitations, and principles.
- **Participation:** Ensuring citizens' participation in management and administrators responding to citizens' demands.
- **Justice/Equity:** The good functioning of justice, equality, and competition mechanisms.

It is stated that governance can be spoken of in countries where the three elements listed above exist and have the possibility of application. The existence of various mechanisms becomes necessary for the application and continuous

functionality of these three basic elements. The two most important of these mechanisms are the existence of a functioning and developed democracy and an information society capable of using technology actively. Among the others, it is stated that management tools such as the formation of an accountability system, ensuring transparency in management, introducing a performance-based management system, well-defining responsibility and ensuring its good implementation, and pre-determining and implementing ethical rules are necessary (Kızıltas, 2005). Because with the term good governance; lawful, transparent, compliant with law, accountable, effective, consistent, and predictable management models are targeted (Ateş and Buyruk, 2018:85).

The governance element, which has an important duty in terms of effectiveness and efficiency in the management process, carries many principles with it to create this functionality (Güven and Alan, 2018). Among the priority principles put forward by the World Bank and accepted as governance principles are listed principles such as participation, cooperation, accountability, transparency, responsibility, effectiveness and efficiency, rule of law, equality, and inclusiveness (Güven and Alan, 2018). Again, as stated above, the European Union touched upon the issue of good governance practices within the *White Paper* document published in 2001. According to the White Paper, good governance is based on five principles: Openness, participation, accountability, effectiveness, and (economic and social) coherence (Yıldırım, 2014). The Commission sees each principle as important and superior to one another in order to make a more democratic governance exist (Yıldırım, 2014). However, for these purposes to be included in life and for their practice to be carried out, two important principles, proportionality and subsidiarity, need to be put into practice and operated in harmony with the other five mentioned principles (Tataroğlu, 2019:32). It should be underlined that the concept of governance is evaluated as this important on the basis of principles. Because good governance means good management. Management being good and functional comes into existence in the presence of these principles. Because these principles constitute the pillars of the good governance concept. In summary, it should be underlined that good governance is handled as a new understanding that includes all principles necessary for the formation of a democratic administration, and the principles forming this understanding can be listed as participation, transparency, accountability, effectiveness, consistency, fairness, and adherence to law (TESEV, 2008:3).

Good governance harbors a set of features and principles within its structure to make management more functional and inclusive. When examined as literature, eight main principles of the good governance concept that are connected to each other, complete each other, and affect each other are mentioned. These can be listed as: openness, responsiveness, accountability, participation, rule of law, consistency, effectiveness, integrity, and equality

(Yılmaz, 2019:75). These principles should be examined for good governance to be evaluated better and more healthily. Let us examine the principles that are connected to each other and each have separate importance.

4.1.1. Openness/Transparency

Transparency is the administration being in a state of accountability due to decisions taken in the management process (Öner, 2011). Transparency is the access of citizens to timely, understandable, relevant, qualified, reliable information regarding decisions made by states on economic, political, and social issues, the financial situations of organizations active within the private sector, and the activities of international organizations (Kuzey, 2003). In a basic sense, it can be defined as the process of accessing clear and understandable information whose accuracy has been analyzed in all of the state's economic, social, and political decision-making and implementation stages (Küçükkahyaoglu, 2019). Transparency takes place as the most significant criterion of citizens' right to access all documents and information regarding by whom, where, how, and at what time decisions are taken in all decision-making processes (Küçükkahyaoglu, 2019:7). It is the application of all public officials in a way that decisions taken and decision-making processes are open and shareable with other stakeholders (TESEV, 2008:18-19).

When openness is in question in management, three characteristics are usually mentioned (T.R. Prime Ministry State Planning Organization, 2007): Transparency, accessibility, and responsiveness. It is essential for good governance that public decision-making bodies are open in their actions and that the relationship between citizens and persons in the position of decision-making authority is active. Because in the governance system, it is important to adopt a style where stakeholders are informed and mutual interactions exist, as opposed to the traditional public administration style.

Ensuring transparency within public administration will facilitate the flow of global capital movement by creating a general environment of trust at both national and international levels (Yazıcı, 2018). Currently, in states where public administration and political structures are transparent, both national investors and global capital participants invest more easily, without problems and without a state of unease, and benefit the economic development of states (Yazıcı, 2018). Along with this, public administration being transparent serves as a tool for individuals to increase their trust in their countries (Yazıcı, 2018). As can be seen, the principle of transparency ensures that management mechanisms carry out their actions openly and secure public administration's sense of trust towards its citizens. Alongside this infrastructure evaluation, another dimension whose importance needs to be emphasized is that one of the tools to help the abstract and legal entity status of municipalities concretize

in their activities and operations and to secure trust over their citizens passes through observing the principle of transparency. Observing and maintaining the principle of transparency stands out as a quite important concept in the eyes of municipalities, which is the subject of our article. Citizens knowing actions such as activity reports, capital sharing, distribution, and transfer carried out by municipalities (or administrative mechanisms) with different stakeholders is instrumental in raising the state of mutual trust with the administration to upper levels. This situation will help both citizens and local and regional institutions, associations, and organizations reinforce their feelings of trust in the administration and participate in management processes.

4.1.2. Participation

Participation is a principle related to the involvement of various actors in the decision-making process (Yıldırım Ö. K., 2018). Participation is citizens being at the center of local public activities and being included in the public living space through methods defined to be open (Civil Society Development Center, 2019). In the governance model, participation is the involvement of the ruled segment, assumed to be the parties most affected by the problems, as stakeholders in the decision-making process to solve the experienced problems (İşik and Çetenak, 2018). Because within the framework of the governance model, the aim is not for local governments to implement all works themselves, but to make other actors in society applicable within a partnership understanding; as a result of such active participation, the connection of the individual urbanite and the formal and informal organizations within the city structure to the city is ensured. Along with this, the sharing of urban resources around equity criteria becomes predictable, and sustainability can be guaranteed by making cities livable (Göymen, 2000; Demirkaya, 2018). This kind of widespread and active participation understanding provides legal legitimacy to the activities of local governments (Göymen, 2000). Increasing participation ensures more trust is felt towards final decisions and institutions presenting policies (White Paper, 2001:8).

When participation arguments within the good governance system are evaluated spreading from urbanites specifically to the general society, it is possible to make similar comments. The participation principle is actually decision-making mechanisms evaluating citizens as stakeholders in decision-making processes. Decisions to be taken are thus adopted by the stakeholder citizens, increasing the rate of citizen participation in management.

Within the context of public administration, participation expresses the inclusion of non-state institutions, organizations, or citizens in the decision-making, planning, and implementation process of the management mechanism (Ateş and Buyruk, 2018:85). While other priorities exist in the restructuring

process of public administration, the main goal is to bring the state closer to its citizens and obtain the legitimacy of applied policies, which finds possibility with the participation of individuals, non-governmental organizations, and the private sector (Çukurçayır and Sipahi, 2003). Utilizing the principle of participation comes to the agenda to ensure this participation. Essentially, it is possible for the participation principle to encompass many institutions, non-governmental organizations, private sector, and public institutions in the eyes of municipalities as well. At this point, citizens keeping their relations with the municipality at an advanced level and being able to show themselves effectively as a stakeholder of the management wheel is directly proportional to municipalities and the central administration recognizing this opportunity for citizens. Considering that the trust environment established increases in direct proportion to increasing participation, it is understood how important this proposition is. Since the actors and principles of good governance have separate importance within themselves; every actor strengthening their contact with stakeholders using good governance principles will rise to even higher levels with the observance of the participation principle.

4.1.3. Rule of Law

The concept of law expresses the entirety of rules regulating the connections between citizens and the state, where sanctions are appointed dependent on rules set by the state (Yıldırım, 2019). The rule of law is the principle enabling evaluations regarding to what extent legal rules are obeyed and at what level institutions related to law are reliable (Yıldırım, 2018). Essentially, good governance is evaluated as the understanding of the rule of law dominating social life. Along with this, it is stated that society becomes better managed with the growth of belief in the rule of law rather than the superiority of individuals (Boz, Yurdaer and Eraslan, 2019). Because all members of society are equal before the field of law, and all stakeholders are responsible before the legal field. This situation is a great convenience for management mechanisms.

The rule of law has three meanings: First; the rule of law being in the position of regulator of state power; second, the rule of law meaning equality before laws; and third, the rule of law being in the position of determinant of judicial rules and management methods (Aktan and Çoban, 2022). This principle, which regulates the power of the administration, protects equality, and ensures the positive continuation of stability by providing a way and method with judicial rules, protects the state of citizens' thoughts towards their state being in a positive direction. Every decision and act based on law is binding for both citizens and decision-making mechanisms. This bindingness is a return of the good governance principle for states as much as it is an

expression of the feeling of security between them and their citizens. This situation indicates to the citizen that the state mechanism observes a decision system that will be fair around laws in all conditions and necessities. An independent judicial order possessing laws created consistent with the needs of the time, active and beneficially working courts, and regulatory institutions interpreting and applying laws in a fair and transparent manner is the key to ensuring the rule of law (Uzel, 2006:49).

It is quite important for citizens and local and regional administrators, public or legal persons and institutions to act within the boundaries drawn by law. Because the superiority of the legal field is an important criterion determining the freedom areas of persons, institutions, and organizations, as well as functioning as a protector of the legitimate order in social and administrative terms. The body of rules that is mandatory to be obeyed by everyone regardless of hierarchy and position is essentially an essential criterion for chaos not to occur. Because the rule of law essentially expresses that public administration must behave in accordance with the law when performing its duties (Kuzey, 2004:63). The actual implementation of governance is possible with the legal field and legal dominance approaching the entirety of society and institutions equitably. Observing the legal field and maintaining its superiority means observing good governance. Because the ability to apply legal norms soundly and balanced means the ability to apply good governance in practice.

4.1.4. Accountability

Accountability has been used as public officials being liable for their acts (Uzel, 2006). Deficiencies found in accountability systems within the traditional public administration mentality reveal the necessity for the formation of new accountability mechanisms and the use of current systems more actively (Yalçın, 2010). Accountability aims to determine whether those given a specific authority, resource, or duty behave as requested of them (Biricikoğlu and Gülen, 2008). In the traditional sense; the term accountability – responsibility to give account is defined as the punishment of a mistaken assignment or a wrongly done issue (Kesim, 2005). Today, however; accountability is characterized as mutual contact and relationship between the account-holder and the account-giver, rather than a one-way information sharing and explanation action (Eryılmaz and Biricikoğlu, 2011). Because within the scope of the New Management Understanding; emphasis is largely placed on efficiency and results. It evaluates work methods and processes emphasized by the traditional management understanding as obstacles standing in front of active and beneficial management (Eryılmaz and Biricikoğlu, 2011).

Accountability is the desire to show that government decisions and acts are compatible with clearly defined and agreed-upon goals, and practices are consistent with these goals (Barış, 2020:432). In situations where there is a mutual balance of influence alongside the state, civil society, and markets, the accountability principle strengthens further. Besides this, not only public institutions but also non-governmental organizations and private sectors must be positioned in a more accountable manner towards society and their institutional stakeholders (Uzel, 2006:45). This situation benefits every stakeholder continuing their acts by observing the consciousness of responsibility. The existence of an accountable structure is necessary for everyone, large, small, crowded, or minority. Through this principle, many crimes such as bribery and embezzlement are prevented, and a buffer duty is undertaken against interlocutors within the boundaries drawn by law. For local and regional administrators and municipal institutions, the accountability principle is of regulatory effect in terms of institutions prioritizing law and being responsible before the law. Administrators knowing they can face important sanctions legally and conscientiously must be aware that they need to behave quite sensitively in the face of the greatness of this principle. Because the act of giving account before the law covers an area that needs to be considered quite a lot from every angle. The existence of accountability is essential for acts and activities to be in the interest of the state and the nation. When evaluated on the axis of governance mentality; administrators in the management mechanism acting knowing that every action they apply throughout management must be accounted for is ensured through the accountability principle. It is mentioned that the accountability principle is an effective tool in terms of being able to show the status of whether principles such as transparency, equality, and rule of law are followed (Kuzey, 2004:68).

4.1.5. Responsiveness

The responsiveness principle means citizens are taken as interlocutors by persons at the government level or individuals in public administration and are informed on issues relevant to them. Duty holders who need to be sensitive towards interlocutor citizens – especially if they are politicians or bureaucrats – must be ready to respond in accordance with the responsiveness principle, sensitive, and capable of grasping citizens' wishes and urgent situations (Acar, 2003). Because this principle draws attention to society being aware that they will be listened to and answered by those in government or public leadership (Eyduran, 2014:48). Administrators being able to respond more to citizens' requests in administration processes means the service quality of the administration going further (Şahin, 2018:99). This situation contributes to citizens' needs being known better and plays a role increasing citizens' desire to participate in management.

The responsiveness principle means politicians and individuals working in the public sector are always ready to answer to the citizen, eager, sensitive, and in a structure able to understand the citizen's wishes and ideas (İzci and SarıTÜRK, 2017). According to the responsiveness principle, which is one of the basic components of good governance, public institution employees, private sector members, and civil society volunteers must act in a way that is both accountable and responsive within the circle of their own knowledge and obligation areas or activities where they are stakeholders. For municipalities, local and regional administrators, and responsible parties, it is important to be in a position to answer for their every step that is not within the legal line. Keeping this principle on the agenda will help administrators in the position of giving account to take their decisions more healthily and systematically. Responsiveness should therefore be evaluated as a necessary state that needs to be taken into account, especially in the eyes of society and municipalities, covering all successor and predecessor administrative mechanisms and protecting the citizen's rights. Because considering responsiveness in applied actions will ensure the survival of stability and order. For this reason, it can be stated that administrators abide by the governance understanding to the extent they can answer for the actions they apply. Indeed, liable parties who perform actions being held accountable and being able to answer regarding the results emerging as a consequence of their actions will contribute to increasing the quality in management.

4.1.6. Effectiveness (Efficiency)

It is stated that the effectiveness principle constitutes the main element of the governance mentality (Akyel and Köse, 2010). Effectiveness means decisions taken by the management are applied equally and simultaneously to all individuals, and there is a favorable relationship between the results expected to be obtained and both the resources to be used and the effects on segments that will be negatively affected (TESEV, 2008:19). Effectiveness means judgments being taken at the most correct stage, at the most correct time, and meeting needs (Boz, Yurdaer and Eraslan, 2019:506). Effectiveness is the degree of reaching goals and targets as a result of activities carried out by an institution with the aim of reaching defined purposes and strategic ambitions (Demirkaya, 2023; Gündoğan, 2007). The effectiveness principle is the success shown to reach the result. It is stated that ensuring effective governance will be possible with citizens actively participating in the process of solving society's problems, the performance or output measurement process, and structural reforms to be made in the country (Çukurçayır and Sipahi, 2003:55). Again, in a technical sense, the term effectiveness is defined as

the efficient use of public resources through competent public bureaucracy with the aim of fulfilling priority public demands and performing services (Palabıyık, 2004:67).

Since the concept of effectiveness will be realized with a participation idea based on stakeholder logic, it will cause all segments and individuals who will benefit the taking of decisions to be bound to them from both moral and legal angles; the application of this principle is realized by adapting to the decisions given (Ergün, 2006). Indeed, the embodiment of an effective governance understanding can be implemented with the participation of different groups of society in decision-making mechanisms (Ergün, 2006). Decision-making mechanisms observing actions such as effectiveness and efficiency will help citizens provide participation in the administrative process to solve certain societal problems. Because the term effectiveness simultaneously contains actions such as participation, activity, and movement. This means society participating in the management process and being a part of the solution in this process. It is valuable for society members to have such a mission and implement the requirement of such a mission from the smallest administration system to the largest formations. It is important for municipalities, every local and regional official institution and organization, civil society mechanisms, and the private sector to establish effective communication and contact mechanisms with citizens within this system and develop these systems with research and development studies, as it serves the interests of the state and society. It should not be forgotten that the management understanding tried to be followed in an effective line is one of the most important actions ensuring the execution of the governance mechanism.

4.1.7. Integrity and Equity (Fairness)

Integrity and equity are among the fundamental principles of good governance (Öztürk, 2002). Equity means giving equal opportunities to every citizen; attributing obligations and rights at the same level to all actors (Memduhoğlu and Yılmaz, 2021). Governance offering equal opportunities to all citizens, along with loading equal degrees of rights and responsibilities and bringing all individuals together around a common purpose, is a requirement of the equity principle (Eyduran, 2014:48). The equity principle ensures individuals trust the state by the public sector not engaging in discriminatory practices against any part of society in judgments given and revealing the rules the citizen is bound to clearly and plainly, applying them equally to all citizens (TESEV, 2008:18).

The integrity and equity principle is the state of having equal rights for all segments and communities, from regional and local administrators to all governance actors. This means administrative mechanisms binding to rules and conditions with full adherence and paying attention never to breach laws. An honest administrative mechanism can treat everyone fairly by putting all members of society into a scale. The existence of a contrary situation may cause society to view decision-making mechanisms and ultimately the state or administrative mechanisms as systems difficult to trust. Conversely, citizens being treated equally and honestly by administrative authorities will be instrumental in the citizen being included in management and will ensure management quality rises to advanced levels and the concept of governance is applied in practice. For this reason, every unit from the smallest management system to municipalities, from municipalities to the government, from non-governmental organizations to the private sector must act considering this principle.

4.1.8. Consistency (Coherence)

The consistency principle means policies and actions are compatible with each other and do not conflict. Administrative actions and policies must be consistent and easily understood (White Paper, 2001:8). Ensuring a coherent approach within a complex system requires political ownership and all institutions possessing a strong sense of obligation (T.R. Prime Ministry State Planning Organization, 2007:15-16). Indeed, decisions taken being consistent with each other over time ensures that regulations to be carried out by the state are predictable and create an environment where public opinion can feel safe to bring about forward-looking development investments (TESEV, 2008:18). This situation is ensured thanks to actions and policies mutually having the features of being easily understandable and consistent (Yalçın, 2010:20).

Consistency is a principle that supports increasing the trust felt towards the state by reducing the nation's panic about the future, in addition to having a stable management grasp and helping reduce the nation's states of anxiety regarding the future (Cingi, 2021:26). Consistency, which is one of the elements forming the backbone of governance, can be sustained by leadership holders being in complete harmony in the actions they take, decisions they make, and statements they give, and not leaving a question mark in citizens' minds. Administrators wishing to continue management processes in a modern way within the governance system, from local and regional administrators to non-governmental organizations and even the private sector, must dwell on this principle just as much as on other principles. Because individuals directing their current lives

and continuing their occupations find the opportunity to become easier thanks to administrator individuals complying with unity of discourse and action. Especially states providing services in multiple and different fields is a tool for them to observe the consistency principle more in all their actions. Because the lack of unity in the actions and discourses of state administrators will shake the nation's trust in its state by losing the feeling of trust in society. Due to the definition of the governance concept, this situation should also be evaluated for private organizations and civil society formations. Because acts performed administratively or decisions given concern many political organs or managerial units in terms of their interlocutors and results. For this reason, governance requires the consistency of central or local government institutions and authorities and their working in an active manner (Sobaci, 2007).

5. ANALYSIS OF THE ISTANBUL METROPOLITAN MUNICIPALITY STRATEGIC PLAN FROM THE PERSPECTIVE OF GOOD GOVERNANCE PRINCIPLES

The IMM 2020-2024 Strategic Plan is handled briefly with the presentation of the mission and vision and immediately following, under the title Core Values, with ten sub-titles and explanations of these sub-titles. The said section can be summarized on tables as follows (Istanbul Metropolitan Municipality, 2019:87).

- ***Mission:*** *"To provide accessible services for an Istanbul that produces by protecting all values of the city with a new generation municipalism understanding, and lives 24 hours with its cultural and social life."*

- ***Vision:*** *"A fair, green, and creative city, happy Istanbulites."*

The section handled with the title Future Outlook states as a mission; adopting a city style that is livable uninterruptedly for 24 hours with producing, cultural, and social activities by protecting all values of the city in line with the new generation municipalism understanding. Along with this, a profile of a fair, green, and creative city and happy Istanbulites is expressed as the vision (Istanbul Metropolitan Municipality, 2019:86). Planning the mission and vision by observing the future living and comfort area will contribute to the municipality both being ready for probable innovations in the future time and continuing its communication with the citizen positively. While the aim of protecting values in the city ensures displaying a fair approach to citizens; the aim of offering uninterrupted and accessible services to Istanbulite fellow citizens will help ensure and protect the livable environment in the city. Ensuring this environment means the continuation of management transforming into a better state.

Following the evaluation of the Strategic Plan as mission and vision, the themes and explanations mentioned in the Core Values title are concepts with direct and immediate contact with governance. It is important that the municipality determines equality, accountability, transparency, and participation as theme names within the context of core values. Within the framework of municipal services; observations are made that characteristics are expressed such as: approaching all citizens equally and trying to respond to citizens' demands and needs, striving to be in a transparent attitude in issues regarding citizens by using resources effectively, adopting the obligation of accountability, ensuring services are carried out effectively within the circle of legal and social norms acceptable at the international level, trying to implement modern, solution-focused methods applied on an international scale, striving to leave a livable environment to future generations by preserving green areas, observing merit in all activities, including Istanbulite fellow citizens in decision-making processes, developing an urbanism understanding that can respond rapidly and effectively to changing trends in the global system and transforming social needs (Istanbul Metropolitan Municipality, 2019:87). Containing these features allows the Future Outlook section to be interpreted as a section containing important features in terms of governance. Administrative mechanisms building core values upon human focus, justice, transparency, inclusiveness, environmental sensitivity, merit, participation, and similar, and acting in line with the requirements of this, always act more sensitively while realizing their actions and ensure the administrative process is adopted by all elements of society.

The main themes of the Plan are determined as Accessible Istanbul, Environmentally Sensitive, Producing Istanbul, Sharing Istanbul, Living Istanbul, Unique Heritage, Financial Sustainability, and Participatory and Innovative Management (Istanbul Metropolitan Municipality, 2019: 90). Thematic areas were created on a table for each theme. The themes and thematic areas can be seen in table form as follows (Istanbul Metropolitan Municipality, 2019:90).

5.1. IMM Strategic Plan Themes and Thematic Areas

Determining thematic areas and naming themes is important for maintaining current and future municipal services in a better way. Especially for sustaining management in a better form, keeping the scope of thematic areas wide with important headings by determining themes is a tool to benefit both the citizen's interest and administrative mechanisms serving their fellow citizens more effectively and efficiently. It is observed that the term governance has direct or indirect connections with the subject theme headings. Specifically, the term good governance falling into the area of the last theme Participatory and Innovative Management is significant. Because

including good governance in the thematic area scope brings good governance to the position of one of the pillars of strategic development. This undoubtedly means good governance is taken into consideration on the axis of the said plan. It is clearly seen that other thematic areas are related to many areas from participation to responsiveness, from effectiveness to equality. Themes determined in this section of the plan are essentially important in terms of seeing towards which goals and purposes actions are organized.

- **Accessible Istanbul:** Urban Planning, Transportation, Modern Infrastructure, Urban Informatics, Emergency Health, Disaster and Emergency, Urban Transformation.
- **Environmentally Sensitive:** Green Area, Sea, Air, Water Management, Energy and Energy Efficiency, Waste Management.
- **Producing Istanbul:** Employment, Tourism, Urban Agriculture, Entrepreneurship, Investment Office, Vocational Training.
- **Sharing Istanbul:** Social Inclusive Services, Social Support Services, Social Aid.
- **Living Istanbul:** Health, Vector Control, Culture and Art, Sports, Events, International Organizations, Sports Facilities, Animal Rights and Life, Veterinary Services, Inspections, Permits and Licenses, Consumer Rights.
- **Unique Heritage:** Tangible/Intangible Historical Assets.
- **Financial Sustainability:** IMM Budget, Savings, New Business Models, Alternative Financing Sources, Effective Management of Assets.
- **Participatory and Innovative Management:** Good Governance, Occupational Health, Organizational Development, Affiliate Management, Operational Excellence, Stakeholder Focus.

The second heading within the context of the section constitutes Goals and Objectives (Istanbul Metropolitan Municipality, 2019:90). This heading is also presented in tables like the upper heading. These tables are created on the axis of code, goal, code, and objective columns.¹ Handling tables by coding with goal and objective columns is for the purpose of developing strategy and obtaining and visualizing various forms of data more easily. Indeed, the created table codes and objectives are used in other parts of the section. For example; the 3rd objective (coded H3) of the A1 coded Creating a Resilient City by Developing Qualified and Functional Living Spaces goal of the Accessible Istanbul titled table is determined as Realizing Urban Transformation Services with Disaster Priority and Transparent and Participatory Methods. Openness and participation are clearly emphasized in the determined objective. In tables created as a

¹ Tables within the section are handled by providing information and explanations about the tables. To access the tables, one can refer to the said section (IMM, 2019:91-93).

result of preparing objectives and codes in order in this way; it is seen that features such as effectiveness, accountability and responsiveness, equality, consistency, inclusiveness, accessibility, continuity in digitalization integration, and sustainability are observed. From this angle, it can be said that the goals and objectives of the tables are tools for the better application of governance.

Following the tables created centered on human-focused themes, a new table was created on the axis of the connection of the goal and objective codes determined in the upper heading with the spending units in the municipality. This table was created with the name Relationship of Goal, Objective and Spending Units; and duty sharing regarding Responsible Unit, Unit to Cooperate With between objectives and spending units is presented directly to the reader (Istanbul Metropolitan Municipality, 2019:94-95). Creating objectives by establishing contact with spending units within the institution is important. Because the establishment of duty sharing and cooperation between the target and spending units determined to develop strategy will set a barrier to any conflict and confusion situations that may occur in the future time. This state of being a barrier will be instrumental in services not being interrupted and administrative mechanisms not experiencing unrest in the processes of fulfilling their duties. The effort to constantly maintain stability by guaranteeing continuity in governance is possible with serious planning of steps and processes in strategy development. As for the integration of created tables into life; it will be possible by always keeping developed strategies in view and relevant units being ownership-oriented and finishers in every work and action falling into their fields.

After the table created with the name Relationship of Goal, Objective and Spending Units, the title Sustainable Development Tools is handled (Istanbul Metropolitan Municipality, 2019:96). In this context, it is stated that United Nations Sustainable Development Goals (IMM, 2019:96). and international sustainability standards are closely followed by the Istanbul Metropolitan Municipality, and works towards compliance and improvement are tried to be put into practice. Along with this, it is mentioned that effort is made for the constitution of a common value by considering stakeholder expectations (Istanbul Metropolitan Municipality, 2019:96). In this context, analysis of international city indices, analysis of global risks and opportunities cities may encounter in the near future, and meetings and workshops held with internal and external stakeholders were executed. In line with the vision of the Istanbul Metropolitan Municipality Mayor, a matrix associating the 2020 – 2024 Istanbul Metropolitan Municipality Strategic Plan with the United Nations Sustainable Development Goals was created to be a roadmap for Istanbul's sustainable development (Istanbul Metropolitan Municipality, 2019:96). It is mentioned that global trends and reflections in terms of urbanism were analyzed to ensure a better understanding of international conditions and trends outside

the institution and to take action by foreseeing determinations regarding threats and opportunities the municipality may encounter. Again, it is voiced that stakeholder ideas were tried to be taken, and stakeholder analysis was carried out on a wide scale with many events to ensure participation at the most advanced level. Themes and goals were created in a way to allow generating value to the maximum extent from among economic, environmental, social, and governance terms encountered by the municipality and its stakeholders (Istanbul Metropolitan Municipality, 2019:96). It is separately stated that Istanbul Metropolitan Municipality adopts a sustainable, holistic, and long-term management model and the perspective that “The 2020 – 2024 Strategic Plan has been a plan covering the United Nations Development Goals by reflecting a participatory innovative management approach targeting financial sustainability, prioritizing the protection of the city’s heritage, creating fair living conditions, sharing, producing, environmentally sensitive, accessible in the main service areas our municipality serves.” (Istanbul Metropolitan Municipality, 2019:96). Following this declaration, on a table named Relationship of Goals and United Nations Development Goals; it is shown which United Nations Development Goals the goals determined within the scope of the plan are connected with (IMM, 2019:97).

The third main heading of the Strategy Development Section constitutes Goal Cards. Goal Cards are measured by 224 indicators where 9 Goals, 48 Objectives, and 145 Activity groups take place (Istanbul Metropolitan Municipality, 2019:98). In a broader expression; under the goal and objective umbrella determined within the Plan; Objective Risk, Activity and Projects, and Cost Estimation outputs are presented as data. Again, determinations and needs mentioned and handled as output within the Plan are analyzed on these tables. Goal cards are formed from outputs mentioned and handled within the plan and designed in a way to show which responsible unit needs to cooperate with which unit. In the design stage, key performance indicators were observed and units of measure were appointed. Also, objective risks are shown on the created table and presented to public information.

It would be appropriate to evaluate the 48 objectives on a table to reveal which good governance principle they are connected with, in accordance with the rankings of the Goal Cards in the Strategic Plan. With this perspective, the said objectives can be examined as follows;

Table 1. IMM Strategic Plan Goal Cards and Governance Relationship

GOAL CARDS	Openness / Transparency	Participation	Rule of Law	Accountability	Responsiveness	Effectiveness	Integrity and Equity	Consistency (Compliance)
1. Goal Card	X						X	
2. Goal Card	X	X					X	
3. Goal Card	X	X					X	
4. Goal Card							X	
5. Goal Card 1H5							X	
6. Goal Card							X	
7. Goal Card 1H7							X	
8. Goal Card 2H1								
9. Goal Card 2H2								
10. Goal Card								
11. Goal Card 2H4							X	
12. Goal Card							X	
13. Goal Card							X	
14. Goal Card 3H1							X	
15. Goal Card							X	
16. Goal Card 3H3							X	
17. Goal Card 3H4							X	
18. Goal Card 4H1							X	
19. Goal Card 4H2		X					X	
20. Goal Card		X					X	X
21. Goal Card 4H4							X	
22. Goal Card 5H1		X					X	X
23. Goal Card		X					X	X
24. Goal Card		X					X	X
25. Goal Card 6H1							X	X
26. Goal Card		X					X	X
27. Goal Card 6H3		X					X	X
28. Goal Card		X					X	X
29. Goal Card 6H5		X					X	X
30. Goal Card							X	X
31. Goal Card 6H7		X					X	X
32. Goal Card 7H1	X		X	X			X	
33. Goal Card 7H2							X	
34. Goal Card 7H3	X						X	
35. Goal Card	X						X	
36. Goal Card 8H1							X	
37. Goal Card	X			X	X		X	
38. Goal Card	X	X					X	X
39. Goal Card							X	
40. Goal Card 9H1		X					X	
41. Goal Card		X					X	
42. Goal Card 9H3		X					X	X
43. Goal Card		X					X	X

In this table created by scrutinizing the data in the goal cards, the principles of goal cards related to good governance have been tried to be determined. Because considering that the goals and purposes appointed as a result of researches and organizations made while creating the Strategic Plan are naturally understood by all citizens reading the Strategic Plan; it is natural to be able to evaluate and reveal the connection of the mentioned goals and objectives with good governance in this way, even if based on form and naming. From this angle, primarily the contact at the point of goal and objective was considered.

Afterwards; the connection of activities and projects with good governance was tried to be detected. The detection of this connection was done based on naming in goals and objectives, words containing good governance principles used in these namings, and themes directly contained in namings.² As a result of the analysis made, it was observed that good governance principles were observed; especially the effectiveness and participation principles, which can be seen as a reflection of good governance, took place at quite high levels. This situation shows that action is taken with the aim of being able to keep the effectiveness area in municipal activities at an advanced level.³

6. CONCLUSION

Today, the opportunities brought by modern times and technological developments have caused new paradigms to emerge much faster in every field through a state of change and transformation. With the development of technology, developments in many fields such as social, political, cultural, and economic are at a visible dimension. In times when globalization continues so rapidly, the spread of these and similar developments and changes to different countries should be met quite naturally. One of these states of change, transformation, and development showed itself in the concept of management. It has been seen that the relationship between public administrations and citizens transformed into a different state from the traditional model, revealing a new concept, and this concept is governance. Governance, where mutual communication and interaction are important instead of the old management understanding, appears as a developing concept at this stage. Governance, first used in a report issued by the World Bank in 1989 regarding Africa's development problem, was gained to our Turkish language with the Habitat-II Conference.

Good governance is a concept ensuring the continuation of management with the participation of more than one actor in the management process. Good governance is a concept accepted as a tool for administrative mechanisms to realize management in a more functional and effective way. For management to be more effective and functional, good governance harbors certain principles within its structure. These principles constitute the backbone of the study. Because the application of good governance comes into existence with the observance of these principles. Within the scope of the article, eight principles were examined: openness, responsiveness, accountability, participation, rule of law, consistency, effectiveness, and equality. Institutions and organizations

2 The point intended here is; establishing a connection based on namings and themes. Considering it is natural for objectives created to realize specific goals to be understood by all citizens reading the Strategic Plan; it is natural for the connection of the mentioned goals and objectives with good governance to be evaluated and revealed in this way.

3 Along with this, which goal card other principles are connected with is presented to the reader's information via the mentioned table.

applying these eight principles sustain the management system on a governance axis. In this step, it should be stated that especially public administrations and municipalities observing the mentioned principles in actions they realize towards their citizens can make management more effective and efficient. Along with this, it was observed that good governance principles are actually handled as good governance practices and these principles can be evaluated by municipalities. It will show that institution administrators are trying to apply governance principles if they strive to observe issues such as: administrative mechanisms constantly taking an effective position within the process while performing their activities and acting by clearly conveying their actions to those concerned, trying to apply their actions observing national and international legal norms and thereby raising their accountability and responsiveness rates to advanced levels, realizing their activities consistent with predetermined plans and programs, providing practices that will increase the participation of internal and external stakeholders in the management system, and approaching interlocutors equally. It has been determined that administrative mechanisms acting in this manner will gain citizens' satisfaction when they implement their actions and can take the trust felt in management to further levels. Municipalities determining their areas of movement by observing these principles will raise the efficiency rate in activities to be done towards the citizen. Because the citizen having a say as a stakeholder in management will pave the way for offering contributions in various ways by ensuring the citizen's participation in the management system.

Following the examination of good governance principles, the final part of the article constituted the 2020–2024 Istanbul Metropolitan Municipality Strategic Plan. After the good governance definitions handled within the article, the strategic plan of the Istanbul Metropolitan Municipality was examined to be able to observe how the concept of good governance is applied in the field. It was stated that the examination of this plan was done both to be an example of the view of municipalities within the country towards governance and to see how the concept of governance is applied in the field. The Strategic Plan was examined with the aim of revealing the relation of concepts within the published document with governance. The 2020–2024 IMM Strategic Plan appears as a document tried to be prepared in accordance with the new management understanding. Specifically, mission, vision, and headings confirm this argument. It is observed that principles of participatory, transparent, accountable and responsive, observing the rule of law, and equality understanding are observed within the plan. Issues such as with what perspective the Plan was prepared, the effort to create the plan under the guidance of accessed data by trying to reach Istanbulite fellow citizens, sharing where and in what amount resources are saved with financial tables, and how key performance indicators and objectives were constituted being clearly

stated within the plan support this argument. In light of the information shared in the document, it shows that the IMM Strategic Plan was prepared and tried to be put into application in accordance with good governance principles by observing features such as participatory, effective, transparent in management. This situation is important. Because the strategic plan of Istanbul, the largest metropolis of Turkey and one of the world's largest metropolises, being a plan prepared observing good governance principles is a positive contribution in terms of management being sustained more efficiently by other municipalities also being able to benefit from good governance principles while preparing and applying their plans. Within the scope of all this background, it is observed that the concept of good governance has gained an important place in the eyes of municipalities in Turkey. Specifically, correctly observing good governance principles in the administration style of administrative mechanisms such as public institutions, non-governmental organizations, and municipalities will ensure the management mechanism functions more effectively, efficiently, and continuously, strengthening the contact with the citizen (Demirkaya, 2019).

In management systems where the good governance model is kept in view, communication with society can be applied more effectively and efficiently. Governance sustaining its system by observing mutual interaction and participation shows this situation. Works to implement the principles and features of the good governance concept will transform management into an even better state. Good governance principles are the application tools of good governance. Specifically, openness, rule of law, accountability and responsiveness, participation, effectiveness, equality, and consistency principles should be mentioned as principles necessary to be observed for the application of the good governance concept in administrative systems. The application of these principles is an action that will develop the public's feeling of trust in municipalities and local government. Citizens being able to filter the actions and activities of both local and central administrations through these eight principles means an increase in the rate of satisfaction from management. An increase in satisfaction from management means public opinion carrying the trust felt towards management mechanisms to further levels. Because being able to implement a management process that approaches all its citizens equally, accepts the rule of law, can inform stakeholders transparently in realized actions, ensures actions can be at an accountable and responsive level, tries to include relevant persons in the management process by making them stakeholders in the management scheme, strives to establish an effective and beneficial management mechanism, and can act consistently in work and activities will affect the citizen's attitude towards management positively and increase management quality. Again, the implementation of good governance will be instrumental in the inclusion of new stakeholders in the management system, effectively lightening the state's load in the management

process and contributing positively to the speed of completing work of bureaucracy at local and general levels. Allowing stakeholders participating in the management scheme to do the duties and collaborations falling upon them will make it possible for the entire management system to continue its administration seriously and consistently. Together with this background, new paradigms should be brought to the management wheel by evaluating modern opportunities well, and specifically technological steps such as digitalization steps should be followed carefully. Social media applications, digital platforms, and internet components that technology integrates into our lives must be used as required for the continuity of management to proceed more healthily. Particularly, the good usage and monitoring of social media channels by public institutions and organizations, the private sector, and non-governmental organizations will prevent both the spread of disinformation information, which is one of the greatest dangers of our age, and the unstable and fear climate that may occur on the basis of governance. In times where digital transformation happens rapidly, countries following this transformation will present a healthier and more stable environment to their citizens in terms of management. This state of following will be a tool for the better application of the governance model. In summary; the use of good governance principles and features by management mechanisms in a way suitable with the social, political, and technological opportunities of the age we live in will ensure management is sustained in a more quality, satisfying, and stable manner.

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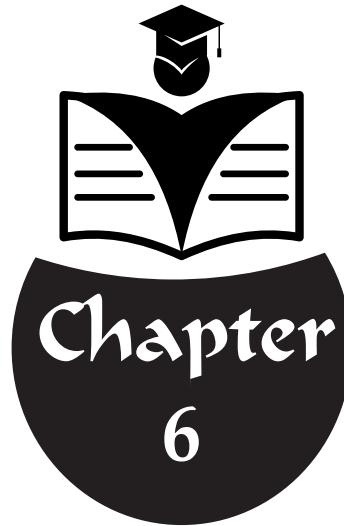
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HUMAN-IN-THE-LOOP AI IN MANAGEMENT INFORMATION SYSTEMS: BALANCING AUTOMATION, ACCOUNTABILITY, AND ORGANIZATIONAL CONTROL

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Chapter 1: Introduction and Conceptual Context

1.1. MIS in the Age of AI: From Informatization to Intelligent Autonomy

The evolution of Management Information Systems (MIS) is fundamentally defined by its progressive incorporation of technology into organizational processes, consistently shifting the focus from mere transactional data processing toward active, strategic decision support (Hirschheim & Klein, 2012). The advent of Artificial Intelligence (AI) marks the newest, most profound, and potentially destabilizing phase: the transition from informatization to intelligent autonomy (Acharya, Kuppan, & Bhaskaracharya, 2025).

Drawing on Zuboff's foundational work (Zuboff, 1988), traditional MIS efforts focused on informatizing manual processes, which essentially rendered them transparent, documented, and knowable to human supervisors. Modern AI, particularly in its machine learning (ML) forms, introduces autonomy, where complex and consequential processes—especially those related to decision-making, pattern recognition, and prediction—are delegated to algorithms (Baird & Maruping, 2021). This marks a fundamental shift from traditional Decision Support Systems (DSS), where the human explicitly provided the rules or instructed the system (Power, 2002), to predictive and generative AI, where the system autonomously generates a course of action or a prediction (Hao, Demir, & Eyers, 2024). Hao, Demir, and Eyers (2024) note that this delegation of cognitive work presents a critical challenge to established organizational structures and governance models, requiring a re-evaluation of the core tenets of MIS.

The core dilemma facing contemporary MIS strategy is the Triple Paradox: the inherent and non-trivial tension among three non-negotiable organizational goals when deploying autonomous AI systems:

Automation: The desire for increased operational efficiency, reduced cognitive load on human workers, lower costs, and accelerated decision-making speed (Arantes, Santos, & Simão, 2023). This is the primary value proposition driving AI adoption (Davenport & Ronanki, 2018).

Accountability: The ethical, legal, and regulatory necessity to ensure decisions are fair, auditable, explainable, and adherent to societal values and compliance regimes (De Paula, Vasconcelos, Santos, & Lago, 2020). Accountability demands transparency into the decision-making process, a concept often antithetical to complex, proprietary AI models (Burrell, 2016).

Organizational Control: The strategic mandate to maintain managerial oversight, governance, and alignment of automated processes with overall corporate strategy, risk appetite, and long-term objectives (Cram & Wiener, 2020). Losing control means potentially ceding strategic direction to algorithms optimized for short-term metrics.

The paradox emerges because maximizing Automation pushes systems toward full autonomy, which in turn risks undermining accountability and strategic control—often referred to as the Black Box problem (von Eschenbach, 2021). Conversely, implementing excessive human oversight to ensure accountability negates the benefits of automation, creating a costly Bottleneck problem (Subramaniyan et al., 2021). This chapter argues that Human-in-the-Loop (HITL) AI provides the necessary sociotechnical solution to strategically reconcile this paradox (Grønsund & Aanestad, 2020).

Chapter 2: Literature Review and Foundational Concepts

2.1. Defining Human-in-the-Loop (HITL) AI

HITL AI refers to systems where human expertise is intentionally woven into the machine learning workflow to train, validate, and tune the model, ensuring the system remains grounded in human judgment (Mosqueira-Rey et al., 2023). It is recognized as a necessary mechanism for addressing the limitations and risks associated with pure algorithmic autonomy.

We clarify four major HITL architectures relevant to MIS decision-making:

- 1. Human-as-Supervisor:** The human monitors the AI's output and intervenes only when performance drops, an anomaly is detected, or the confidence score is below a predefined threshold (Sheridan, 1992).
- 2. Human-as-Corrector:** The human actively corrects or refines AI recommendations, especially for complex edge cases or explicit mistakes, with the corrected data then fed back into the model for continuous re-training and performance improvement (Amershi et al., 2014).
- 3. Human-as-Trainer:** The human labels, cleans, or curates data to initially train the model, ensuring the data foundation reflects organizational reality and desired outcomes (Roh, Heo, & Whang, 2019).
- 4. Human-as-Governor (MIS-Specific Extension):** Proposed here, this highly strategic role specifically focuses on assessing high-stakes AI outputs against organizational risk tolerance, ethical policy, and legal compliance before a final decision is executed. The Governor holds the ultimate veto power over the AI system.

HITL effectively operationalizes Simon's concept of bounded rationality (Simon, 1947), recognizing that while AI offers superior processing efficiency, speed, and data handling (rationality), humans provide the necessary judgment, contextual awareness, and ethical constraint to manage the inherent unboundedness of real-world, complex decision environments.

2.2. Levels of AI Autonomy in MIS Applications

To strategically manage the HITL design, MIS leaders must adopt a structured autonomy scale, which defines the delegation of authority across

different decision tiers (Sheridan & Verplank, 1978):

Level 0 — Manual Decision-Making: Human performs all tasks, relying solely on traditional information systems (e.g., spreadsheets, static reports).

Level 1 — Human-in-the-Loop (Verification): AI recommends, but the human must actively approve, verify, or modify the decision before execution (e.g., high-risk loan decisions, strategic supply chain forecasts). This level prioritizes Accountability and Control.

Level 2 — Human-on-the-Loop (Override Option): AI acts autonomously, but the human supervisor retains the right to interrupt or override the action if necessary (e.g., standard inventory optimization, low-level HR routing). This level balances Automation with reactive Control.

Level 3 — Full Automation: AI acts entirely without human intervention or only alerts humans to major failures (e.g., fully automated fraud detection, high-frequency trading). This level prioritizes Automation.

Selecting the appropriate autonomy level for a given task is not merely a technical configuration setting; it is fundamentally a governance decision that dictates the extent of strategic authority delegated by the organization to the machine (Weill & Ross, 2004). This delegation must be continuously monitored by MIS.

2.3. The Value Proposition of Automation in MIS

In ERP and SCM, automation leads to greater efficiency through predictive maintenance schedules and significantly enhanced demand forecasting accuracy (Toorajipour et al., 2021). In CRM and HRIS, it elevates responsiveness through automated customer service interactions, personalized outreach, and optimized talent sourcing (Huang & Rust, 2018; Tambe et al., 2019). These applications powerfully underscore the Automation driver of the Triple Paradox, promising large-scale productivity gains, improved forecasting accuracy, and substantial reductions in manual error rates. The challenge for MIS leaders is to realize these efficiency gains without incurring catastrophic ethical or compliance risks, highlighting the imperative of ethical integrity alongside optimization.

2.4. Accountability in Algorithmic Decision-Making

Accountability requires that organizations can explain, justify, and take responsibility for the outcomes and potential harms caused by their systems (Wieringa, 2020). The burgeoning literature on algorithmic bias (where models perpetuate societal discrimination due to flawed data) and fairness highlights the severe risk autonomous AI poses to ethical governance and legal compliance (Noble, 2018; Buolamwini & Gebru, 2018).

Concepts like Explainable AI (XAI) and transparency are not mere technical buzzwords but are essential Accountability mechanisms that allow

humans to inspect and validate the algorithm's rationale and input variables (Gunning, 2017). This inspection is especially critical for decisions that affect individuals' fundamental rights, legal standing, or economic opportunity, directly referencing the importance of governance models and the author's prior work on accountability in technology adoption (Goodman & Flaxman, 2017). MIS systems must be designed to facilitate, not obscure, this auditability.

2.5. Organizational Control and MIS Governance

Organizational Control ensures that processes and actions align with the defined strategic objectives of the firm. We leverage Ouchi's Control Theory (Ouchi, 1980)—a cornerstone of organizational study—to dissect this concept in the AI era:

Behavior Control: Monitoring employees' actions and procedures. This becomes nearly impossible with autonomous AI, as the machine's behavior is often opaque.

Outcome Control: Monitoring and rewarding performance based on quantifiable results. AI can distort this, as it may optimize for narrow, measurable outcomes while masking bias or ethical violations (Strathern, 1997).

Clan/Value Control: Reliance on shared values and culture. While always important, this is often insufficient for managing the technical complexity and speed of algorithmic risk.

AI systems fundamentally disrupt traditional control structures because the decision process is opaque (eroding Behavior Control) and optimized outcomes may hide flawed logic (flawing Outcome Control) (Kellogg et al., 2020). Therefore, MIS governance must proactively evolve to embed specific control mechanisms directly into the sociotechnical design of the AI systems themselves, rather than merely monitoring the human users.

Chapter 3: The Proposed MIS Framework – The Triple Balance Model

3.1. Conceptual Architecture of the Triple Balance Framework

The Triple Balance Framework proposes that sustainable, high-impact, and ethical AI deployment in MIS relies on achieving a dynamic equilibrium among the three forces: Automation, Accountability, and Organizational Control.

Core Elements: The three forces represent the competing organizational objectives that define the Triple Paradox.

Balancing Force: The Human-in-the-Loop Mechanism acts as the central moderator. By strategically inserting human intervention points at specific

levels of autonomy, organizations can effectively fine-tune the balance—sacrificing minimal automation speed to gain necessary accountability and strategic control.

The framework asserts that system stability and organizational trust are only achieved when the three forces are maintained in dynamic equilibrium, a state which requires continuous management through sociotechnical HITL design.

3.2. Strategic Design of HITL Mechanisms for Control

Effective HITL implementation is not a one-size-fits-all solution; it requires careful strategic design tailored to the decision context:

Autonomy Calibration: The level of AI autonomy must be inversely proportional to the decision's risk sensitivity (e.g., Level 3 for low-risk, routine tasks; Level 1 for high-risk, consequential tasks) (European Commission, 2021). This prevents strategic core decisions from being delegated without oversight.

Human Authority Level: The human's power (approve, override, audit) must be rigorously defined based on the decision tier. Strategic decisions, such as market entry or major capital investments, require the human as a Governor with ultimate override authority, while operational tasks require the human as a Supervisor for verification.

Control Linkage: The HITL design must explicitly link back to maintaining Ouchi's control mechanisms. For example, mandatory human sign-off on high-risk decisions preserves Behavior Control by documenting human action, while rigorously auditing the outcomes of human overrides (and AI recommendations) helps refine Outcome Control metrics.

3.3. Accountability Infrastructure Integrated into MIS

To transform the theoretical Triple Balance into a functional, auditable system, specific MIS infrastructure must be mandated and integrated:

a. Automated Audit Trails: The core of accountability. The MIS must systematically and immutably log every stage of the decision process: the AI's raw recommendation, the human's final action, and the specific rationale for any human override. This comprehensive log is the foundation for meeting external regulatory requirements for Accountability (Raji et al., 2020).

b. Explainability Interfaces (XAI Dashboards): These are critical front-end MIS designs that translate complex algorithmic features (e.g., SHAP values, feature importance) into simple, actionable, and human-readable decision drivers for managers (Lundberg & Lee, 2017). This XAI capability is vital for the human in the loop to be able to inspect, trust, and ultimately justify a decision to external parties.

c. Ethical & Compliance Gates: These are formal, embedded decision checkpoints within high-risk workflows. For instance, an operational decision flagged for potential bias or privacy violation automatically routes the process to a compliance officer (the Human-as-Governor) before execution, serving as a proactive MIS-level escalation protocol and ethical firewall.

Chapter 4: Managerial and Sociotechnical Implications

4.1. Human–AI Collaboration as a Sociotechnical System

Implementing HITL represents a profound sociotechnical challenge, not merely a software update. It mandates the simultaneous redesign of both the technological system and the human subsystem (Bostrom & Heinen, 1977). Workforce implications are significant, requiring the management of cognitive load (avoiding alert fatigue), addressing skill requirements (managers need high AI literacy), and mitigating organizational resistance to being supervised by an algorithm (Dietvorst, Simmons, & Massey, 2015). Sociotechnical systems theory dictates that for HITL to be effective and sustainable, organizations must holistically redesign:

Tasks and Roles: Defining the human role as a supervisor, moderator, or governor, rather than a sole decision-maker.

Information Flows: Ensuring that XAI and audit trail data are presented efficiently and contextually to the human.

Organizational Culture: Promoting a culture of transparent algorithmic use, shared learning, and mutual trust between the human and the AI system.

4.2. Strategic Guidelines for MIS Leaders

To navigate the Triple Paradox successfully, MIS leaders must adopt proactive strategic guidelines that bridge the technical and organizational divide:

Calibrating Autonomy Levels: Establish a clear, documented policy that maps the level of AI autonomy directly to the decision's potential business, financial, and ethical risk, ensuring high-consequence decisions always remain at Level 1 (HITL).

Establishing AI Failure Protocols: Develop robust, pre-defined protocols and incident response plans for scenarios where the AI provides a flawed, biased, or adversarial recommendation, clearly defining the human escalation path and the system's "kill switch" (Amodei et al., 2016).

Change Management Programs: Implement comprehensive training programs focused on AI literacy, ethical decision-making, and understanding XAI outputs. The training must demonstrate how the HITL system enhances the manager's capabilities (augmentation) rather than simply replacing them (automation) (Kotter, 1996).

4.3. Case Illustration: Human-in-the-Loop AI in Credit Risk Scoring

This section demonstrates the practical application of the Triple Balance Framework using the scenario of a major financial institution (FI) deploying an advanced Machine Learning (ML) model for credit risk assessment. Under evolving regulations such as the EU AI Act, credit scoring is classified as a high-risk AI system, requiring mandatory human oversight, documentation, and explainability (Madiega, 2021).

4.3.1. The Automation Imperative

Goal: The FI aims to reduce loan application processing time drastically (e.g., from 48 hours to 4 hours) and increase assessment accuracy by leveraging ML models that analyze vast amounts of data beyond traditional credit scores (e.g., unconventional transaction patterns).

Challenge: The need for high volume, automated decision-making conflicts sharply with legal and ethical requirements for scrutiny, particularly in a domain prone to historical bias.

4.3.2. Designing the HITL Mechanism (The Balance)

To reconcile this paradox, the FI implements a tiered Human-in-the-Loop (HITL) design, calibrating the human's role based on the decision's risk severity:

Decision Tier	AI Autonomy Level	Human Role (HITL Mechanism)	Control Focus
Low-Risk Loans	Level 3: Full Automation	Human-on-the-Loop: Audits a random sample monthly.	Automation (Efficiency)
Medium-Risk Loans (AI-Ambiguous)	Level 1: Human-in-the-Loop	Human-as-Supervisor: All decisions require a loan officer's final verification and sign-off.	Organizational Control (Risk Policy Adherence)
High-Risk Loans	Level 1: Human-in-the-Loop	Human-as-Governor: Decisions are escalated to a Credit Committee, supported by an XAI dashboard, for potential override.	Accountability (Legal & Ethical Compliance)

This tiered HITL design operationalizes the Triple Balance Framework by dynamically adjusting the human role depending on the required balance among automation efficiency, accountability demands, and organizational control.

4.3.3. Accountability Infrastructure in the MIS

The MIS provides essential infrastructure tools to support the human in the loop:

XAI Dashboard: For medium and high-risk decisions, the system generates a simple explanation of the AI's risk factors. This allows the loan officer to fulfill Accountability requirements by explaining the adverse decision to the client in plain language.

Automated Audit Log: The MIS automatically logs the original AI recommendation, the officer's override decision (if any), and the officer's written justification for that override. This ensures a complete, immutable record for regulatory and internal auditing, directly supporting Ouchi's Outcome Control.

4.3.4. Sociotechnical Implications

The FI also updated job roles and performance metrics for loan officers to reflect their new responsibilities as AI supervisors rather than solely human decision-makers. This essential sociotechnical redesign ensures the organizational culture and skill sets align with the HITL system, fostering effective Human-AI Collaboration and acceptance.

Chapter 5: Conclusion and Future Directions

5.1. Summary of Insights

This chapter successfully addressed the Triple Paradox of modern MIS by proposing the Human-in-the-Loop mechanism as the key moderator for responsible AI deployment. We illustrated that by strategically designing HITL roles and implementing a robust, MIS-integrated accountability infrastructure, organizations can achieve high levels of automation without compromising ethical governance or managerial oversight. The detailed case illustration of credit risk scoring confirmed that the tiered HITL approach is a viable and necessary strategy for balancing these competing demands in high-stakes organizational contexts.

5.2. Research Agenda for Future Studies

Future research should focus on the empirical validation and extension of the Triple Balance Model, including:

Effectiveness Studies: Empirically testing the long-term impact of different HITL autonomy levels (Level 1 vs. Level 2) on decision quality, speed, and manager satisfaction.

Cross-Cultural Governance Comparisons: Examining how varying regulatory environments (e.g., EU, US, Asia) necessitate different calibrations of the Triple Balance Framework and its core components.

GenAI Integration: Investigating the challenges of integrating Generative AI into HITL systems, particularly when the AI's explanation is also automatically generated, which introduces a "double loop" of potential machine autonomy.

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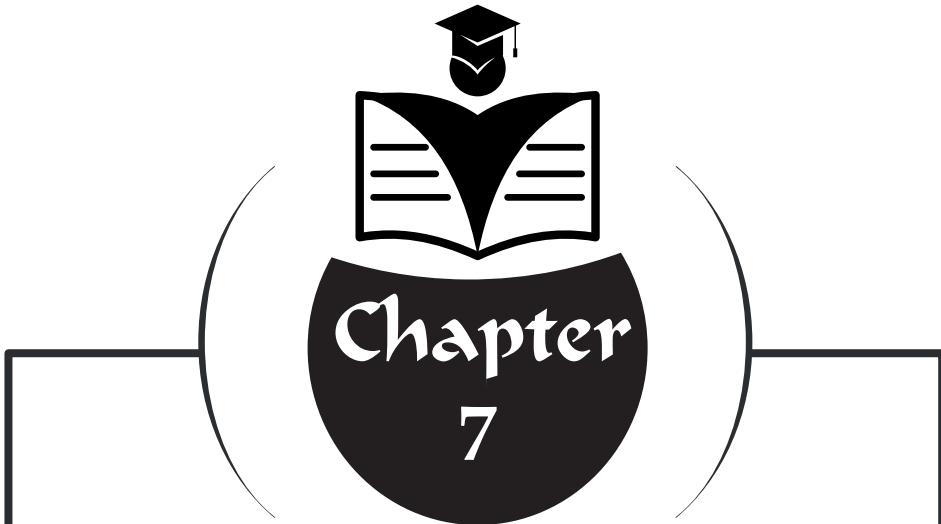
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UNDERSTANDING RED TOURISM: A VOSVIEWER-BASED BIBLIOMETRIC ANALYSIS

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1. Introduction

Tourism is not merely an activity with economic impacts; it is also a multidimensional phenomenon that generates significant socio-cultural (Wilson, 2008; Hasanoglu et al., 2025), political (Pradeep, 2020) and ideological effects (Lin, 2015). In this context, tourism functions as a medium through which historical narratives, collective memory, and national identities are constructed, transmitted, and reproduced. Among the various forms of tourism that embody these functions, red tourism has emerged as a distinctive and increasingly important field of academic inquiry (Wang et al., 2008; Wang, 2012; Zhao and Timothy, 2017; Zhao, 2020; Liu and Teng, 2021; Xu et al., 2021; Zhou et al., 2023; Qian et al., 2025).

Red tourism refers to a form of tourism centered on visits to sites of historical and ideological significance, with the aim of providing experiences related to national history and collective memory. Emerging primarily within the Chinese context, red tourism encompasses travel to revolutionary heritage sites associated with the history of the Chinese Communist Party and socialist movements. In this respect, red tourism is regarded as a sub-type of special interest tourism, as it appeals to visitors motivated by specific historical, political, and ideological interests rather than conventional leisure- and recreation-oriented travel motivations (Xiao, 2013; Tang et al., 2021; Zhou et al., 2022a).

From a theoretical perspective, red tourism can be conceptualized as a distinctive form of heritage tourism that focuses on the interpretation and preservation of revolutionary history and ideological heritage (Li and Hu, 2008). From this perspective, red tourism integrates educational, experiential, and commemorative elements, enabling visitors to engage with historical narratives while simultaneously contributing to the formation of attitudes related to national identity, patriotism, and political legitimacy (Zhou et al., 2022a). Beyond its cultural and educational functions, red tourism operates as a strategic instrument for destination development. By enhancing visitors' destination loyalty, this form of tourism contributes to the development of destinations and indirectly supports their economic revenue generation (Chen et al., 2025).

Over the past few decades, academic interest in red tourism has increased rapidly, resulting in a growing number of studies employing diverse theoretical frameworks and methodological approaches (Li et al., 2010; Caraba, 2011; Lin, 2015; Zhao and Timothy, 2015; Wang et al., 2023; Qian et al., 2025). The existing literature conceptualizes red tourism as a socio-political space, an instrument of ideological communication (Lin, 2015; Hung, 2018), a mechanism for the construction of collective memory (Tang et al., 2021), and a factor influencing tourists' emotional experiences, identity formation, and behavioral intentions (Wang et al., 2023; Chen et al., 2025). However, the rapid growth of research in this field has resulted in a fragmented body of knowledge, making it increasingly

difficult to achieve a holistic understanding of the field's intellectual structure, thematic evolution, and emerging research trends. Therefore, there is a need for a bibliometric study to synthesize and systematically assess the body of knowledge in this field. Previous bibliometric studies in this field have primarily focused on publications up to 2023 (Calderon-Fajardo, 2023). However, a substantial number of new studies have been published in the past two years, underscoring the need for an updated bibliometric analysis that incorporates the most recent developments in the literature.

In this context, this chapter conducts a bibliometric analysis of the red tourism literature to identify key trends, thematic patterns, and the intellectual structure of the field, with particular emphasis on studies published in the most recent years (2024-2025). By offering a structured and comprehensive overview of the up-to-date literature, this chapter aims to provide valuable insights and guidance for future theoretical and empirical research on red tourism.

2. Literature Review

2.1. *An overview of the literature on red tourism*

Many tourists are drawn to destinations that offer distinctive and multifaceted cultural experiences (Ogretmenoglu et al., 2023a). Therefore, cultural heritage areas are steadily gaining popularity (Ogretmenoglu et al., 2025). Red tourism, in particular, constitutes a unique cultural experience, providing insights into historical and ideological heritage (Zhou et al., 2022a). In this context, the recent literature has primarily focused on visitors' cultural experiences, behavioral intentions, self-congruity, destination loyalty, and related aspects within the scope of red tourism. These studies are briefly summarized below.

Tang et al. (2021) examined the factors influencing the construction of red memories in red tourism through a survey of visitors to Mount Jinggang, China. Using structural equation modeling (SEM, hereafter), the research found that both the site's red cultural atmosphere and tourists' experiences significantly contributed to the development and enhancement of red memories, while perceptions of the red cultural atmosphere did not significantly affect memory correction. The findings also revealed intergenerational differences, offering insights into the social evolution of red memories.

Zhou et al. (2022b) investigated the applicability of self-congruity theory in the context of red tourism in Shaoshan, China, comparing the effects of self-congruity and functional congruity on tourist satisfaction and destination loyalty. Using SEM, the study found that self-congruity explains greater variance in functional congruity among red tourists and has an equal effect on satisfaction but a stronger influence on destination loyalty compared

to functional congruity, highlighting the importance of value-expressive attributes in red destination marketing.

Yan and Hyman (2023) examined how red tourism is used to subtly enhance political legitimacy in China. Drawing on a historical analysis of multi-level sources, the study shows that the value-laden and expressive nature of visits to selected historical sites enables governing regimes to reinforce legitimacy through political identity formation, political meaning framing, and nationalist mobilization.

Wang et al. (2023) investigated the relationships among emotional experiences, national identity, and behavioral intentions in the context of red tourism in China and the study found that positive emotional experiences significantly enhance national identity and behavioral intentions, with national pride mediating this relationship, while previous experience moderates the effect of positive emotions on national pride.

Wang et al. (2025) conducted a systematic literature review using the PRISMA method to examine the role of red tourism in youth education in China. The study highlights red tourism as an educational tool that strengthens historical memory, patriotism, and national identity among young people by integrating tourism with learning.

As can be inferred from the studies reviewed above, the contemporary literature on red tourism addresses the topic through diverse theoretical and empirical perspectives and reflects a rapidly expanding body of knowledge. Therefore, examining this literature through a bibliometric analysis is important for systematically identifying research trends, thematic concentrations, and the intellectual structure of the field.

2.2. A Review of bibliometric studies in the tourism field

The bibliometric approach is frequently employed in the field of tourism (e.g., Kesici, 2022a; Atsiz et al., 2022; Ogretmenoglu et al., 2023b; Abdul Shukor and Kattiyapornpong, 2024; Asif et al., 2024; Ciki 2022; Geng et al., 2024; Kumar et al., 2024; Legendre et al., 2024; Ciki and Tanrıverdi, 2023; Fauzi et al., 2025; Mazlan et al., 2025; Sahin et al., 2025; Pathmanandakumar, 2025; Rafi et al., 2025). Although providing a comprehensive overview of all bibliometric studies in tourism is not feasible, this section highlights selected recent research, aiming to offer insights into the methodologies and key parameters employed in previous studies.

Supardin et al. (2025) aimed to conduct a bibliometric analysis of halal tourism to synthesize existing empirical research and identify future research directions. The study employed a systematic literature review of articles in

the Scopus database from 1997 to 2023, focusing on titles, abstracts, and keywords. Bibliometric analyses were carried out using VOSviewer software to map trends and patterns in the literature.

Liu et al. (2025) conducted a systematic bibliometric review of tourism-related carbon emissions research to map the knowledge structure and identify key trends in the field. The study utilized the Web of Science (WoS) database as the data source and retrieved a total of 2,802 relevant articles. For analysis, CiteSpace software was employed to perform co-occurrence, co-citation, and co-word analyses, generating visual knowledge maps to identify research nodes, clusters, and the evolution of scientific knowledge within the discipline.

Novianty and Rahmanita (2025) conducted a bibliometric study to systematically map the literature on wellness tourism and agrotourism, identifying research trends, citation patterns, author collaborations, and emerging themes. Data were collected from Scopus and WoS, including 247 and 198 articles respectively, with duplicates removed. Bibliometric analyses and visualizations were performed using VOSviewer to provide a comprehensive overview of the field.

As can be seen from the recent studies mentioned above, researchers generally obtained their data from indexed databases such as Scopus and WoS. In their analyses, they utilized various software tools, including VOSviewer, CiteSpace, and RStudio, to examine parameters such as keyword co-occurrence, co-citation, and bibliometric coupling. In this context, data for this book chapter will also be obtained from the WoS database, data will be analyzed using VOSviewer. Detailed information regarding these procedures is provided in the following Methodology section.

3. Methodology

This book chapter examines the academic literature on red tourism using bibliometric methods (Donthu et al., 2021). The WoS database was selected as the data source. Only English-language studies were included to ensure consistency with the international literature and to enable a more reliable assessment of global research trends. In addition, the search was restricted to publications in which the term “red tourism” appeared in the title; therefore, no specific WoS category restrictions were applied. The data collection process was conducted between December 15 and December 19, 2025. The initial search results were refined by excluding book reviews and book chapters, while including articles, proceeding papers, and early access publications. As a result, a total of 59 publications were identified as suitable for analysis. Subsequently, all records were imported into VOSviewer for scientific mapping, and the analyses were performed using this software (Van

Eck and Waltman, 2011). This methodological approach enabled a detailed examination of the structural characteristics of the red tourism literature and the identification of prominent conceptual clusters.

4. Results

Within the scope of this research, six different analysis parameters have been determined to enable a multidimensional assessment of trends in the literature. During the review process, the distribution of publication numbers by year, the authors who contributed most to the field, the leading countries, effective institutions and universities, the most cited studies, and the key concepts that came to the fore were analyzed in detail. Through these parameters, the structural dynamics and interaction networks of academic production in the field of red tourism were revealed in depth.

4.1. Distribution of publications by year

An analysis of the annual distribution of publications in the field of red tourism reveals that research output is concentrated in specific years, but this concentration does not follow a consistent upward trend (see figure 1). Notably, nine articles were published in 2023, indicating that this year represented a peak in research attention on the topic. Significant numbers of publications were also observed in 2017 ($n=7$) and 2025 ($n=8$). Conversely, the early studies following 2007, the initial years of red tourism publications in the WoS database, reflect limited academic interest. Overall, the red tourism literature demonstrates a fluctuating and periodic publication pattern, and although certain years show notable concentrations, this does not indicate continuous growth in the field.

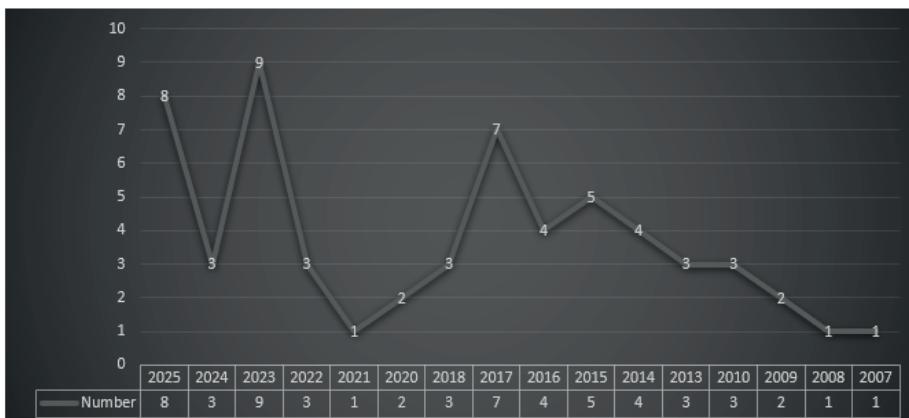


Figure 1. Distribution of articles on red tourism by year.

Source: Compiled by the author using WoS database.

4.2. Prominent scholars shaping the field

An analysis based on the productivity levels of authors contributing to the red tourism literature reveals that some academics stand out in the field (See Table 1).

Table 1. Authors Contributing Most to Red Tourism Literature.

No.	Author Name	Number of Publications
1	Li, Yiping	2
2	Timothy, Dallen J.	2
3	Wong, Jose Weng Chou	2
4	Wang, Fuyuan	2
5	Qiu, Han	2
6	Wall, Geoffrey	2
7	Zhou, Huijing	2
8	Xia, Yuhong	2
9	Jiang, Yajun	2
10	Hu, Zhiyi	2

Source: Prepared by the authors based on WoS.

4.3. The most productive countries

As shown in Figure 2, the analysis of the geographical distribution of publications in the field of red tourism reveals that research output is concentrated in a few countries.

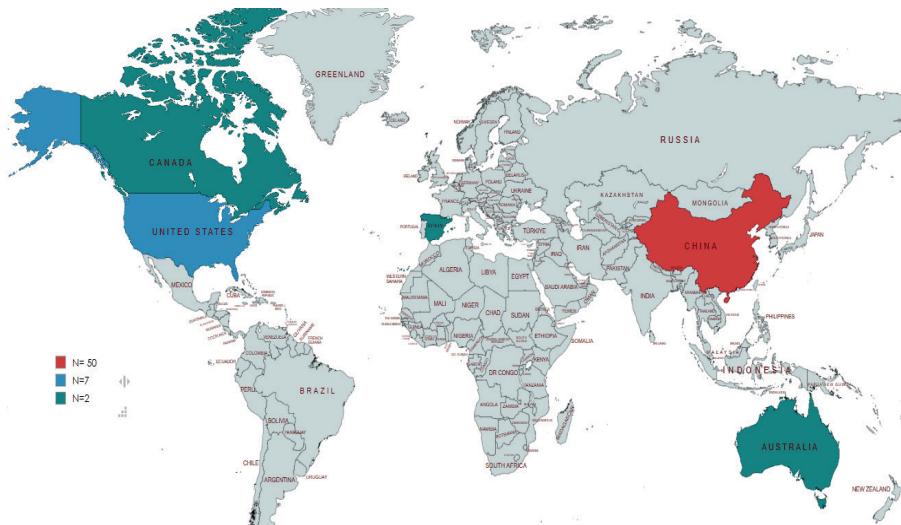


Figure 2. The distribution of countries contributing to red tourism literature.

Source: Prepared by the authors using mapchart.net.

Notably, China dominates the field with 50 publications, reflecting its central role in both the historical and ideological contexts of red tourism. Other countries with at least two publications include the USA, Australia, Canada, and Spain, indicating that while red tourism research has primarily developed in China, there is a growing international interest, particularly from North American countries and European countries. This distribution highlights the emerging global engagement with red tourism as a research topic, although this interest remains relatively limited outside of China.

4.4. Effective institutions

As shown in Table 2, the analysis of institutions producing the most publications in the field of red tourism indicates that academic output is concentrated around a number of universities and research institutes. The Chinese Academy of Sciences and the Institute of Geographic Sciences and Natural Resources Research CAS lead with four publications each, followed by Linyi University with three publications. A large number of other institutions, including Arizona State University, University of Hong Kong, Nankai University, and Macau University of Science and Technology, have contributed two publications each. This pattern demonstrates that while research in red tourism is largely concentrated in Chinese institutions, there is also notable participation from international universities. Overall, the data highlight both the central role of Chinese academic institutions and the emerging global interest in red tourism research.

Table 2. Most productive institutions in red tourism research.

Institution	Number of Publications
Chinese Academy of Sciences	4
Institute of Geographic Sciences Natural Resources Research CAS	4
Linyi University	3
Arizona State University	2
Arizona State University Downtown Phoenix	2
Chengdu Univ Technol	2
East China University of Technology	2
Fujian Normal University	2
Guangzhou University	2
Guilin Tourism University	2
Guilin University of Technology	2
Hong Kong Polytechnic University	2
Human University of Science Technology	2
Macau University of Science Technology	2
Nankai University	2
Sichuan University	2
Sun Yat Sen University	2
University of Hong Kong	2
University of Waterloo	2

Source: Prepared by the authors based on WoS.

4.5. *Leading papers in citation frequency*

This section analyzes the studies focusing on Red Tourism that have received the highest number of citations in the WoS database (as of December 16, 2025), and the findings regarding the top 5 most cited studies are presented in Table 3. These five articles were published in five different journals and contributed to the socio-political dimensions of red tourism from various perspectives. At the top of the list is the study by Zuo, Gursoy, and Wall (2017), which received 99 citations. This article examines the role of the central government's influence in China on the local population's support for Red Tourism. The study has gained a unique position in the literature by thoroughly examining the influence of political actors on tourism policies. The second study, authored by Zhao and Timothy (2015) has received 73 citations. Third on the list is the article authored by Li, Hu, and Zhang (2010) and published in the Journal of Tourism and Cultural Change; it has received 56 citations. Fourth is the study written by Li and Hu (2008) and published in the Journal of China Tourism Research; it has received 41 citations. Finally, in fifth place is the article published by Tang, Zhang, and Yang (2021). Published in the Journal of Destination Marketing & Management, the study has received 34 citations.

Table 3. The most contributing authors

No	Authors	Title	Journal	Year	WoS Citations
1	Zuo, B; Gursoy, D; Wall, G	Residents' support for red tourism in China: The moderating effect of central government	Annals of Tourism Research	2017	99
2	Zhao, S; Timothy, D.J.	Governance of red tourism in China: Perspectives on power and guanxi	Tourism Management	2015	73
3	Li, Y.P; Hu, Z.Y; Zhang, C.Z	Red tourism: sustaining communist identity in a rapidly changing China	Journal of Tourism and Cultural Change	2010	56
4	Li, Y.P; Hu, Z.Y	Red Tourism in China	Journal of China Tourism Research	2008	41
5	Tang, W.Y; Zhang, L.Q; Yang, Y	Can red tourism construct red memories? Evidence from tourists at Mount Jinggang, China	Journal of Destination Marketing & Management	2021	34

Source: Authors' own elaboration based on WoS.

4.6. *Main keywords in red tourism articles*

Figure 3 shows that network visualization of keywords in the red tourism literature.

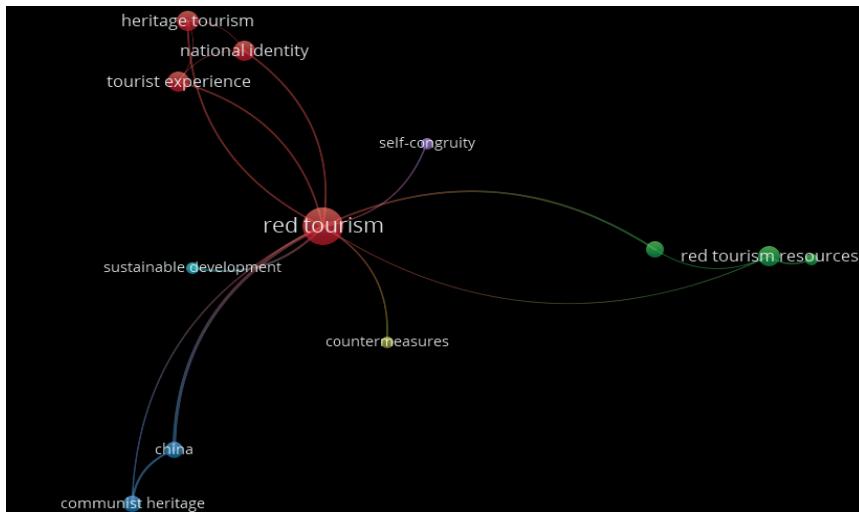


Figure 3. Links to the most frequently used words.

Source: Prepared by the authors using VOSviewer.

The analysis demonstrated that 12 keywords are grouped into six clusters, with “red tourism” occupying a central position and linking multiple research themes. A dominant cluster comprising heritage tourism, national identity, and tourist experience highlights the prevalence of heritage- and identity-oriented approaches in the literature. Another cluster centered on red tourism resources and resource development reflects the strong emphasis on planning and supply-side perspectives, while the association with sustainable development indicates growing scholarly interest in sustainability issues. The co-occurrence of China and communist heritage underscores the concentration of studies within the Chinese context. In contrast, self-congruity and countermeasures appear as weakly connected themes, pointing to underexplored research areas, particularly in relation to tourist behavior.

In general, this analysis based on keywords reveals that red tourism studies have largely been shaped within the Chinese context, revolving around concepts such as ideological identity, sustainability, and cultural heritage.

5. Conclusion and Limitations

In this chapter, articles published on red tourism in the WoS database were examined, and the obtained data were analyzed using VOSviewer. The results of the analysis indicate that the red tourism literature exhibits a periodic and fluctuating publication pattern rather than a steady growth trend, with academic interest concentrating particularly in certain years. It was found

that the studies are largely China-centered, and that China holds a dominant position in the field in terms of the number of publications. From a thematic perspective, the literature has primarily been shaped around concepts such as national identity (Wang et al., 2023), communist heritage (Qian et al., 2025), and behavioral intentions (Chen et al., 2025).

Moreover, this study found that publications on the topic peaked particularly in 2023 and 2025. This indicates that the subject has recently attracted increased attention from researchers and suggests that more studies may be published in the future. Finally, although there are studies examining the experiences of tourists participating in this type of tourism (Zhou et al., 2022a; Wang et al., 2023), their number remains quite limited. Conducting further research aimed at understanding the experiences of these tourists in the future could provide valuable insights into their experiences and perspectives.

In addition, given that self-congruity and countermeasures appear as weakly connected themes, future studies should further explore these concepts by focusing on their roles in shaping tourist behavior. In particular, examining self-congruity from a psychological perspective and countermeasures from a managerial or policy-oriented perspective may help deepen the behavioral understanding of red tourism. Lastly, the economic impacts of this type of tourism can be examined using various econometric methods (Kesici, 2022b).

This chapter has several limitations. First, the data were drawn exclusively from the WoS database. Second, only studies published in English were included. Finally, VOSviewer was the only software used for bibliometric mapping. These limitations should be considered when interpreting the findings of this chapter.

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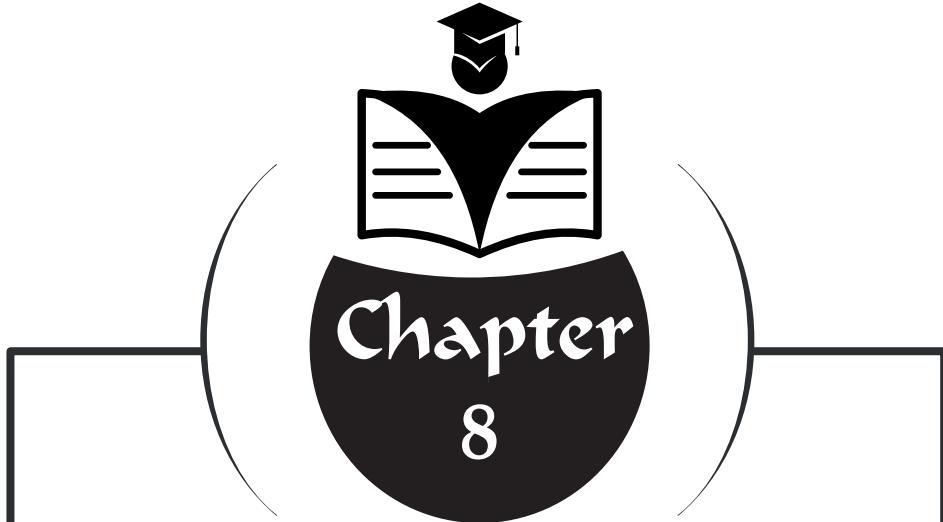
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**GLOBALIZATION STRESS AND CARBON INTENSITY
IN TRADE-DEPENDENT
ENERGY-IMPORTING ECONOMIES:
A DISTRIBUTIONAL PANEL LOCAL-PROJECTIONS
STUDY (1998–2023)**

“ _____ ”

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1 Introduction

Lowering carbon intensity is central to decarbonisation because it captures whether economies are producing the same value with fewer emissions, even when output expands (Kongkuah & Alessa, 2025). Yet carbon intensity is not determined solely by domestic technology and climate policy. In highly open economies, external conditions transmitted through trade, global value chains, and energy markets can shape production choices, energy use, and the pace of efficiency upgrading. This is especially relevant for trade dependent, energy importing economies, where disruptions to imported energy, intermediate inputs, and external financing can quickly affect how firms produce and which fuels they rely on.

The trade and environment literature provides a clear conceptual starting point. Openness influences environmental outcomes through scale, composition, and technique effects (Antweiler et al., 2001). Scale effects can raise emissions pressure when output expands, composition effects reflect shifts toward cleaner or dirtier sectors, and technique effects capture improvements in technology and regulation that can reduce pollution per unit of output. The net outcome is therefore ambiguous and depends on comparative advantage, regulatory stringency, and the extent to which openness accelerates cleaner technologies or induces relocation of pollution intensive activities (Copeland & Taylor, 2004). For carbon intensity, these channels operate directly through changes in energy efficiency, the energy mix, and the structure of production.

However, global integration is rarely smooth. It is punctuated by stress episodes linked to surges in uncertainty, geopolitical tensions, and disruptions in cross border logistics. These events can affect emissions efficiency through both demand and supply channels. When uncertainty rises, firms tend to delay investment and hiring, which can slow the replacement of carbon intensive capital and reduce adoption of energy saving technologies (Bloom, 2009). Geopolitical risk can propagate through sanctions, security shocks, and disruptions to commodity markets, especially energy markets, with consequences for production costs and fuel choices (Caldara & Iacoviell, 2022). In this setting, carbon intensity may rise if firms cope by relying on cheaper or more available carbon intensive inputs, postponing efficiency upgrades, or shifting production toward more energy intensive activities.

Two gaps motivate this study. First, much of the evidence on globalisation, risk, and environmental outcomes is built around average effects, which can mask meaningful differences between low and high carbon intensity regimes. Countries with relatively low carbon intensity may be vulnerable because their efficiency depends on imported intermediates, stable logistics, and continuous upgrading. High intensity countries may respond differently due to structural rigidity or limited adjustment margins. Second, the timing of adjustment

is often underexplored. Stress shocks can have immediate effects through disruptions and price spikes, while longer run effects can emerge through delayed investment and persistent reallocation.

This paper addresses these gaps by studying how globalisation related stress shapes carbon intensity in a mechanism driven sample of trade dependent, energy importing economies over 1998 to 2023. The analysis operationalises exposure using a Globalisation Stress Exposure measure that combines a common global stress component with country specific vulnerability, so that cross country differences reflect differential exposure to shared global stress conditions. Empirically, the paper combines three complementary tools. First, panel quantile regression is used to identify heterogeneous effects across the conditional distribution of carbon intensity (Koenker & Bassett, 1978). Second, quantile local projections trace horizon specific responses, allowing the adjustment path to differ over time without imposing a tightly specified dynamic system (Jordà, 2005). Third, cross sectionally robust panel methods are employed to mitigate bias from unobserved common factors that affect countries simultaneously, such as global commodity cycles and synchronized financial conditions (Pesaran, 2006).

The study makes three contributions. It reframes the globalisation environment nexus around stress transmission rather than average openness alone. It provides distributional evidence on whether global stress disproportionately affects low, median, or high carbon intensity regimes. It also delivers dynamic evidence on the persistence of stress effects, while accounting for unobserved global drivers that can confound cross country inference.

The remainder of the paper is organised as follows. Section 2 reviews the related literature and theoretical channels linking global stress to carbon intensity. Section 3 describes the data, construction of the stress and exposure measures, and the empirical strategy. Section 4 presents the baseline quantile results and the dynamic responses from quantile local projections. Section 5 discusses robustness and policy implications. Section 6 concludes.

2 Literature Review

Globalisation can influence environmental performance through multiple channels that may operate in opposite directions. A central framework decomposes the effect of trade and integration into scale, composition, and technique components (Antweiler et al., 2001). In this view, openness may increase environmental pressure if output expands faster than efficiency improves, but it can also reduce pressure when technology diffusion, stricter regulation, and cleaner production dominate. A related synthesis emphasises that outcomes depend on comparative advantage, regulatory stringency, and whether pollution-intensive activities relocate across borders (Copeland &

Taylor, 2004). These mechanisms imply that the environmental consequences of globalisation are conditional and can vary markedly across countries and time.

A parallel literature links development, structural change, and environmental outcomes through the Environmental Kuznets Curve hypothesis, which associates early-stage industrialisation with rising environmental pressure and later-stage development with improved environmental performance (Grossman & Krueger, 1995). The empirical evidence is not uniform, and results are sensitive to specification, pollutant choice, and time horizon, which cautions against treating income as a sufficient proxy for environmental progress (Stern, 2004). For carbon intensity, defined as emissions per unit of output, the development pathway is mediated by energy systems, industrial structure, and the pace of technological upgrading. Carbon intensity is therefore informative for assessing efficiency-oriented decarbonisation because it can decline even when total emissions rise, reflecting changes in energy mix and production efficiency rather than levels alone.

While much of the globalisation and environment literature treats openness as evolving smoothly, global integration is frequently punctuated by stress episodes. Heightened uncertainty, geopolitical tensions, and disruptions to global value chains can quickly affect production costs, input availability, and investment decisions, with implications for energy use and emissions efficiency. Uncertainty shocks have been shown to depress investment and employment as firms delay irreversible decisions under elevated risk (Bloom, 2009). Policy-related uncertainty also exhibits systematic spikes around major political and economic events, reinforcing the macroeconomic relevance of uncertainty as a measurable shock (Baker et al., 2016). Geopolitical risk has similarly been formalised as a quantifiable driver of macroeconomic fluctuations that can affect investment and activity through security concerns, sanctions, and disruptions to cross-border flows (Caldara & Iacoviell, 2022). These stressors are plausible determinants of carbon intensity because they influence energy prices and availability, the feasibility of clean investment, and the likelihood that firms adopt carbon-intensive coping strategies when markets and logistics are disrupted.

Against this background, the theoretical basis of the study combines trade and environment theory with crisis transmission theory. The scale, composition, and technique framework implies that globalisation can raise carbon intensity when integration expands carbon-intensive production or shifts economic activity toward energy-intensive sectors, but it can lower carbon intensity when it accelerates technology diffusion, energy efficiency, and cleaner production methods (Antweiler et al., 2001; Copeland & Taylor, 2004). Crisis transmission theory adds that stress episodes, captured by elevated uncertainty and geopolitical risk, can delay investment and alter

production decisions in ways that slow technological upgrading and disrupt supply chains (Baker et al., 2016; Bloom, 2009; Caldara & Iacoviell, 2022). For trade-dependent, energy-importing economies, these mechanisms are expected to be amplified because shocks propagate through imported energy prices and availability, trade logistics, and external financing conditions. The combined framework therefore predicts that global stress can worsen carbon intensity by shifting activity toward more carbon-intensive inputs and by slowing efficiency-enhancing investment, although the magnitude and persistence of this effect depend on structural vulnerability and adjustment capacity.

Two empirical implications follow from this theoretical framing. First, the stress–carbon intensity relationship is likely to be heterogeneous. Mean-based estimates implicitly assume similar effects for low- and high-carbon-intensity regimes, yet differences in sectoral structure, technology constraints, and policy capacity suggest otherwise. Quantile regression provides a direct way to evaluate heterogeneous effects across the conditional distribution of an outcome (Koenker & Bassett, 1978). In this context, quantile estimates can reveal whether global stress disproportionately worsens carbon intensity among already high-intensity economies, or whether relatively cleaner economies experience sharper setbacks because they depend more on imported intermediates and energy-efficient capital that are vulnerable to disruption. Second, the response is likely to be dynamic. Stress episodes can generate immediate impacts through demand compression and logistics frictions, while medium-run effects can arise from delayed investment and persistent reallocation in production and energy systems. Local projections offer a flexible approach for tracing responses across horizons without imposing a fully specified dynamic system (Jordà, 2005).

Cross-country inference is further complicated by cross-sectional dependence arising from unobserved common factors, including commodity cycles, technological trends, and synchronized financial conditions, all of which can influence carbon intensity and correlate with stress indicators. Common correlated effects methods address this problem by using cross-sectional averages to proxy unobserved multifactor structures and reduce bias from shared shocks (Pesaran, 2006). Dynamic extensions improve robustness when persistence and lagged dependence are present (Chudik & Pesaran, 2015). Together, these approaches support credible estimation in settings where global forces shape both the explanatory construct and the outcome.

Overall, prior research establishes that globalisation affects environmental performance through trade-related mechanisms, while crisis and risk literatures indicate that uncertainty and geopolitical tensions can disrupt investment and cross-border flows in ways that are relevant for emissions efficiency. The remaining gap is an integrated assessment that links stress exposure to carbon

intensity while allowing effects to differ across carbon-intensity regimes, tracing adjustment over time, and accounting for shared global drivers. This study responds by focusing on trade-dependent, energy-importing economies and by combining quantile methods, local projections, and cross-sectionally robust panel estimators to provide distributional and dynamic evidence on how globalisation-related stress shapes carbon intensity.

3 Methodology

We study 27 trade-dependent, energy-importing (TDEI) economies over 1998–2023 (annual). Countries enter the sample if: (i) average trade openness $\geq 70\%$ of GDP, (ii) net energy imports > 0 in at least 70% of years, and (iii) population ≥ 5 million, with adequate WDI coverage. The outcome is carbon intensity \underline{CI}_{it} defined from WDI as CO₂ emissions relative to real output.

Controls \underline{Z}_{it} are WDI¹ annual series: trade openness, net energy imports, manufacturing share, industry share, GDP per capita, urbanization, electricity access, and renewable-energy share (Antweiler et al., 2001; Copeland & Taylor, 2004).

To capture global turbulence, we build a Global Stress Index (GSI) as the first principal component of standardized World Uncertainty Index (WUI²) which is originally of quarterly frequency, Geopolitical Risk Index (GPR³) with a monthly frequency, and Global Supply Chain Pressure Index (GSCPI⁴) which is also of monthly frequency; aggregated to annual means before Principal Components Analysis (PCA). Geopolitical risk is measured using the index proposed by (Caldara & Iacovielli, 2022). Principal components provide a parsimonious common factor that summarises shared variation in high dimensional data (Bai & Ng, 2002; Hotelling, 1933). PC1 loads positively on all three series and explains ~61% of variance (Table 3–4).

$$\underline{GSI} = \underline{WUI} + \underline{GPR} + \underline{GSCPI} \quad (1)$$

Country vulnerability is summarized by a Country Exposure Index (CEI_{it}) from WDI components (trade openness, energy-import dependence, manufacturing share; equal weights in the baseline, PCA-weights in robustness). We then define Globalisation Stress Exposure

$$\underline{GSE}_{it} = \underline{GSI}_t \times \underline{CEI}_{it}, \quad (2)$$

1 Available at: <https://databank.worldbank.org/source/world-development-indicators>

2 Ahir, H, N Bloom, and D Furceri (2022), “World Uncertainty Index”, NBER Working Paper. <https://www.nber.org/papers/w29763>

3 Caldara, Dario, and Matteo Iacoviello (2021). Geopolitical Risk Index (GPR). Board of Governors of the Federal Reserve System. Available at: <https://www.policyuncertainty.com/gpr.html>

4 Federal Reserve Bank of New York, Global Supply Chain Pressure Index, <https://www.newyorkfed.org/research/gscpi.html>.

GSE is in equation (2) is scaled within country for comparability.

We begin with panel quantile regressions to allow the effect of GSE to vary across the conditional distribution of carbon intensity. Quantile regression captures heterogeneous responses that are obscured by mean based models (Koenker & Bassett, 1978). We include country fixed effects to control for time invariant heterogeneity, following panel quantile approaches developed for settings with unit effects (Canay, 2011; Galvao Jr, 2011).

$$Q_\tau(CI_{it} | X_{it}) = \alpha_i + \gamma_t + \beta_\tau \text{GSE}_{it} + \delta_\tau' Z_{it}, \quad (3)$$

And equation (3) is estimated with unit fixed effects α_i , year dummies γ_t , and robust VCE (Bofinger kernel; Parzen–Chamberlain as a check). Implementation follows our qregpd setup with explicit year dummies and clustered SEs at the country level (Bofinger, 1975; Buchinsky, 1995).

These baseline estimates deliver the distributional patterns reported in Tables 5–6.

We then map the time path of globalization-stress shocks using Quantile Local Projections (QLP) following (Jordà, 2005, 2023a; Jordà & Taylor, 2024a). For horizons $h = 1, \dots, H$,

$$\Delta^h CI_{i,t+h} = \alpha_i^{(h)} + \gamma_t^{(h)} + \theta_\tau^{(h)} \text{GSE}_{it} + \phi_\tau^{(h)}' Z_{it} + \varepsilon_{i,t+h}^{(h)}, \quad (4)$$

Equation (4) is estimated separately at $\tau \in \{0.25, 0.50, 0.75\}$. This yields distributional impulse-responses that are robust to dynamic misspecification and easy to aggregate across horizons.

To keep the empirical design internally consistent, all estimation is conducted at the annual frequency. Global stress indicators that are originally observed monthly or quarterly are first aggregated to annual means and then standardized prior to the principal component analysis (PCA). This frequency alignment avoids mixed-frequency modelling challenges and ensures that the constructed stress index is measured on the same time scale as carbon intensity and the country-level covariates.

A second identification choice concerns how exposure is defined and how the sample is selected. Rather than relying on geographic groupings, the analysis focuses on a mechanism-based set of trade-dependent, energy-importing economies (TDEI), where vulnerability to external disruptions is expected to be economically meaningful. Globalisation Stress Exposure (GSE) is defined to combine a common global stress component with country-specific vulnerability, so that cross-country variation reflects differences in exposure intensity to the same global stress environment. This structure improves comparability across countries and strengthens identification relative

to designs where “treated” and “control” groups are determined primarily by location.

Finally, the estimation strategy is chosen to match the paper’s distributional and dynamic objectives. Panel quantile regressions capture heterogeneity in the conditional distribution of carbon intensity (CI), allowing effects to differ between low-, median-, and high-CI regimes. Cross-sectionally robust estimators, including CCE, DCCE, and AMG, are used to reduce bias from unobserved common factors that can simultaneously drive CI and global stress. To trace dynamics without imposing a fully specified dynamic panel structure, the study employs quantile local projections (QLP), which provide horizon-by-horizon responses that are flexible and transparent. Parameter interpretation is as follows:

1. β_{τ} : semi-elastic effect of GSE on the τ -th conditional quantile of CI (positive β_{τ} higher CI at that quantile).
2. $\theta_{\tau}^{(h)}$: h-step response of CI to a unit change in GSE at quantile τ .
3. δ_{τ} and $\phi_{\tau}^{(h)}$: effects of controls at level and along the impulse-response path, respectively.

4 Results

The results presented across the tables follow the logical sequence of the empirical procedure applied in the study. *Table 1* lists the countries that constitute the Trade-Dependent Energy-Importing (TDEI) sample. These countries were selected based on three criteria—trade openness above seventy percent of GDP, net energy-importing status in at least seventy percent of the observed years, and populations exceeding five million. The list covers advanced and emerging economies such as Austria, Belgium, Germany, Korea, Thailand, and Ghana, reflecting a balanced mix of developed and developing economies that rely heavily on global trade and imported energy. Establishing this sample ensured that the analysis focused on economies most exposed to international supply-chain disruptions and global stress conditions

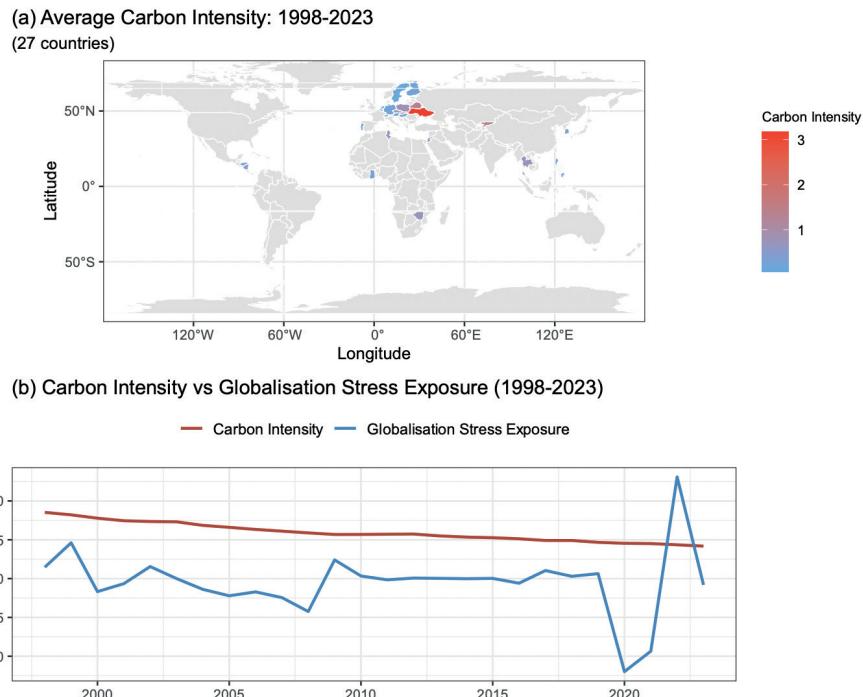


Figure 1: Choropleth Map and Variable Trends

Figure 1 summarizes two views of the sample of 27 trade-dependent, energy-importing economies (1998–2023). Panel (a) maps each country’s average carbon intensity (CI) over the period, revealing pockets of higher CI in more manufacturing- and energy-intensive economies, with lower CI where services and renewables play larger roles. Panel (b) plots the yearly cross-country means: average CI drifts downward through the sample—consistent with gradual efficiency gains and cleaner energy shares—while globalisation stress exposure (GSE) is volatile, hitting a trough around 2020 (pandemic-era demand collapse and temporary emissions/throughput compression) and peaking near 2022 (post-pandemic supply-chain strain and geopolitical shocks). Taken together, the map shows where CI levels remain structurally high, and the lines show that, on average, CI has fallen even as episodic global stress has swung sharply; conditions that motivate our distributional, stress-response modelling that follows.

Table 1: Trade-Dependent Energy-Importing (TDEI) sample

ISO3	Country
AUT	Austria
BLR	Belarus
BEL	Belgium
CZE	Czechia
SLV	El Salvador
FIN	Finland
DEU	Germany
GHA	Ghana
HND	Honduras
HKG	Hong Kong SAR, China
HUN	Hungary
JOR	Jordan
KOR	Korea, Rep.
KGZ	Kyrgyz Republic
LBN	Lebanon
NLD	Netherlands
NIC	Nicaragua
PHL	Philippines
POL	Poland
PRT	Portugal
SVK	Slovak Republic
SWE	Sweden
CHE	Switzerland
THA	Thailand
TUN	Tunisia
UKR	Ukraine
ZWE	Zimbabwe

Table 2 reports the descriptive statistics for the main variables used in the study. The results show substantial heterogeneity across the TDEI economies. The mean trade-to-GDP ratio of about 110 percent confirms that the sample is indeed composed of highly open economies. Average net energy imports amount to roughly 59 percent, supporting the classification of these countries as energy-import dependent. The mean carbon-intensity (CI) level is 0.594 kg CO₂ per unit of output, with wide variation, indicating differing levels of emission efficiency. The average Country Exposure Index (CEI) is close to zero, suggesting that, after standardization, the typical economy's exposure to trade and manufacturing risk is around the sample mean. The large dispersion in renewable-energy share (REN_SHARE) and access to electricity (ELEC_ACCESS) highlights differences in energy structure and technological capacity within the group

Table 2: Descriptive statistics (TDEI panel)

Variable	N	Mean	SD	Min	Max
CEI	702	0.008	0.575	-1.910	1.599
CI	702	0.594	0.652	0.043	5.509
ELEC_ACCESS	698	93.740	14.281	32.300	100.000
EN_IMPORTS	668	59.525	35.530	-43.168	234.044
GDPPC	702	19081.328	20516.150	675.058	90605.019
GSE	702	-0.045	0.941	-5.798	6.815
IND_SHARE	696	25.767	6.331	2.086	39.922
MANUF_SHARE	696	16.502	5.661	0.913	30.930
POP	702	21577513.514	25000227.831	4181281.000	114891199.000
REN_SHARE	648	22.304	20.100	0.000	84.100
TRADE	702	110.907	57.412	47.313	442.620
URBAN	702	67.775	17.737	30.795	100.000

The next stage involved constructing the Global Stress Index (GSI) through principal-component analysis (PCA). Table 3 presents the factor loadings of the three standardized stress indicators: the World Uncertainty Index (WUI), the Geopolitical Risk Index (GPR), and the Global Supply Chain Pressure Index (GSCPI). All three load positively on the first component, with coefficients between 0.54 and 0.60, implying that each variable contributes almost equally to the underlying global stress factor.

Table 3: GSI (PC1) loadings

Series	Loading_PC1
WUI	0.604
GPR	0.541
GSCPI	0.585

Table 4 summarizes the PCA eigenvalues, showing that the first principal component (PC1) explains about 61 percent of the total variance. This confirms that PC1 effectively captures the common component of global uncertainty, geopolitical risk, and supply-chain tension and can be used as the composite measure of globalization stress for subsequent analysis

Table 4: PCA standard deviations and variance shares

Component	Std.Dev.	Variance Share
PC1	1.355	61.20%
PC2	0.812	22.00%
PC3	0.710	16.79%

The quantile regression results in *Table 5*, *Table 6*, and *Table 7* are obtained by following (Chamberlain, 2008; Chernozhukov et al., 2019; Koenker, 2005; KOENKER, 2006). In *Table 5*, the coefficients quantify how each driver shifts the conditional level of CI at $\tau = 0.25$, 0.50, and 0.75. GSE is positive and statistically significant across all three quantiles, with coefficients of about 0.118 at $\tau=.25$, 0.158 at $\tau=.50$, and 0.138 at $\tau=.75$, meaning that, holding other factors constant, a one-unit rise in GSE is associated with higher CI throughout the distribution, strongest around the median. GDPPC is also positive, with its largest effect near the median (≈ 0.160), indicating that higher income per capita is associated with higher CI at central parts of the distribution. TRADE is negative and steepens toward the upper tail (roughly -0.213 at $\tau=.25$, -0.558 at $\tau=.50$, -1.031 at $\tau=.75$), implying that greater openness is linked to lower CI, especially among high-CI observations. EN_IMPORTS is negative at the lower and median quantiles and attenuates at $\tau=.75$, suggesting that reliance on imported energy aligns with lower CI mainly in the lower-middle regimes. MANUF_SHARE is strongly positive across τ (on the order of 1.1–1.7), meaning manufacturing-intensive economies have higher CI throughout the distribution. URBAN, IND_SHARE, ELEC_ACCESS, and REN_SHARE are negative and precisely estimated, consistent with urbanisation, a larger overall industry share, wider electricity access, and higher renewables share being associated with lower CI.

Table 5: Baseline Quantile Regression (Bofinger bandwidth, robust VCE)

VARIABLES	$\tau = 0.25$	$\tau = 0.50$	$\tau = 0.75$
GSE_std	0.118*** (0.023)	0.158*** (0.051)	0.138** (0.064)
ln(GDPPC)	0.077** (0.039)	0.160*** (0.053)	0.103* (0.056)
ln(TRADE)	-0.213* (0.114)	-0.558*** (0.160)	-1.031*** (0.168)
ln(EN_IMPORTS)	-0.378*** (0.097)	-0.396*** (0.087)	0.008 (0.125)
ln(MANUF_SHARE)	1.138*** (0.136)	1.665*** (0.202)	1.606*** (0.281)
ln(URBAN)	-0.670*** (0.210)	-1.389*** (0.297)	-1.428*** (0.293)
ln(IND_SHARE)	-1.607*** (0.261)	-2.337*** (0.411)	-2.097*** (0.505)
ln(ELEC_ACCESS)	-0.638*** (0.220)	-1.481*** (0.429)	-1.223*** (0.374)
ln(REN_SHARE)	-0.390*** (0.040)	-0.564*** (0.050)	-0.516*** (0.049)
Constant	9.946*** (1.500)	19.587*** (2.709)	19.598*** (2.250)
Observations	608	608	608
VCE	Robust	Robust	Robust
Bandwidth	Bofinger	Bofinger	Bofinger
Density	Fitted	Fitted	Fitted

Note: Standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Using an alternative inference specification in *Table 6*, the Parzen kernel with the Chamberlain bandwidth reproduces the same substantive story. The signs and relative magnitudes remain stable, so the positive association of GSE with CI, the median-concentrated positive effect of GDPPC, the increasingly negative effect of TRADE up the distribution, the mainly lower-quantile impact of EN_IMPORTS, the robustly positive MANUF_SHARE, and the consistently negative URBAN, IND_SHARE, ELEC_ACCESS, and REN_SHARE do not depend on the Bofinger versus Parzen–Chamberlain choice.

Table 6: Baseline Quantile Regression (Parzen kernel + Chamberlain bandwidth, robust VCE)

VARIABLES	$\tau = 0.25$	$\tau = 0.50$	$\tau = 0.75$
GSE_std	0.118*** (0.038)	0.158** (0.072)	0.138 (0.116)
ln(GDPPC)	0.077* (0.040)	0.160*** (0.058)	0.103 (0.068)
ln(TRADE)	-0.213 (0.156)	-0.558*** (0.101)	-1.031*** (0.268)
ln(EN_IMPORTS)	-0.378*** (0.135)	-0.396*** (0.089)	0.008 (0.105)
ln(MANUF_SHARE)	1.138*** (0.241)	1.665*** (0.343)	1.606*** (0.471)
ln(URBAN)	-0.670*** (0.189)	-1.389*** (0.220)	-1.428*** (0.387)
ln(IND_SHARE)	-1.607*** (0.436)	-2.337*** (0.582)	-2.097** (0.860)
ln(ELEC_ACCESS)	-0.638*** (0.221)	-1.481*** (0.194)	-1.223*** (0.280)
ln(REN_SHARE)	-0.390*** (0.040)	-0.564*** (0.032)	-0.516*** (0.086)
Constant	9.946*** (1.246)	19.587*** (1.557)	19.598***/. (3.251)
Observations	608	608	608
VCE	Robust	Robust	Robust
Density	Parzen kernel	Parzen kernel	Parzen kernel
Bandwidth	Chamberlain	Chamberlain	Chamberlain

Note: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

To reinforce consistency, *Table 7* estimates the three quantiles simultaneously with 5,000 bootstrap replications. The bootstrap results confirm the *Table 5* patterns and their interpretation: higher GSE implies higher conditional CI across the distribution, GDPPC is most positive near the median, TRADE reduces CI most at the upper quantile, EN_IMPORTS lowers

CI mainly at the lower and median quantiles, MANUF_SHARE remains a strong positive correlate, and URBAN, IND_SHARE, ELEC_ACCESS, and REN_SHARE continue to align with lower CI. Together, the movement from *Table 5* to *Table 6* and then to *Table 7* shows that the economic meanings are robust to alternative variance estimation and intensive bootstrap inference.

Table 7: Simultaneous Quantile Regression (sqreg, 5,000 bootstrap reps)

VARIABLES	$\tau = 0.25$	$\tau = 0.50$	$\tau = 0.75$
GSE_std	0.118** (0.049)	0.158** (0.075)	0.138* (0.074)
ln(GDPPC)	0.077* (0.043)	0.160** (0.071)	0.103* (0.060)
ln(TRADE)	-0.213 (0.158)	-0.558*** (0.137)	-1.031*** (0.238)
ln(EN_IMPORTS)	-0.378*** (0.116)	-0.396*** (0.105)	0.008 (0.120)
ln(MANUF_SHARE)	1.138*** (0.250)	1.665*** (0.320)	1.606*** (0.380)
ln(URBAN)	-0.670*** (0.211)	-1.389*** (0.278)	-1.428*** (0.330)
ln(IND_SHARE)	-1.607*** (0.472)	-2.337*** (0.587)	-2.097*** (0.729)
ln(ELEC_ACCESS)	-0.638** (0.311)	-1.481*** (0.484)	-1.223** (0.481)
ln(REN_SHARE)	-0.390*** (0.046)	-0.564*** (0.044)	-0.516*** (0.067)
Constant	9.946*** (1.727)	19.587*** (2.724)	19.598*** (3.367)
Observations	608	608	608

Note: Standard errors in parentheses. Employed 5,000 bootstrap reps

*** p<0.01, ** p<0.05, * p<0.1

Next, the study presents the estimation results of the quantile local-projection (QLP) models which are reported in Table 8 and were obtained by following (Jordà, 2005, 2023b; Jordà & Taylor, 2024b). The coefficients on the standardized Global Stress Exposure (GSE_std) variable represent the impulse-response of carbon intensity at different quantiles and forecast horizons. The findings indicate strong heterogeneity across the carbon-intensity distribution. At the 25th and 50th quantiles, the effects of globalization stress are positive and statistically significant at the 1 percent level for horizons two through six. The magnitude of the coefficients rises with the forecast horizon, peaking at 0.163 and 0.213 respectively, suggesting persistent medium-term increases in carbon intensity following a globalization shock. The 75th quantile shows weaker and less consistent effects, with only one horizon marginally significant at the 10 percent level. This pattern suggests that lower- and median-emission

economies are more vulnerable to global stress, while high-emission countries exhibit smaller or statistically uncertain responses

Table 8: Quantile local-projection coefficients on GSE shock
(CCE, country FEs)

Quantile	Horizon	β (95% CI)	SE	p-value	
0.25	1	-0.004 (-0.021, 0.013)	0.009	0.629	
0.25	2	0.048 (0.024, 0.071)	0.012	0.000	***
0.25	3	0.085 (0.048, 0.121)	0.019	0.000	***
0.25	4	0.105 (0.052, 0.157)	0.027	0.000	***
0.25	5	0.130 (0.096, 0.164)	0.017	0.000	***
0.25	6	0.163 (0.103, 0.224)	0.031	0.000	***
0.50	1	0.005 (-0.009, 0.019)	0.007	0.502	
0.50	2	0.016 (-0.012, 0.044)	0.014	0.274	
0.50	3	0.078 (0.043, 0.114)	0.018	0.000	***
0.50	4	0.123 (0.058, 0.188)	0.033	0.000	***
0.50	5	0.140 (0.050, 0.231)	0.046	0.002	***
0.50	6	0.213 (0.070, 0.357)	0.073	0.004	***
0.75	1	-0.010 (-0.043, 0.023)	0.017	0.553	
0.75	2	0.032 (-0.053, 0.117)	0.043	0.458	
0.75	3	0.178 (-0.027, 0.383)	0.105	0.090	*
0.75	4	0.113 (-0.093, 0.318)	0.105	0.282	
0.75	5	0.097 (-0.042, 0.235)	0.071	0.174	
0.75	6	0.032 (-0.072, 0.135)	0.053	0.548	

Table 9 summarizes the peak impulse responses by quantile. The maximum estimated responses occur at the sixth horizon for the 25th and 50th quantiles and at the third horizon for the 75th quantile. The positive and statistically significant peak values for the lower and median quantiles confirm that globalization stress shocks tend to raise carbon intensity over the medium term, particularly in economies that are relatively less carbon-intensive at baseline. These results highlight the asymmetric and persistent nature of globalization shocks on emission efficiency among trade-dependent, energy-importing countries. They provide clear empirical support for the hypothesis that globalization stress can temporarily reverse decarbonization progress, especially in economies whose production structures are more sensitive to external disruptions

Table 9: Peak impulse responses of carbon intensity to a GSE shock

Quantile	Horizon h*	Peak β	95% CI	p-value	Stars
0.25	6	0.163	0.103 , 0.224	0.000	***
0.50	6	0.213	0.070 , 0.357	0.004	***
0.75	3	0.178	-0.027 , 0.383	0.090	*

Notes: β are horizon-h coefficients from quantile local-projections with country fixed effects and cross-sectional averages (CCE). Standard errors are quantile-regression ‘nid’ SEs. Stars: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

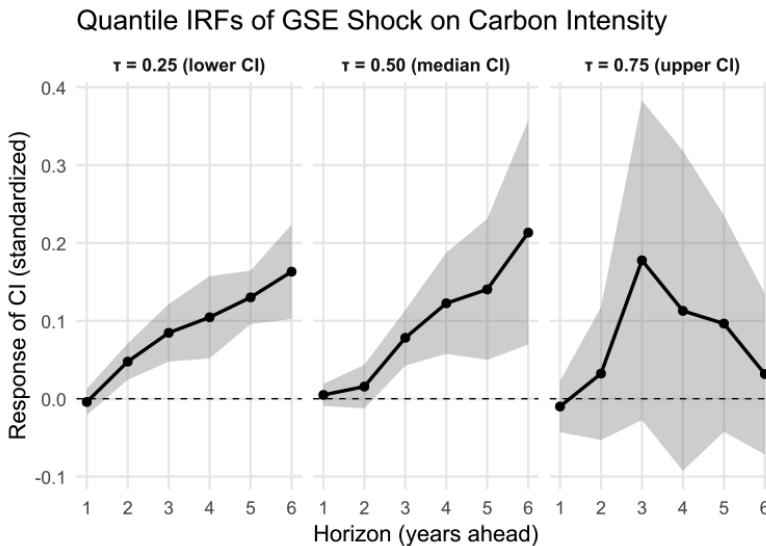


Figure 2: Quantile impulse responses of carbon intensity (CI) to globalization stress exposure (GSE)

Figure 2 presents the quantile impulse response functions (IRFs) showing the dynamic effect of Globalization Stress Exposure (GSE) on carbon intensity (CI) across the conditional quantiles $\tau = 0.25, 0.50$, and 0.75 . The analysis captures how economies with different carbon intensity levels respond to globalization-related stress shocks over time. These shocks are derived from the composite Global Stress Index (GSI), which integrates the World Uncertainty Index (WUI), the Geopolitical Risk Index (GPR), and the Global Supply Chain Pressure Index (GSCPI). The GSI is interacted with each country's exposure index to obtain the GSE variable that measures the extent of globalization-related stress an economy experiences.

The results show that the response of carbon intensity to GSE shocks is generally positive across all quantiles, with stronger and more persistent

effects at the median and upper quantiles. This suggests that globalization-related stress tends to increase carbon intensity over time, implying that economies often adjust through more emission-intensive production pathways when confronted with global disruptions or uncertainty.

For economies in the lower quantile ($\tau = 0.25$), representing relatively low-carbon or cleaner producers, the response of carbon intensity to GSE shocks is modest but persistent. This indicates that such economies remain somewhat vulnerable to globalization stress, although the magnitude of the effect is limited. In contrast, the median quantile ($\tau = 0.50$) exhibits a stronger and more sustained rise in carbon intensity throughout the six-year horizon. This pattern suggests that medium-emission economies are more affected by globalization stress, possibly because of their intermediate position in global value chains and their dependence on imported energy and manufacturing inputs. At the upper quantile ($\tau = 0.75$), which corresponds to highly carbon-intensive economies, the response of carbon intensity rises rapidly during the early years, peaking around the third or fourth horizon before gradually declining. This pattern points to an initial surge in emissions intensity following global stress shocks, reflecting a short-term reliance on carbon-intensive processes and a relatively weak capacity for structural adjustment.

Although the confidence intervals widen at longer horizons, indicating increasing uncertainty, the general direction of the response remains positive. This consistent pattern confirms that exposure to globalization-related stress raises carbon intensity, with the strength and persistence of the effect depending on the underlying emission profile of each economy. Overall, the findings suggest that global stress conditions reinforce the carbonization of production and trade, particularly in economies that have limited diversification or resilience mechanisms to manage international shocks.

Globalization stress exposure raises carbon intensity across all quantiles, with stronger and more persistent effects at higher emission levels. Low-carbon economies ($\tau = 0.25$) show mild but steady responses, median economies ($\tau = 0.50$) experience a sustained rise, and high-emission economies ($\tau = 0.75$) display a sharp initial increase that peaks around the third year before moderating. Overall, GSE amplifies emission intensity, particularly in economies more integrated into global trade and less adaptable to external shocks.

5 Discussion

The results indicate that higher globalisation related stress exposure is associated with higher carbon intensity in trade dependent, energy importing economies. This pattern suggests that stress episodes tend to weaken emissions efficiency rather than support decarbonisation. The finding fits naturally within crisis transmission logic, where heightened uncertainty and geopolitical tensions disrupt investment planning, tighten financing conditions, and amplify supply chain frictions that affect production and energy use.

Existing evidence supports this interpretation. Uncertainty shocks have been shown to reduce investment and hiring as firms delay irreversible decisions under elevated risk, which can slow capital renewal and postpone efficiency improving upgrades (Bloom, 2009). Economic policy uncertainty is also known to spike around major political and economic events and to influence real activity through expectations and investment channels (Baker et al., 2016). When these mechanisms operate in energy importing settings, they can delay adoption of cleaner technologies and reduce progress in energy efficiency, increasing emissions per unit of output. Empirical studies often report that uncertainty measures are associated with weaker environmental performance or higher emissions, particularly where clean investment is sensitive to confidence and financing conditions (Adams et al., 2020; Anser et al., 2021).

The results also align with the trade and environment framework where the net environmental consequence of globalisation depends on the balance of scale, composition, and technique effects (Antweiler et al., 2001; Copeland & Taylor, 2004). During stress episodes, technique effects may weaken when technology diffusion slows and firms defer upgrades, while composition effects may shift unfavourably if countries substitute toward more carbon intensive inputs to maintain production continuity. These responses are especially plausible for trade dependent economies integrated into global value chains, where disruptions to imported intermediates can induce reliance on domestic substitutes that are less efficient and more emissions intensive.

Geopolitical risk strengthens this channel through energy market and trade disruption pathways. Geopolitical risk has been formalised as a measurable source of macroeconomic risk that can propagate via sanctions, conflict related uncertainty, and commodity market disruptions, particularly in oil and gas markets (Caldara & Iacoviell, 2022). In energy importing economies, adverse geopolitical conditions can raise energy costs, constrain supply availability, and trigger short run energy security strategies that rely on fossil fuels. Evidence in environmental and resource economics frequently reports that geopolitical risk is associated with higher emissions or environmental degradation in settings where energy systems remain carbon intensive or where shocks impede the transition toward cleaner technologies (Chen et al., 2023). This literature supports the view that global stress can create conditions under which carbon intensity rises even if longer run policy targets remain oriented toward decarbonisation.

The heterogeneous results across the carbon intensity distribution are particularly informative. They imply that vulnerability and adjustment capacity differ across regimes, so a single average effect can be misleading. Trade and environment theory predicts such conditionality because openness interacts with regulatory capacity, industrial structure, and technological readiness (Copeland & Taylor, 2004). In some contexts, uncertainty can reduce emissions in the immediate term through demand contraction, yet

still worsen medium run emissions efficiency if investment and technology upgrading are delayed. This helps explain why the direction and magnitude of risk effects can vary across samples and horizons in the empirical literature, and it reinforces the value of distributional evidence for policy design.

The dynamic results indicate that the stress effect is not purely contemporaneous. This is consistent with gradual adjustment mechanisms. When stress increases and investment is deferred, the implications for emissions efficiency can persist as the capital stock adjusts slowly. Local projections provide a transparent way to trace horizon specific responses without imposing restrictive dynamic assumptions (Jordà, 2005).

Several implications follow. First, decarbonisation strategies in trade dependent, energy importing economies require an explicit resilience component. If global stress systematically raises carbon intensity, stabilising clean investment during stress episodes becomes critical. Policy tools include protecting renewable deployment pipelines, de risking clean investment finance, and reducing uncertainty around energy transition regulations so that technique effects are not interrupted when stress rises. Second, energy security responses need to be structured to avoid carbon intensive lock in. Diversification of energy supply, grid flexibility, storage, and demand side efficiency can reduce reliance on high carbon fuels during disruptions. Third, heterogeneity implies that policy should be differentiated. High intensity economies may need structural measures that accelerate fuel switching and industrial upgrading, while lower intensity economies may need policies that prevent efficiency gains from being reversed when trade logistics and imported inputs are disrupted.

The results should still be interpreted with caution. The analysis is conducted at annual frequency and captures macro level relationships, so it cannot fully identify sector specific pathways. The stress exposure construct summarises broad global conditions, and the estimates are reduced from relationships consistent with the proposed transmission mechanisms rather than direct tests of each channel. Even so, by linking global stress exposure to carbon intensity using distributional and dynamic evidence, the study complements trade and environment theory and the crisis transmission literature by showing that environmental efficiency can deteriorate during global stress, especially in economies that depend heavily on trade and imported energy (Antweiler et al., 2001; Bloom, 2009; Caldara & Iacoviell, 2022; Copeland & Taylor, 2004).

6 Conclusions and Policy Recommendations

Using a mechanism-driven sample of 27 trade-dependent, energy-importing economies (1998–2023), we find that globalisation stress exposure (GSE); the interaction of a common global stress factor with each country's exposure;

raises carbon intensity (CI) in a distributionally asymmetric way. Panel quantile results show stronger and more persistent CI increases at the lower and median quantiles, with shorter-lived effects at the upper quantile. Quantile local projections indicate that a 1-SD GSE shock can elevate CI for multiple years. Descriptives show a gradual long-run decline in average CI, periodically interrupted by stress episodes (e.g., the 2020–2022 period). Overall, TDEI economies remain structurally vulnerable: stress shocks tilt production toward higher-CI inputs even where baseline efficiency has improved.

Policy recommendations.

1. **Energy-security buffers:** accelerate renewables, flexible backup capacity, storage, strategic fuel reserves, and cross-border interconnections to cushion imported-energy spikes.
2. **Supply-chain de-risking:** diversify fuel and intermediate-input sources; promote near/friend-shoring for emissions-intensive stages; develop green-corridor logistics to limit stress-sensitive CI spikes.
3. **Counter-cyclical clean support:** deploy temporary rebates/credits for low-carbon fuels and fast-track efficiency retrofits during stress periods to avoid reversion to dirtier technologies.
4. **Resilient carbon pricing:** maintain carbon-price paths but pair with output-based rebates and green-credit guarantees for exposed tradables to prevent dirtier substitutions when stress rises.
5. **Targeted heterogeneity:** prioritise support where **quantile results show greater sensitivity** (lower- and mid-CI countries/sectors); use audits to target quick-win efficiency and fuel switching.
6. **Early-warning dashboard:** operate a GSI–CEI–GSE dashboard that triggers pre-agreed actions (reserve releases, green procurement switches, coordinated fiscal/monetary signals) when exposure increases.
7. **Trade policy for resilience:** keep renewable-equipment markets open in crises; fast-track low-carbon inputs at customs; pursue mutual recognition of green standards.
8. **Transition finance:** scale blended-finance and transition-linked loans tied to verified CI reductions; channel concessional lines to grid upgrades and industrial electrification in high-exposure sites.

Limitations & future work.

Results are annual and macro-level; sectoral panels and higher-frequency designs can sharpen channels. Extending to volatility-based stress measures, alternative exposure weights, and broader country sets will further test robustness.

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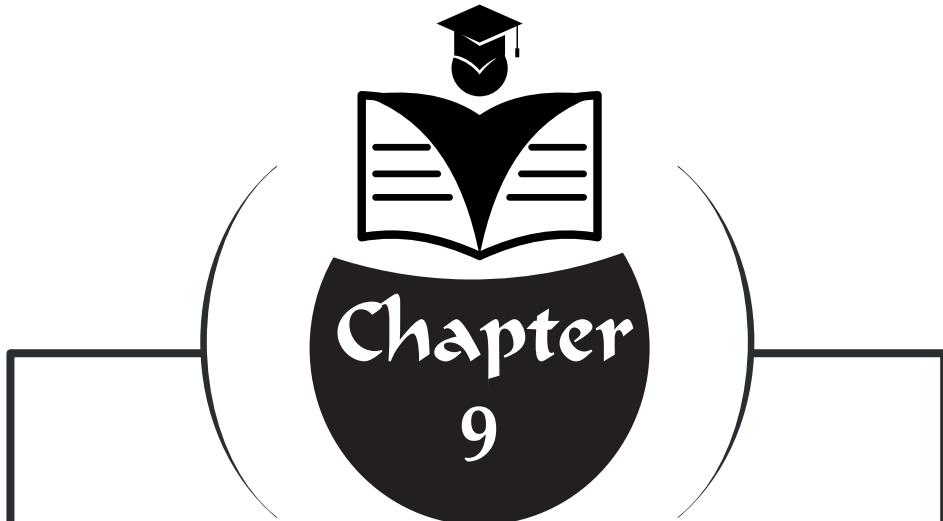
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FROM CHAOS TO BALANCE: ADAPTIVE LEADERSHIP AND ORGANISATIONAL RESILIENCE IN SUSTAINABLE MANAGEMENT

“ _____ ”

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1. Introduction

Organisations in the 21st century face complex challenges that push the boundaries of traditional management approaches, under the simultaneous impact of accelerating technological progress and multi-layered uncertainties (such as the climate crisis, geopolitical tensions, and resource scarcity). Indeed, a significant portion of current problems are too complex to be resolved through established procedures or technical expertise. In this context, Uhl-Bien and Arena (2018) emphasise that, in order for modern organisations to survive, it is necessary to create an ‘adaptive space’ that can respond to complexity, rather than relying on a static management approach. Therefore, today’s problems are, in essence, ‘adaptive problems’ that require a fundamental transformation of organisational values, belief systems, and cultural codes (Heifetz et al., 2009; Northouse, 2021). Sustainability-focused managerial efforts are at the heart of this adaptive transformation. Sustainability is more than just a reporting discipline or a technical environmental management practice; it is a systemic alignment process that requires the organisation to radically rebalance its economic, social and ecological priorities. Indeed, Elkington (1998) the originator of the Triple Bottom Line (TBL) concept, criticises the fact that the concept is now viewed merely as an accounting tool, stating that what is truly needed is a systemic paradigm shift and radical adaptation. This process triggers ontological tensions between short-term profit maximisation and long-term corporate responsibilities, which naturally activates an organisational resistance mechanism (Hahn et al., 2015).

At this point, the Adaptive Leadership model provides a critical conceptual framework for managing these structural tensions. This approach, conceptualised by Heifetz and Linsky (2002), centres on the distinction between technical and adaptive problems, shifting the leader’s role from being a ‘solution-producing authority’ to a facilitator who activates the organisation’s collective learning and adaptation capacity. From an Adaptive Leadership perspective, the leader frames uncertainty as a learning opportunity rather than a crisis and aims to transfer responsibility to stakeholders by keeping them at the threshold of ‘productive discomfort’.

This study synthesises the Adaptive Leadership approach with sustainable management literature, discussing at a theoretical level how environmental, social and economic conflict areas shaped by the TBL perspective can be managed. As noted by Linnenluecke (2017), organisational resilience is not merely the capacity to recover from a shock, but also the ability to proactively adapt to environmental changes. In this regard, the study argues that Adaptive Leadership is not merely a management style, but also a strategic and catalytic mechanism that builds organisational resilience during periods of uncertainty.

2. The Theoretical Framework of Adaptive Leadership

2.1. Distinction Between Technical and Adaptive Problems

The fundamental distinguishing feature of the adaptive leadership approach is the ontological distinction of organisational failures, categorising them as either ‘technical’ or ‘adaptive’. This distinction is a fundamental diagnostic mechanism that determines the strategic course of leadership intervention (Heifetz & Linsky, 2002). The authors argue that leadership failures often stem from attempting to solve complex adaptive problems using standard technical methods.

Heifetz and Laurie (1997) argue that at the root of many organisational failures lies leaders’ tendency to perceive situations requiring adaptive change as ‘technical failures’ and attempt to resolve them using existing routines. This misdiagnosis is termed the ‘technical fix trap’ and fosters passive-aggressive resistance to change (Thygeson et al., 2010). Technical problems are issues that have a definable structure, clear boundaries, and existing solutions within the scope of corporate expertise or operational procedures. In this context, the leader manages resource allocation as an ‘authority figure’ and ensures hierarchical coordination. In contrast, adaptive problems are situations that directly target the organisation’s shared values, established belief systems, and cultural behaviour codes, and whose solutions are not possible with the existing knowledge base (Northouse, 2021). Such problems require individuals to step outside their comfort zones and engage in a new learning paradigm.

From a sustainability perspective, while establishing emissions reporting systems can be structured as a technical process, an organisation’s shift from profit-oriented to value-oriented is a typical adaptive challenge (Heifetz & Linsky, 2002). Linnenluecke (2017) explain that the fundamental reason sustainability cannot be institutionalised is that leaders trigger organisational resistance by focusing on technical patchwork solutions rather than transforming the system. Table 1 presents a comparative overview of these two conceptual planes in the context of sustainability.

Table 1. Comparison of Technical and Adaptive Problems in the Context of Sustainability

Comparison Dimension	Technical Issues	Adaptive Issues
Nature of the Problem	Clear and easy to define. Its boundaries are well defined.	Complex, ambiguous and difficult to define. The root causes are deep-seated.
Type of information required	Current expertise and technical knowledge	New learning, experience and collective intelligence
Source of the solution	Experts, consultants, authority figures	Stakeholders experiencing the problem
Required change	Process and system improvement	Transformation of values, beliefs and behaviour
The leader's role	Generating and implementing solutions	Framing questions and facilitating the process
Typical response	Relief and compliance	Resistance, anxiety and uncertainty
Sustainability example	Installation of carbon filters	Transformation of the business model to become carbon neutral

Note. Adapted from the works of Heifetz and Linsky (2002) and Northouse (2021), compiled by the authors.

As shown in Table 1, sustainability issues are adaptive not only in terms of the content of the solution but also in terms of who will produce the solution and how. This removes the leader's role as a 'solution provider' and transforms them into an actor who manages organisational learning and confrontation processes.

2.2. Fundamental Principles of Adaptive Leadership and Sustainable Management

Adaptive leadership defines leadership not as a static position, but as a dynamic process of interaction that permeates the entire organisation and mobilises the system in the face of complex problems. Metcalf and Benn (2013) state that leaders must possess a high level of cognitive complexity and adaptive capacity in order to manage 'wicked problems' such as sustainability. This capacity is built upon the following five fundamental principles:

1. Situational Awareness and 'Stepping Back onto the Balcony': This metaphor, used by Heifetz et al. (2009), refers to a leader's ability to simultaneously engage in operational activities (the dance floor) while observing the system from the outside (the balcony). In sustainability governance, this perspective is critical for recognising the systemic roots underlying stakeholder resistance and seeing the whole picture (Edmondson,

2018).

2. Openness to Learning: Adaptive change requires an experimental ground where failure is accepted not as a mistake but as an outcome of learning. Psychological safety, as emphasised by Edmondson (2018), creates a space where employees can take risks to experiment with sustainability-focused innovative ideas (Yukl & Gardner, 2020).

3. Flexibility and Adaptability: Sustainability goals follow a non-linear path characterised by high uncertainty. Therefore, it is essential for leaders to demonstrate 'agility' by being responsive to environmental signals and feedback, rather than adhering to rigid, pre-determined strategies (Uhl-Bien & Arena, 2018).

4. Participatory Leadership: Complex issues such as sustainability exceed the capacity of a single mind. Adaptive leaders increase organisational ownership and spread cultural transformation to the grassroots by distributing responsibility for solutions among stakeholders (Marshall et al., 2011).

5. Controlled Tension: A certain degree of disruption to the existing comfort zone is necessary to trigger change. Heifetz and Linsky (2002) argue that leaders must manage a level of tension that is neither so low as to prevent change nor so high as to cause chaos, by keeping the organisation in a 'productive discomfort zone'. Table 2 summarises the functional relationship between these principles and sustainable management practices.

Table 2. Integration of Adaptive Leadership Principles into Sustainability

AL Principles	Operational Skills	Sustainability Output
Situational Awareness	Ability to read emotional and systemic dynamics	Proactively managing stakeholder conflicts
Openness to Learning	Tolerance for trial and error	Innovative environmental and social solutions
Flexibility and Adaptability	Change of direction based on feedback	Rapid adaptation to changing climate policies
Participatory Leadership	Spreading solution production to the grassroots	Influencing sustainability in corporate culture
Controlled Tension	Managing the tension necessary for change	The driving force for overcoming the status quo

Note. Adapted from the works of Metcalf and Benn, (2013) and Marshall et al., (2011), compiled by the authors.

2.3. Adaptive Process and Organisational Resilience

Adaptive leadership is based on the concept of a ‘holding environment’ or adaptive workspace, which operates through a continuous feedback loop rather than a linear problem-solving phase, enabling stakeholders to manage the pressure for change (Heifetz et al., 2009). In this process, the organisation transforms from a static and reactive structure into a ‘learning organisation’ that embraces uncertainty as an input and continuously renews itself (Senge, 2006).

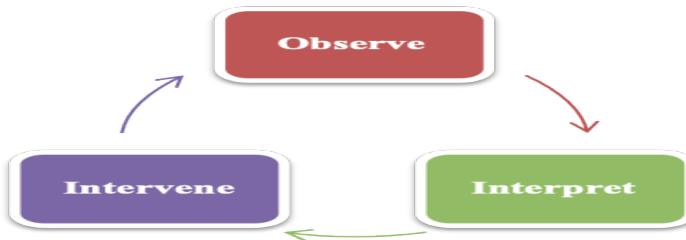


Figure 1. Adaptive Leadership Process (Heifetz et al., 2009)

The adaptive leadership process is not linear; it is a continuous cycle of ‘observe-interpret-intervene’ (Heifetz et al., 2009). This cycle builds organisational resilience by enabling the organisation to become immune to external shocks. As emphasised by Linnenluecke (2017), organisational resilience is not merely crisis management, but also the ability to view environmental changes as opportunities. In long-term goals such as sustainability, the adaptive leadership process transforms the organisation into a learning organisation (Senge, 2006). In this process, returning responsibility to stakeholders ensures that sustainability awareness becomes a cultural norm rather than a hierarchical dictate (Marshall et al., 2011).

3. Adaptive Transformation and Structural Barriers in Sustainable Management

Sustainability management literature has, for a long time, interpreted environmental and social crises primarily from the perspective of technical capacity inadequacy. This reductionist approach has focused on operational and measurable outputs such as carbon filtration systems, energy efficiency algorithms, or green supply chain protocols. However, the inadequacy of these technical solutions offered by mainstream management models in the face of the accelerating global ecological crisis has prompted researchers to question the behavioural and structural dynamics at the root of the problem (Ferdig, 2007). Recent research argues that sustainability crises cannot be overcome through technological innovation alone, but only by resolving deep value conflicts and transforming established habits (Heifetz et al., 2009).

In this context, sustainability emerges not as an operational improvement concerning what the organisation does, but as an adaptive challenge that triggers an ontological questioning of ‘why it exists’ (Ferdig, 2007). The

tension between short-term profit maximisation and long-term systemic well-being forms the fault lines at the heart of the sustainability transformation (Senge, 2006). The Business Sustainability 3.0 approach conceptualised by Dyllick and Muff (2013) addresses precisely this point, requiring organisations to place social issues at the heart of their business model, demonstrating systemic adaptation rather than merely technical compliance.

3.1. Value Conflicts and Resistance in Sustainability

Sustainability-focused waves of change often encounter intense resistance within organisations that cannot be explained by rational reasons. From an adaptive leadership perspective, this resistance is not an irrational attitude towards change; rather, it is a meaningful signal that the organisation's current value systems and definitions of success are under threat (Heifetz et al., 2009).

According to Heifetz and Linsky (2002), people resist not change, but loss. Sustainability goals require the revision of traditional performance metrics, the redistribution of power balances, and often the abandonment of existing business models that provide status. This triggers concerns among employees about loss of status, erosion of competence, and loss of control. At this point, the role of adaptive leadership should not be to view resistance as an obstacle and suppress it, but rather to diagnose which organisational values or habits the resistance is trying to protect. Therefore, sustainability transformation is not a technical implementation process, but an adaptive working space where organisational values are renegotiated and mental models, as emphasised by Senge (2006), are deconstructed.

3.2. Technical Fix Trap and Threshold of Productive Disturbance

A common scenario in the failure of sustainability projects is addressing problems requiring adaptive transformation with technical fixes (Heifetz et al., 2009). For example, believing that corporate ethical issues can be resolved simply by publishing an Ethics Code document or reducing the fight against climate change to annual reporting processes creates, in Obolensky's (2014) words, an illusion of a solution. While technical interventions provide temporary relief by relieving the organisation of immediate pressure, crises re-emerge with different symptoms (such as greenwashing) because the underlying structural value conflicts remain unresolved (Senge, 2006; Lyon & Montgomery, 2015).

Adaptive transformation requires sustainability to be reconceived as an integral part of corporate identity. At this point, the leader's success depends on their ability to keep the organisation within the Productive Uncomfortable Zone (Heifetz et al., 2009). This balance is vital for the sustainability transformation:

Very low tension: Leads to the preservation of the status quo (inertia).

Very high tension: Triggers the organisation's defence mechanisms, causing paralysis (panic).

An adaptive leader manages this tension by removing sustainability goals as an external pressure factor and integrating them into the organisation's systemic purpose, thereby triggering learning (Northouse, 2021). This strategic balance enables the organisation not only to survive but also to develop high organisational resilience in changing world conditions.

4. Interaction with the Triple Bottom Line (TBL) of Adaptive Leadership

Sustainable management shifts the criteria for organisational success away from purely financial ratios, placing them on a multidimensional responsibility framework comprising environmental integrity, social equity and economic sustainability. The Triple Bottom Line (TBL) approach, institutionalised by Elkington (1998), conceptualises this requirement through three fundamental pillars that interact with each other. However, the author notes that the simultaneous and coordinated management of these dimensions is not only an operational challenge for organisations but also a source of ontological tension.

The root cause of these structural tensions lies in the fact that TBL components are based on different time horizons (short-term/long-term), conflicting stakeholder expectations, and incompatible value systems. Slawinski and Bansal (2015) argue that the fundamental challenge in sustainability management is the lack of synchronisation between the immediacy expected by financial markets and the slow nature of ecological systems. At this point, sustainability ceases to be a technical balancing problem and becomes a wicked adaptive leadership issue where strategic priorities and organisational identity are renegotiated.

The multidimensional tensions created by sustainability and the adaptive leadership strategies to be used in overcoming these tensions have been synthesised based on the fundamental approaches in the literature and are presented in Table 3.

Table 3. Forms of Intervention in the Paradoxes of Adaptive Leadership in TBL Dimensions

TBL Dimensions	Fundamental Tension	Adaptive Leadership Intervention
Environmental	Short-term cost – long-term environmental benefit	Treating resilience as data
Social	Power balances and privileges	Encouraging participation and ownership
Economic	Profitability – sustainable investment conflict	Developing two-way capability

Note. It was developed by the authors using the theoretical frameworks proposed by Elkington (1998) and Heifetz et al. (2009).

4.1. Environmental Dimension

Environmental sustainability goals pose a direct challenge to organisations' established operational logic and definitions of efficiency. Transitioning to carbon-neutral strategies or circular business models may be perceived in the short term as resource waste or increased costs, triggering organisational inertia. From an adaptive leadership perspective, this resistance is not an obstacle to be suppressed, but a strategic source of data that decodes which invisible assumptions the organisation clings to (Heifetz & Linsky, 2002). By adjusting the dose of productive discomfort, as emphasised by Heifetz et al. (2009), the leader compels the organisation to confront ecological realities.

4.2. Social Dimension

Social sustainability disrupts hierarchical privileges and power balances within organisations through its objectives of ethical value chains, inclusivity, and fair distribution. Such adaptive challenges run too deep to be resolved by top-down social responsibility policies. Adaptive leadership transfers solution production directly to those affected by the problem by implementing the principle of 'giving the work back' (Heifetz et al., 2009). The leader's role here is to create a 'holding environment' where different voices can be heard, making social sustainability a living organisational norm (Missimer et al., 2017).

4.3. Economic Dimension

The economic dimension of TBL encompasses the sharpest paradox of sustainable management: the dilemma of 'profitability versus responsibility'. Adaptive leadership approaches this situation not as a conflict to be resolved, but as a matter of 'ambidexterity' to be managed. Rosing and Zacher (2017) state that leaders must, on the one hand, encourage innovative and flexible discovery processes (opening behaviours), while on the other hand, maintain strategic focus and efficiency in current operations (closing behaviours). In this context, economic sustainability is a matter of the organisation's ability to learn and strategically pivot under uncertainty, i.e., a dynamic capability (Teece et al., 1997).

5. Organisational Resilience and Adaptive Leadership

Corporate sustainability has evolved beyond being merely an operational performance output; it has become a matter of organisational resilience—the capacity of an organisation to protect, adapt, and rebuild itself under high uncertainty (Linnenluecke, 2017). The linear and predictable structure of traditional risk management protocols has proven inadequate for managing the chaotic dynamics of complex systems (Senge, 2006), making the concept of resilience a strategic component of sustainable management.

The classical resilience approach defines the system's speed of returning to its previous equilibrium state (bounce back) after a shock; however, current literature extends this perspective towards forward evolution (bounce forward) (Burnard & Bhamra, 2011). However, Linnenluecke (2017) argues that in today's volatile environment, returning to the old equilibrium actually carries a risk of regression, as the post-crisis world is different from the pre-crisis world. At this point, resilience is being reconceptualised as the ability to evolve into a more complex and adaptive structure by learning from crises (bounce forward) (Burnard & Bhamra, 2011). Weick and Sutcliffe (2007), meanwhile, emphasise that at the core of this capacity lies a corporate mindfulness skill that enables the detection of minor deviations before a crisis deepens.

5.1. Learning from Resilience: Building an Adaptive Culture

The interaction between adaptive leadership and organisational resilience operates according to the principle of the reinforcing feedback loop, as described by Senge (2006), rather than a linear cause-and-effect relationship. Resilience is largely dependent on the organisation's collective learning speed; the catalyst for this speed is adaptive leadership.

During crises, hierarchical authorities often tend to centralise control and resort to technical fixes. Adaptive leadership, however, frames moments of shock as productive voids where the status quo dissolves and new learning opportunities emerge (Heifetz et al., 2009). Resistance in this process is fuelled by two fundamental mechanisms:

Psychological Safety and Error Tolerance: In line with Edmondson's (2018) theory of psychological safety, adaptable leaders position failure not as a punitive element but as a systemic source of data. This attitude prevents the organisation from becoming paralysed by fear, thereby sustaining adaptive capacity (Yukl & Gardner, 2020).

Systems Thinking and Strategic Intervention: From Senge's (2006) perspective, leaders view crises not as isolated incidents but as symptoms that spread throughout the entire system. This holistic view enables the organisation to implement high-leverage interventions that ensure sustainability rather than superficial solutions.

5.2. The Key Components of Resilient Organisations in Sustainable Management

Achieving sustainability goals is not just an ethical statement; it is about building organisational capabilities to ensure these goals are met in the long term. Adaptive leadership establishes a resilient organisational structure based on two critical pillars:

Organisational Ambidexterity: Resilient organisations possess a dual-purpose structure that simultaneously optimises the current business model (exploitation) while exploring future sustainable models (exploration) (O'Reilly & Tushman, 2013). Rosing and Zacher (2017) state that these two conflicting activities can only coexist thanks to the adaptive flexibility provided by the leader.

Stakeholder Ecosystem and Social Capital: As emphasised by Eccles et al. (2014), the most significant difference in sustainable organisations is the deep bonds based on trust they establish with their stakeholders. Adaptive leaders build a broad social immunity system that protects the organisation against external shocks by spreading the responsibility for solutions among stakeholders (giving the work back).

In summary, organisational resilience built by adaptive leadership transforms sustainable management from a static goal into a dynamic capacity for evolution. This capacity enables the organisation not only to emerge from chaos unscathed, but also to transform chaos into a source of balance and strength, thereby establishing sustainability as an element of corporate identity.

6. Conclusion

This study has sought to demonstrate that achieving sustainable management objectives is not merely a technical optimisation, but rather an adaptive transformation process involving the renegotiation of organisational identity and value systems. The primary objective of the study is to demonstrate that the structural paradoxes created by sustainability can only be managed through dynamic organisational resilience built within the framework of Adaptive Leadership.

The structural tensions created by sustainability in the dimensions of the TBL (Triple Bottom Line) inevitably trigger an area of resistance within the organisational system (Hahn et al., 2015). However, the adaptive leadership perspective positions this resistance not as a malfunction that must be suppressed, but as a strategic learning signal that decodes which values and invisible assumptions the organisation is tightly bound to (Heifetz et al., 2009). Within this scope, the fundamental theoretical and managerial outputs provided by the study are as follows:

Systemic Transformation: Adaptive Leadership is positioned as a systemic change architecture that coordinates conflicting demands between TBL dimensions rather than an individual leadership style (Uhl-Bien & Arena, 2018).

Adaptive Taxonomy: Sustainability barriers are differentiated as power asymmetries in the environmental dimension (Heifetz & Linsky, 2002), power asymmetries in the social dimension (Heifetz et al., 2009), and time horizon conflicts in the economic dimension (Slawinski & Bansal, 2015), thereby decoding the codes of cultural resistance.

Dynamic Resilience: Organisational resilience is defined not as the ability to revert to the old status quo after a crisis, but as a continuous capacity for evolution that develops at the threshold of productive discomfort (Obolensky, 2014).

Managerial Diagnosis: The greatest risk in sustainability crises is addressing adaptive problems with technical fixes. This approach becomes a trap that deepens organisational inertia in the long term (Heifetz et al., 2009).

The future of sustainable management depends on adaptive leadership capital that will activate organisations' collective learning and adaptation potential rather than technological capacity. Leaders who view chaos not as a threat but as a springboard for evolutionary leaps are the only actors capable of moving their organisations from a static equilibrium to a dynamic and resilient future. This leadership approach is the fundamental key to making sustainability not merely an operational domain but an existential element of an organisation's institutional identity.

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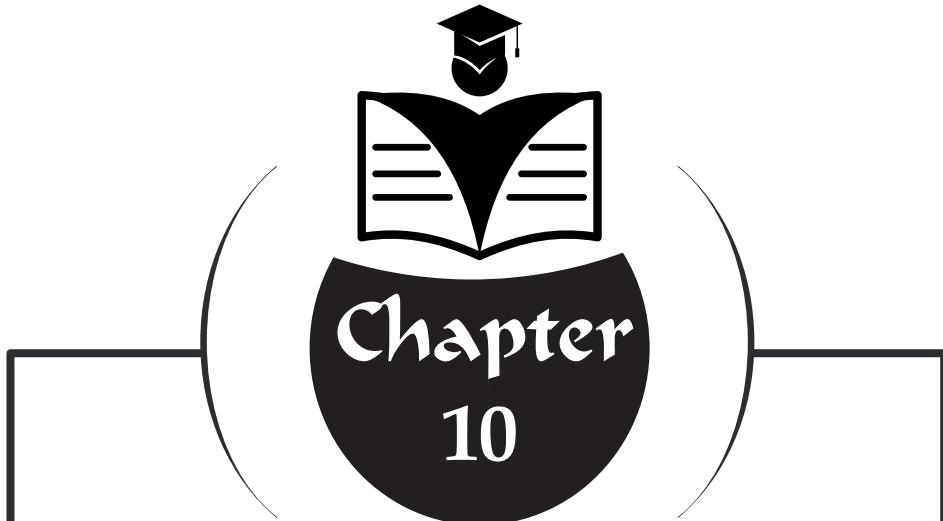
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THE EVOLUTION OF TAX EXPENDITURES IN TÜRKİYE IN THE POST-PANDEMIC PERIOD

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1. INTRODUCTION

Today, changes in the concept of the state resulting from the development of societies and economies have shifted expectations from the state to different areas. The ability of the state to fulfill the duties assigned to it in the best possible manner depends on the efficient use of resources. The state has economic and social objectives that it is obliged to achieve. One of the instruments used in pursuing these objectives is public expenditure. Public expenditures are the total expenditures carried out by the state through the budget. Tax expenditures implemented through the tax system are also known as an alternative to public expenditures. For this reason, tax expenditures are regarded as a type of public expenditure. Discussions regarding the concept of tax expenditures are conducted alongside public expenditures, and they are considered to have complementary characteristics. Today, tax expenditures are widely applied in many countries in order to achieve certain economic and social objectives more effectively and rapidly. Tax expenditures generally refer to foregone tax revenues and, in practice, take the form of tax exemptions and exceptions, deductions, credits, reduced tax rates, and tax deferrals.

Tax expenditures inherently lead to a certain reduction in the state's revenue level, because they include privileges granted by the state to citizens such as exemptions, exceptions, deductions, and deferrals. Such privileges result in a decrease in tax revenues. However, taxes have not only economic but also social and psychological effects. Although an exemption or exception applied by the state may appear to cause a loss of revenue, it can sometimes produce positive outcomes such as increasing production, reducing the consumption of demerit goods, improving income distribution, or achieving broader economic objectives. Understanding the extent to which the socioeconomic objectives of tax expenditure practices are achieved, their costs, and whether they ultimately generate benefits, as well as subjecting them to thorough analysis and reporting them transparently, is of great importance for an effective fiscal policy.

The aim of this study is to evaluate the development of tax expenditures in Türkiye in the post-COVID-19 pandemic period. For this purpose, tax expenditure reports were examined and the amounts of tax expenditures were analyzed. In this context, the study first examines the emergence, conceptual framework, and objectives of tax expenditures. Subsequently, the types of tax expenditures are discussed. Finally, based on the data included in tax expenditure reports published in 2020 and thereafter, various assessments are made regarding the development and composition of tax expenditures.

2. THE EMERGENCE, CONCEPTUAL PERSPECTIVE, AND OBJECTIVES OF TAX EXPENDITURES

The concept of tax expenditure, which was first brought to the agenda in Germany in 1959, began to be implemented in the United States (U.S.) toward the late 1960s (Shapiro, 2003: 23). In an article published in the U.S. in 1963, observations regarding tax loopholes were made without directly referring to the concept of tax expenditures. The concept is addressed in the context of reasons arising from tax technique, tax equity, and the implementation of social and economic policies. Accordingly, it refers to situations in which taxpayers are placed in an advantageous position by failing to fulfill their obligations due to an unintended deficiency or inadequacy in legislation or in a contract, and are able to exploit this situation without being subject to legal sanctions (McKenna, 1963: 63–64). Thus, even if not explicitly stated, attention is drawn to the need to record practices that qualify as tax expenditures.

In the U.S., after the 1950s, the concept of tax expenditures has been based on the idea that exemptions, allowances, deductions, and credits in income tax and corporate tax laws serve as substitutes for general budget expenditures. Initially, tax expenditures were regarded as tax subsidies, and it was noted that tax subsidies had certain characteristics, such as differing among taxpayers, not being explicitly included in the budget, and not having their expenditures and revenues calculated (Bittker, 1969: 244). Tax expenditures are public revenue losses arising from special deductions granted to taxpayers, which are determined by states in line with their financing policies in order to support various social, economic, and environmental objectives (Wilkinson, 1986: 23).

In other words, tax expenditures refer to the loss of revenue caused by tax privileges such as exemptions, exceptions, deductions, and tax deferrals granted to taxpayers. Through tax expenditures, the state forgoes tax revenues in order to achieve certain objectives. However, such privileges lead to deviations from the principle of universality. In some cases, tax expenditures appear similar to transfer expenditures. Nevertheless, there are certain features that distinguish tax expenditures from transfer expenditures. First, the principle of universality applies to public expenditures, and the entire society benefits from such expenditures. In contrast, the privileges granted through tax expenditures are limited to specific groups. Second, tax expenditures arise from the state's relinquishment of taxable income, and these expenditures do not appear in the budget in the form of appropriations. Public expenditures, on the other hand, are carried out through budgetary appropriations (Karaca, 2021: 274).

The definition of tax expenditures varies depending on the country in which they are enacted. For example, Austria defines tax expenditures as the loss of tax revenue resulting from the introduction of exceptions to the general taxation norm in order to grant privileges to the activities of certain natural and legal persons, whereas the Netherlands defines tax expenditures as losses

in tax revenues arising from legal circumstances that are incompatible with the basic tax system. Finland, on the other hand, defines tax expenditures as deviations from the basic taxation structure in order to support specific objectives (Kulu, 2000: 3).

In Türkiye, the concept of tax expenditure is incorporated through the provision set out in Article 73 of the Constitution. After the third paragraph of this article stipulates that taxes, duties, fees, and similar fiscal obligations shall be imposed, amended, or abolished by law, the fourth and final paragraph states that "*the authority to make changes, within the upper and lower limits prescribed by law, to the provisions concerning exemptions, exceptions, deductions, and rates of taxes, duties, fees, and similar fiscal obligations may be delegated to the President.*" Accordingly, it is indicated that the President has authority with respect to tax expenditures and tax rates. In this way, a legal framework has been established to prevent arbitrary practices.

From the perspective of Turkish fiscal legislation, the concept of "tax expenditure" was first introduced into the legal framework with Law¹ No. 5018 on Public Financial Management and Control. Article 15 of the Law includes the phrase "...*tax revenues forgone due to tax exemptions, exceptions, deductions, and similar practices...*". With this regulation, it was envisaged that tax revenues forgone as a result of tax exemptions, exceptions, and deductions (tax expenditures) would be estimated and included in the Central Government Budget Laws (Vergi Harcamaları Raporu, 2007: 2).

The practice of preparing tax expenditure reports first began in Germany and the U.S. at the end of the 1960s. However, the U.S. was the first country to prepare a detailed tax expenditure report/budget. In some Organisation for Economic Co-operation and Development (OECD) countries, the preparation of tax expenditure reports is legally required and is presented annually. These countries include Spain, Austria, Germany, Australia, Greece, France, Portugal, Belgium, and the U.S. The integration of tax expenditure reports into the budget process varies from country to country. Among the countries that link tax expenditure reports to the budget process are Greece, Austria, France, Portugal, Spain, Sweden, Belgium, and Finland. In the U.S., the tax expenditure report is shared as part of the budget, whereas in Greece, tax expenditures are integrated directly with the budget (Giray, 2002: 30). In Türkiye, among the documents to be submitted along with the Central Government Budget Proposal to the Grand National Assembly of Türkiye (GNAT) are the "*schedules of tax revenues foregone due to tax exemptions, tax exceptions, deductions, and similar practices*" (Erdem et al., 2021: 151). In Türkiye, tax expenditures began to appear in the literature at the end of the 20th century, and reports on them were prepared within the budget by the Revenue Administration in 2007, 2016, 2017, and 2018.

¹ Official Gazette of the Republic of Türkiye, N:25326, D:24.12.2003.

When examining tax expenditure practices around the world, it is known that there are both similarities and differences. Since countries have unique tax structures due to their sovereignty, the definitions, scopes, and calculation methods of tax expenditures can vary. Therefore, making an absolute comparison in this area is not possible. Some countries view tax expenditures as deviations from the tax system, tax losses, or tax privileges, while others consider them as an alternative to public expenditures. Additionally, some countries estimate tax expenditures at the central government level, whereas others also take into account tax expenditures at the local level (Bratić, 2006: 115; Kara, 2017: 44).

The methods used to estimate tax expenditures are the foregone revenue method, the realized revenue method, and the outlay equivalent method. The foregone revenue method is simple to apply, but it does not take into account changes in taxpayer behavior, making it relatively prone to error. In contrast, the realized revenue method considers behavioral changes, but it is not widely preferred because it is time-consuming and requires high-quality data. The outlay equivalent method estimates the amount of direct public expenditure that would be required to achieve the same level of benefit as the tax expenditure. Among these three methods, the foregone revenue method is the most commonly used in practice. In Türkiye, the foregone revenue method is also used to estimate tax expenditures (Gül, 2018: 67; Karaca, 2021: 274).

Tax expenditures are a popular policy tool because they are simpler than alternative policy instruments that a government might implement, and they face less bureaucratic opposition. Direct spending programs are subject to more detailed budgetary processes. In contrast, tax expenditures are designed, proposed, enacted, and supported by finance ministries, reducing the likelihood of criticism or obstruction by the finance bureaucracy. Tax expenditures often function as transfers directly provided by the government to individuals using government spending power. For a government that does not have to negotiate with other segments of society, this makes tax expenditures particularly attractive (Brooks, 2016: 86). Furthermore, tax expenditures are an effective way to provide certain state incentives. However, the increasing reliance of governments on tax expenditures for economic and social programs creates an institutional weakness in the design of existing budget processes. Newly implemented tax expenditures are not limited by budget spending targets and are only partially constrained by revenue targets. In many countries, tax expenditures are treated as a simple component of the budget and are often somewhat hidden. The low visibility of tax expenditures, compared to the spending programs they replace, affects not only public perception but also the perspectives of legislators in parliament (Kleinbard, 2010: 355).

Despite their benefits, tax expenditures have many negative characteristics and are generally complex in structure, so the intended results may not always be achieved as planned. In addition, once tax expenditures are enacted into

law, they may become permanent under pressure from interest groups. Even tax expenditures used for social welfare purposes can be exploited, especially by politically connected individuals, for unethical purposes such as favoritism toward friends and relatives. In this way, tax laws can be held hostage for personal gain (Horpedahl & Pizzola, 2012: 6–7).

Additionally, it is possible to argue that the revenue losses arising from tax expenditures are similar to traditional public expenditures. Moreover, since the implementation of public expenditures is subject to certain procedures, many countries have turned to tax expenditures due to difficulties in accurately identifying target groups and the excessive bureaucracy involved. At the same time, it is also known that there are countries that aim to reduce existing tax expenditures and simplify their tax systems.

The purposes and objectives of using tax expenditures vary from country to country. In developing countries, the goals of tax expenditures include reducing regional disparities in development, promoting economic growth and development, fostering technological advancement and industrialization, encouraging foreign investments, increasing employment and productivity, and similar aims. Developed countries, on the other hand, focus on objectives such as maintaining productivity growth, enhancing technology while preserving competitiveness, increasing capital accumulation, and preventing capital flight. Generally, around the world, the common aim of implemented tax expenditures is to protect certain individuals and income groups and provide tax advantages. For legal entities that form institutions, because they possess separate economic power, the main purpose of tax expenditures applied in corporate taxation is to promote and protect the development of certain sectors or areas through tax incentives (Buyrukoğlu & Demiray, 2022: 109–110).

Tax expenditures, as one of the instruments of tax policy, are frequently applied for economic, fiscal, social, and political purposes due to their functions, such as ensuring economic and social balance in the country, increasing investments, promoting equity in income distribution, and preventing double taxation arising from the structure of earnings. In this context, the study first examines economic objectives. There is a significant connection between the items of tax expenditures implemented periodically by governments, such as tax exemptions, tax exceptions, tax deductions, reductions in tax rates, and tax deferrals, and the functions of taxation. Since the 1929 Great Depression, which marked the emergence of an interventionist state or interventionist fiscal approach, various fiscal instruments, primarily public expenditures and taxes, have been frequently used by states to address disruptions and irregularities in economic and social life (Biber, 2008: 60).

Like taxes, tax expenditures are included in countries' tax laws, implemented through legislation, and can be repealed through legal changes. Therefore, tax expenditures involve the government consciously forgoing tax revenues. Through

tax expenditure policies, various measures are employed, such as supporting specific economic activities, implementing practices aimed at ensuring economic stability, interventions to expand production capacity, maintaining external balance, and reducing income distribution imbalances among social groups.

The view that economic growth can be achieved through tax deductions included in tax expenditures emerged with the Supply-Side Economics movement at the end of the 1970s. During this period, in contrast to demand-side policies, Arthur Laffer proposed the “tax cuts” policy as a solution to economic problems. By explaining the relationship between tax rates, total market output, and tax revenues, he argued that total market output and total tax revenues would increase through tax reductions (Aktan, 2009: 41). Various applications have been employed to demonstrate the positive effects of the relationship between tax deductions and economic growth on national economies. While practices vary by country in terms of income tax, they generally include measures such as deductions, rate differentiations, and incentives. Beyond growth objectives these privileges ensure that everyone bears a tax burden according to their ability to pay, thereby reducing the tax burden on individuals with low income levels (Güloğlu, 2005: 61).

In developing countries, the level of private savings is low, so the contribution of the private sector to economic development and growth is very limited. In this context, it becomes important for the public sector to intervene, provide certain privileges to specific groups, and support them. In this regard, tax expenditures become an important fiscal tool and can create significant effects if the economic activities to be supported are appropriately identified. When tax incentives are used in the right activity areas and in appropriate amounts, they can contribute to economic growth and development (Siverekli Demircan, 2003: 109).

One of the most frequently discussed issues regarding tax expenditures is the extent to which they serve their intended purpose. For example, while investments may be encouraged in some regions through tax policies, the opposite may apply in other regions. In this case, a tax incentive that does not influence decisions is considered an unnecessary tax expenditure. For instance, one of the most significant tax expenditures in the tax system is the investment deduction; however, considering deviations from its intended purpose, the losses arising from investment deductions in certain years have been substantial (Kara, 2019: 88). Another objective of tax expenditures is fiscal. The fiscal purpose of taxation is to generate public revenue sufficient to cover public expenditures. Achieving this fiscal objective requires a tax infrastructure capable of generating the necessary resources (Tekin, 2006: 302–303). A strong tax system should also include fiscal tools such as tax expenditures, which support certain groups through transfer payments, prioritize and incentivize research and development activities aimed at increasing production capacity, and contribute to economic

growth and development in the medium and long term, even if they impose a short-term burden on the budget.

Tax expenditures reduce collected tax revenues (or net tax revenue) and, like direct expenditures, disrupt the overall balance of the budget. As a result, when tax expenditures are reduced, net tax revenue will increase. It is more appropriate to define tax expenditures financed directly from the tax base as open-ended funds. Tax expenditures, unlike budget appropriations, are not periodically reviewed and can accelerate economic activity, which in turn may increase expenditures. For example, tax incentives provided to low- and middle-income individuals can lead to higher spending because these groups have a higher propensity to consume. The fiscal consequences of tax expenditures can include a reduction in net tax revenue and a lack of budgetary control (Swift, 2006: 8).

Tax expenditures can have economic objectives such as increasing foreign exchange inflows, attracting foreign capital, accelerating investments, and developing labor and capital markets, as well as social objectives such as protecting certain income groups and ensuring fairness and equality in taxation. When tax expenditures achieve their expected social objectives, they can help implement the principle of taxation according to the ability to pay, which is a key aspect of tax equity (Giray & Ömür, 2019: 74). In cases where it is not possible to balance the special circumstances of certain taxpayers and their tax bases with the general provisions of the tax system, it is possible to use tax expenditures to achieve the social purpose of taxation by granting special deductions, exemptions, or reliefs to these taxpayers or for certain tax matters (Özkara, 2004: 159–160). It should be noted that the primary rationale for socially oriented tax expenditures is to address social injustices. Requests for social assistance are sometimes directly expressed by citizens through various channels, while at other times, civil society organizations or international agreements take the lead.

Within the scope of tax expenditures, the introduction of new taxes, the abolition of existing taxes, changes in tax rates, and issues related to taxation techniques under exemptions and exceptions influence tax policy decisions made in the political process. The tax policies being considered can aim at resource and income distribution, economic growth and development, and economic stability, or they can be policies directed at voters during election periods.

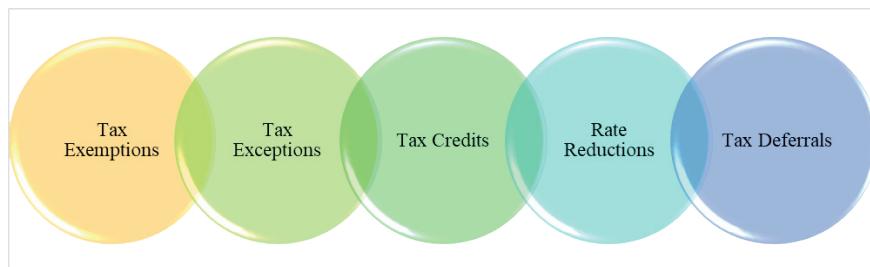
Tax policies chosen by politicians according to their short- and long-term goals produce different outcomes over time. When the approach of reducing public expenditures and taxes is adopted, positive results may be achieved in the short term. However, in the long term, while tax revenues decrease due to tax expenditures, public spending simultaneously rises indirectly, creating a fiscal illusion (Kayalidere & Mastar Özcan, 2012: 344). This situation, which appears favorable to voters focused on short-term results and encourages them to support the politician, can ultimately return as a higher tax burden in the long

term.

3. TYPES OF TAX EXPENDITURES

While the state uses the tax revenues it collects for public expenditures, a portion is set aside for social and economic purposes through tax exemptions. Public expenditures are made to provide public services and achieve economic and social objectives, with taxes being the primary source of financing. The system of tax expenditure practices functions as a type of indirect transfer to individuals and institutions that help achieve these objectives. The types of tax expenditures are shown in Figure 1.

Figure 1. Types of Tax Expenditures



Source: (Heady & Mansour, 2019: 2).

Not all tax privileges can be classified as tax expenditures. Some tax privileges are considered structural features of the tax system. For example, low-income individuals pay taxes at a lower rate than high-income individuals. To classify such a privilege as a tax expenditure, it must be outside the standard framework of the tax system and be considered an alternative to public spending. Since tax exemptions and exceptions exist in all types of taxes, it is also possible to find tax expenditures across all taxes. The critical and key concept in defining an exemption or exception as a tax expenditure is that it remains “outside the standard of the tax system” (Erdem et al., 2021: 151).

In theory, the concept of tax expenditure predominantly refers to positive tax expenditures. In practice, when the term tax expenditure is used, it generally refers to positive tax expenditures. Tax expenditures usually arise in the form of deductions for certain items in the calculation of taxable income or the partial or full exemption of certain incomes (Brown, 1993: 1).

Negative tax expenditure refers to the collection of a higher amount of tax from individuals or institutions than would normally be required under the “standard” application of tax laws for a specific tax revenue source (Erdoğan, 2022: 18). A common issue that arises in the calculation and modeling of tax expenditures is negative tax expenditures. When reduced tax rates are considered as tax expenditures, it is also recognized that higher-than-normal tax rates constitute negative tax expenditures. Since one of the

main objectives of tax expenditure reports is to increase the transparency of fiscal policy, including negative tax expenditures in these reports makes an important contribution to this goal. In cases where the revenue impact of this special application is known and measurable, reporting such revenues under tax expenditures is more appropriate and provides a clearer picture of the total amount of tax expenditures (Hutton, 2010: 3).

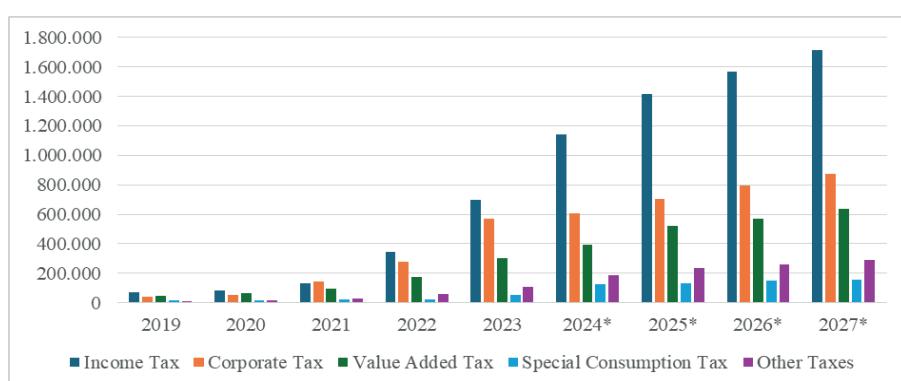
4. THE COURSE OF TAX EXPENDITURES IN TÜRKİYE: AN EXAMINATION OF THE POST-PANDEMIC PERIOD

The foundation of the concept of tax expenditures generally lies in the government's decision not to collect taxes in order to achieve economic, social, and environmental objectives. Tax expenditures reduce taxpayers' obligations due to preferential treatments offered to certain taxpayers while simultaneously causing revenue losses for the government. Based on this, for a practice to be classified as a tax expenditure, there must be economic, social, or environmental objectives; a tax that is foregone in line with these objectives; and, as a result, preferential treatment must be provided to certain taxpayers, allowing them to pay less tax (Vergi Harcamaları Raporu, 2024: 7–8).

Tax expenditures are used as an active policy tool in many developed and developing countries and, in Türkiye, they are an important fiscal instrument for achieving various economic and social objectives, particularly macroeconomic goals. In Türkiye, significant progress has been observed in the area of tax expenditures, especially since the early 2000s (McDonald, 2010: 63). While tax expenditure reports were previously prepared irregularly under the Ministry of Treasury and Finance, after 2020 they came under the Revenue Administration and became a policy document regularly shared with the public.

The study aims to reveal the status of tax expenditures provided to taxpayers in Türkiye for various reasons, primarily economic and social objectives, particularly in the post-COVID-19 pandemic period. Within this scope, tax expenditure reports published in 2020 and thereafter were examined in detail, and figures related to Türkiye-specific data were created.

Figure 2. Tax Expenditure Amounts by Type of Tax in Türkiye,
2019–2027 (Million TL)



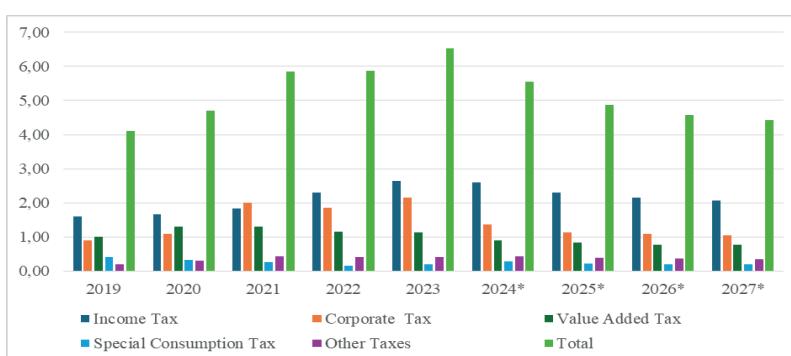
Source: Prepared by the authors based on tax expenditure reports

*Shows estimated data.

Figure 2 shows the amounts of tax expenditures in Türkiye for the period 2019–2027. As observed in Figure 2, tax expenditures exhibit a consistent upward trend. On one hand, incentive policies implemented to mitigate the adverse effects of the pandemic, and on the other hand, the economic context dominated by high inflation, have led to an increase in total tax expenditure amounts. When examining the distribution of tax expenditures by type of tax, the largest share is seen in income tax. This is followed, in order, by corporate tax, value-added tax (VAT), special consumption tax (SCT), and other taxes. The data for 2024 and beyond shown in the figure are estimates; however, statistical calculations indicate that they generally align with the overall increasing trend of tax expenditures. Therefore, it can be seen that in Türkiye, especially in the post-pandemic period, tax expenditures have been actively used as a fiscal policy tool, and this trend is expected to continue in the coming years.

Furthermore, the increasing use of tax expenditures by the government in specific taxes such as income tax, corporate tax, and VAT can be interpreted as an indication that politicians aim to prioritize the non-fiscal objectives of taxation such as promoting employment, production, and growth over the medium term (Yoruldu, 2021: 146). Indeed, in Türkiye, tax expenditures were employed as a policy tool to address the effects of the COVID-19 pandemic. During this period, various measures were taken to mitigate the negative impact on taxpayers and protect them, including revisions to filing, reporting, and payment deadlines (Özcan, 2020: 348).

Figure 3. Ratio of Tax Expenditure Amounts to GDP by Tax Type in Türkiye 2019-2027 (%)

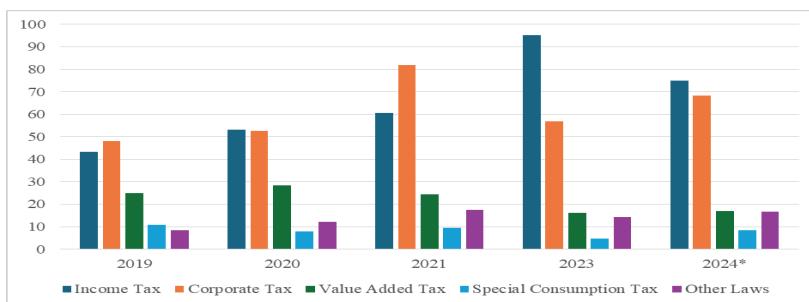


Source: Prepared by the authors based on tax expenditure reports

*Shows estimated data.

Figure 3 shows the ratio of tax expenditures to Gross Domestic Product (GDP) in Türkiye for the period 2019–2027. The ratio of tax expenditures to GDP is an important indicator for understanding their share within national income (Eriçok, 2019: 343) and highlights trends in tax expenditures in the country. This ratio was 4.11% in 2019 and exhibited a continuous upward trend, reaching 6.52% in 2023. According to estimated data for 2024 and beyond, the ratio is expected to decrease to around 4.42%. When examining the ratio by type of tax, income tax has the largest share, followed by corporate tax, VAT, other taxes, and SCT. The shares of each tax type in GDP are proportional to the absolute amounts shown in Figure 2. The fact that an amount nearly reaching 7% of the national income is presented to taxpayers in the form of privileged practices in other words, the relinquishment of collection through tax expenditures, demonstrates the significance of tax expenditures as a potent policy instrument in Türkiye.

Figure 4. Ratio of Tax Expenditures to Collections of the Same Tax Type in Türkiye 2019–2024 (%)



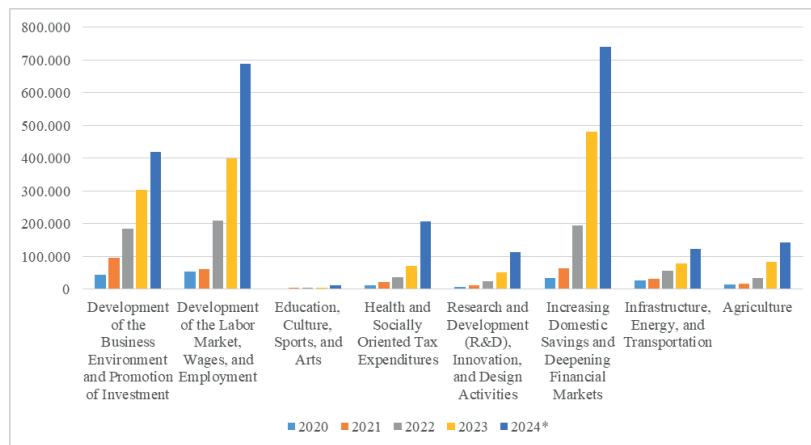
Source: Prepared by the authors based on tax expenditure reports

*Shows estimated data.

Figure 4 shows the ratios of tax expenditures to the collections of the same tax type. Accordingly, in 2019, tax expenditures accounted for 43.3% of collected income tax, 48% of corporate tax, 24.8% of VAT, 10.8% of SCT, and 8.4% of other tax types. When examining the relevant data, it is notable that significant jumps in tax expenditures, especially for income tax and corporate tax, occurred during the years when the economic effects of the COVID-19 pandemic were evident (2021–2023). In fact, in 2023, tax expenditures amounted to 95% of the collected income tax and 57% of the corporate tax.

Tax expenditures were first presented by tax type in the tax expenditures report published in 2007, without being subjected to any functional or sectoral classification. On the other hand, in tax expenditures reports prepared from 2018 onwards, data also began to be compiled according to sectoral/functional classifications.

Figure 5. Distribution of Tax Expenditures by Function in Türkiye 2020-2024 (Million TL)



Source: Prepared by the authors based on tax expenditure reports

*Shows estimated data.

Figure 5 illustrates the functional distribution of tax expenditures. It is observed that the tax expenditure reports compile data across eight different functions. In this context, when examining the functional distribution of tax expenditures, it is evident that functions aimed at economic objectives such as promoting business development and increasing investments, improving the labor market, supporting wages and employment, and enhancing domestic savings and financial market deepening account for a significant share. On the other hand, although representing a smaller share, tax expenditures are also allocated to areas such as education, culture, sports and arts, health and social purposes, infrastructure, energy and transportation, R&D, innovation and design activities, and agriculture. Overall, Figure 5 indicates that the government implements tax expenditures across eight functional areas, with particular emphasis on sectors that support the functioning and stimulation of economic activity.

Table 1. Major Factors Contributing to Tax Expenditures by Tax Type in Türkiye (2024*)

	Total (Million TL)	Share (%)
TAX EXPENDITURES IN INCOME TAX IMPLEMENTATION		
Income Tax Law	1.096.239	100%
-Minimum Wage Exemption	640.003	58.3%
-Taxation of Certain Securities and Other Capital Market Instruments under Provisional Article 67	159.955	14.5%
Total (%)		72.8%
TAX EXPENDITURES IN CORPORATE TAX IMPLEMENTATION		
Corporate Tax Law	510.474	100%
-Exemption on Earnings of Investment Funds and Partnerships	230.689	45.1%
-Reduced Corporate Tax Incentive	126.909	24.8%
Total (%)		69.9%
TAX EXPENDITURES IN VALUE-ADDED TAX IMPLEMENTATION		
Value-Added Tax Law	391.591	100%
-Deliveries of Feed and Fertilizer	82.260	21%
-Deliveries of Bullion Gold and Silver, Capital Market Instruments, and Scrap and Waste	32.284	8.2%
-Leasing of Real Estate Not Included in Economic Enterprises	31.997	8.1%
-Exemption for Tax-Exempt Professionals and Small Farmers	30.636	7.8%
Total (%)		45.1%
TAX EXPENDITURES IN SPECIAL CONSUMPTION TAX IMPLEMENTATION		
Special Consumption Tax Law	122.656	100%
-Vehicle Purchase Exemption for Persons with Disabilities	99.336	80.9%
-SCT Rate Reduction on Fuels Used in Air Transportation	7.397	6%
Total (%)		86.9%
OTHER LAWS	179.248	100%
-Exemption from Banking and Insurance Transactions Tax (BITT) on the Issuance of Shares, Bonds, Promissory Notes, and Certificates	53.490	29.8%
-Transactions of Investment Funds and Partnerships	54.750	30.5%
Total (%)		60.3%

Source: It was prepared by the authors based on the 2024 tax expenditure report.

*Shows estimated data.

Table 1 presents the most significant tax expenditure factors for each tax type based on the estimated data for 2024. In other words, it shows the factors that account for the largest share of tax expenditures under income tax, corporate tax, VAT, SCT, and other laws, separately for each law. For 2024, the two factors within the tax expenditures provided under the Income Tax Law account for 72.8% of the total income tax expenditure. These two factors are the minimum wage exemption and the taxation of certain securities and other capital market instruments under Provisional Article 67. In fact, the minimum wage exemption alone constitutes 58.3% of the total. From this perspective, it can be observed that a significant portion of the tax expenditures provided under the Income Tax Law aims to promote equity in income distribution (Güler, 2019: 143).

Under the Corporate Tax Law, nearly 70% of total tax expenditures are accounted for by the exemption on earnings of investment funds and partnerships and the reduced corporate tax incentive. For the VAT Law, it is evident that 45.1% of total tax expenditures consist of the deliveries of feed and fertilizer, deliveries of bullion gold, bullion silver, and capital market instruments as well as scrap and waste, leasing of real estate not included in economic enterprises, and the exemption for tax-exempt professionals and small farmers. Under the SCT Law, 86.9% of total tax expenditures are attributed to the vehicle purchase exemption for persons with disabilities and the SCT rate reduction on fuels used in air transportation. In particular, since 80.9% of this amount comes from the vehicle purchase exemption for persons with disabilities, it can be interpreted that the government aims to improve equity in income distribution by protecting disadvantaged groups. Finally, within other tax laws, 60.3% of total tax expenditures are composed of the exemption from BITT on the issuance of shares, bonds, promissory notes, and certificates, as well as transactions of investment funds and partnerships.

5. CONCLUSION

Tax expenditures refer to preferential practices provided by governments to achieve various objectives or to incentivize taxpayers in line with their policy goals. In this context, governments can use tax expenditures to influence the economy, the functioning of the social state, and political life. It is a well-known fact that taxes constitute the most important source of revenue for modern states. Therefore, foregoing such a significant source of income for various reasons is a matter of considerable concern for governments. Indeed, tax expenditures, which represent the tax revenues that governments waive to achieve their objectives, may lead to long-term negative effects on government budget balances. What is crucial here is the transparent, fair, and effective implementation of a tax expenditure mechanism designed according to government priorities. Consequently, a tax expenditure structure prepared

based on personal interest rather than economic and social considerations can clearly have adverse effects on the national economy in the long run.

This study examined the composition and structure of tax expenditures in Türkiye following the COVID-19 pandemic. In this context, tax expenditure reports prepared under the guidance of the Revenue Administration were analyzed in detail and illustrated with figures. It was determined that tax expenditures were carried out at significant levels during the relevant period in Türkiye. When examined by tax type, income tax was observed to constitute the largest share. The share of tax expenditures in GDP indicated that they hold an important place in the Turkish economy, with the relevant ratio rising to 6.52% in 2023. Looking at the share of each tax type in collections, the magnitude of tax expenditures under income and corporate taxes was again evident. Furthermore, when examining the functional distribution of tax expenditures, it was found that the most significant functions were economic in nature, including the promotion of business development and investment, improvement of the labor market, support for wages and employment, enhancement of domestic savings, and deepening of financial markets.

Finally, the factors constituting the largest shares of tax expenditures by tax type were examined. In this context, the most significant factor under the Income Tax Law was found to be the minimum wage exemption; under the Corporate Tax Law, the exemption on earnings of investment funds and partnerships; under the VAT Law, the deliveries of feed and fertilizer; under the SCT Law, the vehicle purchase exemption for persons with disabilities; and under other laws, the transactions of investment funds and partnerships. Based on these findings, it can be inferred that tax expenditures, particularly under income tax and SCT, prioritize equity in income distribution. In other words, the latest data indicate that tax expenditures in Türkiye have a role in improving income distribution. While this represents an important development for Türkiye, a tax expenditure structure designed to facilitate economic activity, prioritize disadvantaged groups, and remain free from personal interests is expected to serve as a driving force for long-term growth and development in the Turkish economy.

Future researchers, in order to examine the topic more comprehensively, could first analyze and evaluate the data by including the pre-pandemic period in Türkiye. Additionally, by comparing data from foreign countries with those of Türkiye, they could make various inferences about the share and importance of tax expenditures in Türkiye on an international scale.

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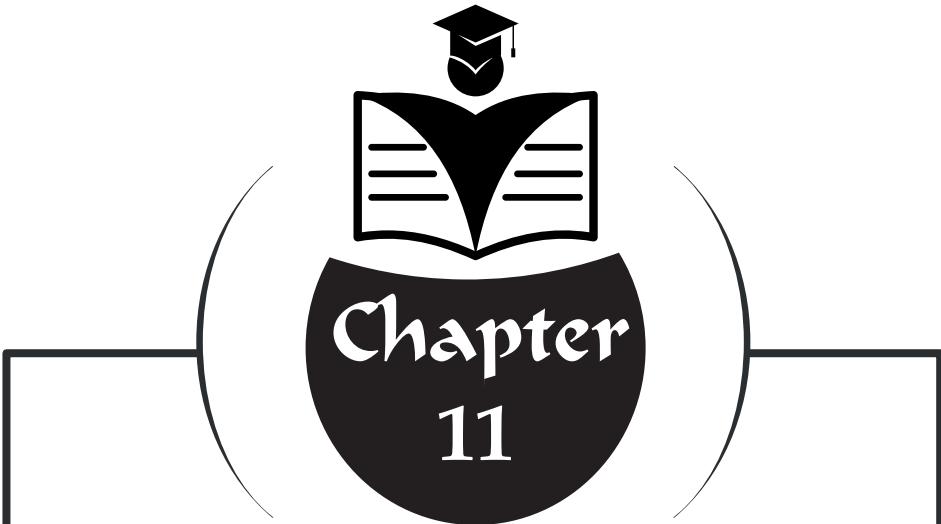
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DETERMINATION OF THE STUDENT- RELATED FACTORS AFFECTING ACCOUNTING STUDENTS' ACADEMIC ACHIEVEMENT

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Introduction and Literature Survey

In a globalizing world, one of the most important factors that enable countries to have strong economies is to have an effective education system in which a qualified workforce that provides added value to the economy is trained. The effectiveness and success of countries' education systems depend on the design and consistent execution of programs in secondary and higher education in accordance with the requirements of the age, developing information technologies, and the expectations of public authorities and market actors.

With the regulation made in the National Education system in 2012, students are required to complete 4 years of compulsory primary and secondary school education. Students who have completed their secondary education can continue their high school education in vocational and technical education programs affiliated to the Ministry of National Education. Vocational and technical education programs at high school level offer students two different education opportunities: formal and non-formal education.

Students in formal programs are subject to the same curriculum in the first year as students in other vocational high schools. Students choose departments according to their interests in the 10th grade and receive more specific training in their chosen field in the 11th and 12th grades. At the same time, in 12th grade students receive education at school two days a week and practice at enterprises three days a week. In this way, students can reinforce the theoretical knowledge they have received for three years by applying it in enterprises (Ministry of National Education, 2013). Students who have completed their secondary education and do not want to continue formal education can benefit from the Ministry's non-formal education programs by attending vocational open education or open education high schools.

The academic achievement of students enrolled in formal and non-formal education programs is determined by using methods such as written, oral, homework and practice. Students' academic achievement is affected by various factors and there are many studies on this subject in the literature. When these studies were analyzed, it was determined that three main factors, namely individual, family, and environmental factors, generally affect students' academic achievement (Arici, 2007: 9; Howie and Pietersen, 2001; Şevik, 2014; Wang, 2004). Individual factors can be explained under the headings of students' self-esteem, self-efficacy, academic motivation, and study habits (Dadlı, 2015; Klomegah, 2007; Özer ve Anıl, 2011; Şevik, 2014). While parents' attitudes, perspective on education, education and socio-economic status are considered as family-related factors, factors such as teachers' behaviors, attitudes towards the lesson, leadership of the school

administration and school culture are considered as environmental (school-related) factors (Arıcı, 2007: 25 ; Polat, 2009; Özer and Anıl, 2011; Dağdelen, 2013; Şevik, 2014). In this context, individual factors affecting the academic success of students are explained in detail below.

Self-Esteem: Self is the formation of an individual's awareness of himself/herself (Onur, 2014). Self-esteem can be explained as the judgment of worthiness, importance and respectability formed by the individual because of self-evaluation in general. When the studies in the literature are examined, it is seen that as students' self-esteem increases, their academic success also increases (Yavuzer, 1989; Baybek and Yavuz, 73; Trautwein et al, 2006; Özgüngör and Pakso, 2017; İşmar and Şehitoğlu, 2021).

Self-efficacy: Self-efficacy can be defined as people's belief in their skills and abilities to plan and implement actions that will enable them to achieve their targeted performance (Kotaman, 2008). An individual's level of self-efficacy significantly affects their efforts to achieve their goals, their level of motivation, their ability to persevere despite difficulties, and their ability to think analytically in every subject. The studies show that there is a positive relationship between an individual's self-efficacy level and academic achievement (Klomegah, 2007; Liu and Koirala, 2009).

Academic motivation: Motivation can be defined as the process that moves an individual towards achieving a certain object or situation (Budak, 2003). A student who has not been sufficiently motivated throughout his education life is likely to fail academically. Breen and Lindsay (2002), Neisi and Yamini (2010), Boyd (2002), Gottfried et al. (2001), Yüner (2020) examined the relationship between students' academic achievement and motivation and all studies found that as students' motivation increased, their academic achievement also increased. On the other hand, Seyis, Yazıcı, and Altun (2013) found no significant relationship between amotivation and academic achievement.

Study Habits: Study habits are defined as learning and using study techniques related to regular and systematic study, note-taking, remembering, repeating, preparing for exams, making use of written sources, concentrating attention on one point and problem solving. (Sarıer, 2016). Studies have shown that there are positive and significant relationships between students' study habits and academic achievement (Özer and Anıl, 2011; Patterson et.al., 2003).

Determining the factors affecting the academic achievement of students and the degree of impact of these factors enables the determination of the difficulties experienced in practice and the duties of families and public authorities in overcoming these difficulties. Therefore, in this study, it is aimed

to determine the student-based factors that affect the academic success of accounting students studying at vocational high schools. The study endeavors to answer following two important questions,

- What is the level of academic achievement, self-esteem, self-efficacy, academic motivation, and study habits of accounting students?
- Do accounting students' self-esteem, self-efficacy, academic motivation, and study habits affect their academic achievement? If there is an effect, to what extent are students' academic achievement affected by these variables?

1. Model, Data and Methodology

This section explains the model, data, and data collection procedures of the study. This study uses the relational survey model, which is one of the general survey models evaluated within the scope of quantitative research methods. Survey model is the whole of the processes applied for the realization of learning and the development of desired behaviors in the individual, describing a past or present situation as it is. The general survey model is surveying on the whole universe or a group of samples to be taken from it to make a general judgment about the universe in a universe consisting of many elements. The relational surveying model, on the other hand, determines whether two or more variables change together, and if a change is observed, how and to what extent this change occurs (Karasar, 2011). The study employs the following model to analyze the relational survey model:

$$Grade_i = a_0 + a_{1i}SelfEst_i + a_{2i}SelfSuf_i + a_{3i}Mot_i + a_{4i}StuHab_i + a_{5i}Income_i + \varepsilon_i \quad (1)$$

In equation (1), \bar{a}_0 is the constant term, \bar{a}_1 , \bar{a}_2 , and \bar{a}_3 are the coefficients of the independent variables, and ε is the error term, respectively. Moreover, $Grade$ is the students' academic transcript general point average. $SelfEst$ represents the students' self-esteem, $SelfSuf$ represents the students' self-sufficiency, Mot represents the academic motivation of students and $StuHab$ represents the students' study habit in their school. $Income$ is the control variable that could be affected the grade of students. The expectation about the coefficients of the variables used in the model is positive in parallel with the studies in the literature. The model does not include gender and age variables, as the students vary in a narrow range such as 15-17 years old and 63% of the sample consists of female students.

This study consists of a sample of accounting students studying at vocational high schools in Turkey. Due to the large number of scale questions to be applied regarding the factors affecting the academic success of accounting students and the difficulty of reaching the students studying in these schools throughout Turkey, the study was limited to the accounting students studying

at vocational high schools in Uşak in the 2024-2025 academic year. In the province of Uşak, there are two schools with accounting programs in the relevant academic year, and a total of 127 students are studying in this program. In the research, 113 of these students were reached and the questionnaire questions were applied one-to-one.

In the study, the overall success average refers to the grades that the students have received from all courses according to their classes, and this scale represents the academic achievement indicator. Information about the school, class, gender, and families of the students (educational status, income and living opportunities, etc.) was obtained with the Personal Information Form created. To obtain data on academic motivation, self-esteem, self-efficacy and study habits, scales with high validity and reliability were used in the national and international literature. These scales are briefly explained in the following section.

Academic Motivation Scale (AMS): Based on the autonomy theory, Vallerand, (1992) developed this scale to measure the students' answer to the question of "Why do you go to school?". The Academic Motivation Scale consists of 28 items (propositions). In these 28 items, the sub-dimensions of intrinsic motivation, extrinsic motivation and amotivation are measured separately. Participants give points between 1-7 for the propositions stated within the scope of the scale, and thus, the academic motivation status of the students is determined by ensuring that the sub-dimensions of the scale receive scores between 4-28. Cronbach's alpha coefficients measure the reliability of the sub-dimensions of this scale. Accordingly, it was determined that these coefficients varied between 0.62-0.91, and the correlation values calculated by the test-retest method ranged between 0.71-0.83 (Vallerand, et al., 1992).

Self-Esteem Scale (SES): The scale was developed by Morris Rosenberg in 1963 (Baybek and Yavuz, 2005). Today, the scale is used extensively in the fields of psychiatry and psychology as well as educational sciences. The Rosenberg Self-Esteem scale consists of 12 sub-dimensions: Self-Esteem, Continuity of Self-Concept, Confidence in People, Sensitivity to Criticism, Depressive Affect, Dreaminess, Psychosomatic Symptoms, Feeling Threatened in Interpersonal Relationships, Participation in Discussions, Parental Interest, Relationship with Father, and Psychic Isolation (Çuhadaroğlu, 1986).

In the calculation of the scale, different scores are used for the correct answer to each question in the Self-Esteem sub-dimension, while the other sub-dimensions are scored as 1 if correct and 0 if incorrect. The self-esteem sub-dimension consists of a total of 6 items and 10 questions. The questions are included in the scale sequentially, consisting of positive/negative statements. For example, there are three questions in the first item of the Self-Esteem sub-

dimension, and if the 2nd and 3rd questions are answered correctly, a total of 1 point is received. The scores obtained because of the answers given to the questions under the sub-dimensions of the scale show what these scores mean for the participants (Baybek and Yavuz, 2005). For example, those who score 0-1 have "high", those who score 2-4 have "medium" and those who score 5-6 have "low" self-esteem (Çuhadaroğlu 1986, Satılmış 1988). As a result of the reliability studies conducted based on the sub-dimensions of the Rosenberg Self-Esteem scale, the test-retest reliability level was 0.82-0.88; The internal consistency level, expressed as Cronbach's alpha, was found to vary between 0.77-0.88 (Çuhadaroğlu, 1986).

Çuhadaroğlu first and originally adapted the self-esteem scale developed by Rosenberg into Turkish in 1986 (Özgüngör, 2014). The reliability level calculated by the test-retest method of the scale adapted by Çuhadaroğlu (1986) was measured between 0.48 and 0.79 within the scope of the sub-dimensions, and the level of internal consistency was measured as 0.88.

Self-Efficacy Scale: The self-efficacy scale was developed to evaluate the ability of individuals to control their behaviors and events. General Self-Efficacy Scales, developed by Schwarzer and Jerusalem (1979) and Sherer et al. (1982), are scales with proven reliability and validity, which are frequently used in the fields of psychology and educational sciences. The scales can generally be applied to all individuals over the age of 12. In addition, a proficiency scale has been developed just to evaluate children's self-efficacy.

This study uses the self-efficacy scale developed by Muris (2001) to evaluate the social, academic, and emotional self-efficacy of children (adolescents) in the 14-17 age group. Social self-efficacy, which is the first sub-dimension of this scale, evaluates the level of children's awareness of their relationships with other children in the same age group and their assertiveness. The academic self-efficacy sub-dimension evaluates the level of realization of children's academic expectations. The emotional self-efficacy dimension of the scale evaluates the level of perception of children's ability to cope with the negativities they encounter in their emotional states. In the self-efficacy scale, there are 7 items each under each of the social, academic and emotional sub-dimensions, and there are 21 statements in total. It is expected that the participants will evaluate these statements as 5 points if they can achieve/make these statements very well, and 1 point if they cannot do it at all.

Thus, a participant can get a minimum score of 21 and a maximum score of 105 from the scale. A participant's high score indicates that his/her self-efficacy perception level is also high. The reliability analyzes of the self-efficacy scale based on sub-dimensions are between 0.85-0.88, which indicates that the reliability of the scale is at a high level (Muris, 2001; 2002).

While Muris (2001) and Muris (2002) tested the reliability of the scale by applying it in Belgium and the Netherlands, Telef and Karaca (2012) adapted the scale into Turkish in its original 21-item form. According to the study, the Cronbach's alpha reliability level of the scale was 0.86 for the overall scale; it varies between 0.64-0.84 at the level of sub-dimensions (Telef and Karaca, 2012).

Study Habit Scale: This study uses the Study Habit Inventory/Scale developed by Uluğ (1981) to determine the findings regarding the study habits of the participants. In the scale, there are a total of 60 statements, 50 of which are basic statements and 10 of which are control statements, to measure the level of study habits of the participants (Yiğit and Kaçire, 2015). Participants answer the statements about study behavior as "yes" or "no". Here, the scores for the study habits of the participants are calculated by subtracting the sum of the "no"s from the sum of the "yes"s given to the first 50 statements. As a result of filling the inventory, the participant can get a maximum of 50 points. This indicates that students' study habits are high (Eren, 2011: 48).

The reliability level of the study habits inventory is evaluated by Cronbach Alpha internal consistency and two-half reliability coefficients. According to the results of the analysis, the Cronbach Alpha value was calculated as 0.86 and the two-half reliability value as 0.84, and it was determined that the scale had high reliability (Yiğit and Kaçire, 2015).

2. Empirical Results

This section exhibits the results of frequency and regression analyses, respectively. The analyses contain of the students' both individual and scale data. This study employs the E-views 12 package program to estimate the relationship between variables used in the equation 1. Table 1 portrays the students' demographic variables analysis results.

Table 1. The students' demographic variables analysis results

Gender	Variables	Frequency Value	(%)	Number of People Living at Home	Variables	Frequency Value	(%)
					1 person	1	,9
	Female	72	63,2		2 people	2	1,8
Age	Male	42	36,8		3 people	19	16,7
	14	9	7,9		4 people	50	43,9
	15	26	22,8		5 people	30	26,3
	16	38	33,3		6 people	8	7,0
Class	17	37	32,5		7 people and more	4	3,6
	9th	27	23,7	Number of siblings	null	8	7,0
	10th	38	34,2		1	56	49,1
	11th	42	36,8		2	37	32,5
Mother and Father Married/Divorced	12th	6	5,3		3	9	7,9
	Living together	100	87,7		4	2	1,8
	Living apart	1	,9		5 and more	2	1,8
	Divorced	13	11,4				

Source: Author's compilation

Table 1 shows 63 % of the students is female and the range of age is between 15 and 17. The class distribution of students can be observed that distributed proportionally. In addition, it is observed that 87% of the students live with their parents, they generally have a nuclear family of 4-5 people, and they have 1 or 2 siblings. In addition to the personal characteristics of the students, the family environment and parental characteristics affect their academic success. Table 2 displays the family's' demographic variables analysis results.

Table 2. The family's demographic variables analysis results

Variables	Frequency Value	(%)	Variables	Frequency Value	(%)
Mother's Education			Income		
Illiterate	1	0,9	5.000 TL and low	2	1,8
Primary school	62	54,4	5.001 TL-10.000 TL	78	68,4
Middle school	28	24,6	10.0001 TL - 15.000 TL	18	15,8
High school	23	20,2	15.001 TL -20.000 TL	14	12,3
Father's Education			20.001 TL-25.000 TL	1	,9
Illiterate	2	1,8	25.000 TL and more	1	,9
Primary school	46	40,4	The state of having a personal study room		
Middle school	32	28,1	Yes	73	64,0
High school	30	26,3	No	41	36,0
Undergraduate	3	2,6	The state of having a personal computer		
Graduate	1	0,9	Yes	42	36,8
Mother occupation			No	72	63,2
Artisan	1	0,9	Buying newspapers/ magazines on a regular basis		
Housewife	83	72,8	Yes	3	2,6
works in the factory	21	18,3	No	111	97,4
Hospital personnel	1	0,9	Frequency of reading books		
Cashier	2	1,8	Every day	7	6,1
Greengrocer	2	1,8	several days a week	12	10,5
Secretary	1	0,9	once in 15 days	6	5,3
Cleaning personnel	2	1,8	once in a month	25	21,9
the tailor	1	0,9	once in 2 months	4	3,5
Father occupation			once in 3 months	11	9,6
municipal personnel	4	3,6	more than 3 months	0	0,0
religious officer	1	0,9	I don't read	49	43,0
Electrician	2	1,8	Who cares and supports me the most		
Retired	11	9,7	Mother	38	33,3
Artisan	13	11,7	Father	13	11,4
works in the factory	45	39,5	Both	26	22,8
Security	3	2,7	Siblings	10	8,8
map technician	1	0,9	Other	3	2,6
builder	6	5,3	Nobody	24	21,1
furnisher	3	2,7	Attending events and meetings at school		
Accountant	2	1,8	Mother	62	54,4
Operator	2	1,8	Father	14	12,3
Driver	10	8,9	Both	14	12,3
Repairman	7	6,2	Siblings	6	5,3
Cleaning personnel	1	0,9	Other	7	6,1
Wholesaler	2	1,8	Nobody	11	9,6

Source: Author's compilation

Table 2 shows approximately 70% of the parents of the students are primary or secondary school graduates, there are no university graduate mothers, and only 2.6% of the fathers are university graduates. Approximately 73% of the mothers of the students are housewives, and approximately 40% of their fathers' work in the factory. In addition, it is seen that the average income of the families of the students is below 20.000 TL and between 5001 TL and 10.000 TL. This situation shows the income of the parents from their professions is consistent with the work they have done. Moreover, the incomes of families generally reflect the minimum wage level at the time of analysis (May / 2023).

Table 2 also shows approximately 64% of the students have a study room of their own, but with the same answer, they do not have a computer of their own. There are also a number of questions to provide data on the intellectual background of students and their families and the importance they attach to their personal development. Accordingly, it is observed that 97% of the families do not regularly buy magazines and newspapers at home, 43% of the students do not read books/magazines, and 22% of the students who read books/magazines have a monthly reading frequency.

According to the results of the students' communication with their families, it is revealed that mothers are always interested in and support their children. 21% of the students stated that no one from their family members took care of them and supported them. According to their participation in activities and meetings at school, it is seen that mothers participate in activities and meetings at school on matters related to their children with a maximum of 54%. This can be explained by the participation of mothers in these activities and meetings, since fathers work during working hours and most of the mothers are housewives. Approximately 10% of the students stated that their families did not participate in the activities and meetings at the school.

Table 3 shows the descriptive statistics values of the variables (academic achievement status, self-feelings, self-efficacy, academic motivation, study habits, income) used in the analyzed model.

Table 3. The summary statistics

Variables	Observation	Mean	Std. Dev.	Min	Max
<i>Grade</i>	113	58,991	14,550	14	88
<i>SelfEst</i>	113	1,557	0,368	0,833	2,486
<i>SelfSuf</i>	113	60,345	13,590	26	105
<i>Mot</i>	113	25,719	7,627	7	47
<i>StuHab</i>	113	27,531	9,428	5	44
<i>Income</i>	113	10898,230	4120,246	1700	30000

Source: Author's calculations

Table 3 shows the students' grade average is about 60, which means they have a moderate level of achievement. The average of the academic motivation variable is 25, which indicates that the academic motivation of the students is at a high level. The fact that the average of study habits is approximately 27.5 shows that students have a moderate study habit. A mean value of about 1.5 indicates that students have a high level of self-sense, while a mean value of 60 indicates that students feel competent academically, socially, and emotionally at a moderate level.

Table 4. The correlation coefficients

	<i>Grade</i>	<i>SelfEst</i>	<i>SelfSuf</i>	<i>Mot</i>	<i>StuHab</i>	<i>Income</i>
<i>Grade</i>	1					
<i>SelfEst</i>	-0,165	1				
<i>SelfSuf</i>	-0,022	0,120	1			
<i>Mot</i>	-0,004	-0,027	-0,031	1		
<i>StuHab</i>	0,254	0,059	0,168	0,066	1	
<i>Income</i>	0,195	0,019	-0,048	-0,076	-0,046	1

Source: Author's compilation

Table 4 shows the correlation coefficients of variables. Accordingly, the highest level of relationship is between *StuHab* and *Grade* by about 25 % and positive. Also, there is a positive and meaningful relationship between *Income* and *Grade* by about 19 %. On the other hand, there is a negative and considerable relationship between *SelfEst* and *Grade* by about 16%.

Table 5 presents the regression analysis results. The results show there is a statistically significant impact of *income*, *StuHab*, and *SelfEst* on *Grade*. The *income* effect the *grade* by unit of 0.001 at 5% significance level. The *StuHab* impact on the *grade* by unit of 0.435 at 1 % significance level. The *SelfEst* influences the *grade* by unit of -7.182 at 5 % significance level. Other variables have not any effect on the *grade* significantly.

Table 5. OLS estimation results

Dep. Variable: <i>Grade</i> Variables	Coef.	Std. Err	t-Stat	Prob.
<i>Income</i>	0.000737	0.000318	2.319304	0.0223
<i>StuHab</i>	0.434579	0.140672	3.089306	0.0026
<i>Mot</i>	-0.023732	0.171793	-0.138143	0.8904
<i>SelfEst</i>	-7.181602	3.568348	-2.012584	0.0467
<i>SelfSuf</i>	-0.040430	0.098001	-0.412548	0.6808
<i>C</i>	53.22740	10.12836	5.255281	0.0000
<i>R-squared</i>	0.143082			

Source: Author's compilation

According to the table 5, the most efficient variable is self-esteem variable. This effect is negative. Although the negative relationship between academic achievement and sense of self indicates that there is an inverse relationship between these two variables, low total scores in Rosenberg's Self-Esteem scale indicate high self-esteem and high total scores indicate low self-esteem. Thus, this result can be stated that as individuals' self-esteem increases, their academic success will also increase. Study habit variable is the second efficient variable. It can be said that if a student study more, grade will high. These results are in parallel with the theoretical expectations and the previous studies in the literature (Yavuzer, 1989; Baybek and Yavuz, 73; Trautwein et al, 2006; Özgür and Paksoy, 2017; İşmar and Şehitoğlu, 2021; Özer and Anıl, 2011; Patterson et.al., 2003).

In the study, some diagnostic tests were performed to determine the validity of the estimated model and variables used in the OLS methodology. Table 6 displays the diagnostic test results. According to these results, there is not any autocorrelation, heteroscedasticity, and normality problem. It is seen that the normality condition is also provided according to the Jarque-Bera test result. Ramsey reset test shows there is not any specification problem in the model. Finally, Figure 1 pictures the Cusum test and the CusumSQ test results. Accordingly, there is not any stability problem in the coefficients due to the test statistics in between the critical levels.

Table 6. The diagnostic test results

Tests	Stats. / Prob.
Jarque-Bera Normality	7,477 (0,023)
Serial Autocorrelation LM Test	0,674 (0,512)
Heteroskedasticity Test: Breusch-Pagan-Godfrey	2,232 (0,056)
Ramsey Reset	0,095 (0,759)
Cusum	Stable
Cusum SQ	Stable

Source: Author's compilation

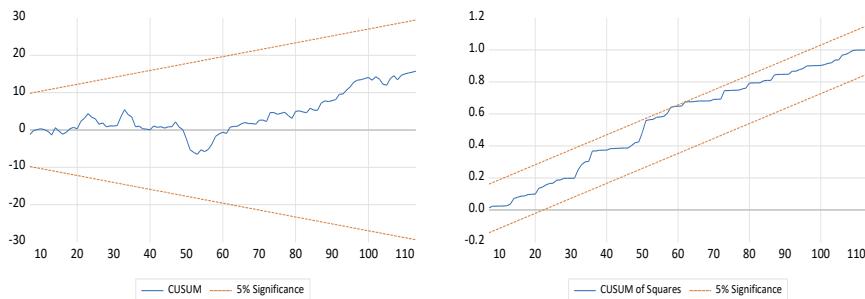


Figure 1 The cusum and the cusum square test result

Source: Author's compilation

3. Conclusion

The study analyzes the personal factors affecting the academic success of accounting students studying at vocational high schools in Uşak. The analysis includes students' self-esteem, self-efficacy, academic motivation, and study habits variables. According to the frequency analysis results, it was revealed that while the academic achievement, study habits and self-efficacy of the students were at a moderate level, their academic motivation and self-esteem were at a good level. Correlation analysis reveals a direct proportional relationship between students' academic achievement, sense of self, study habits and income, consistent with theoretical expectations.

The most critical finding in the study is that the academic achievement of the students was mostly affected by their self-esteem. According to another important result of the study, study habits affected the academic achievement of students at a high level. On the other hand, it was observed that the income level of the families of the students was positive on their academic achievement, but at a very low level, as expected. These findings obtained in the study are consistent with some studies in the relevant literature (Yavuzer, 1989; Baybek and Yavuz, 2005; Özgür and Pakso, 2017; İşmar and Şehitoğlu, 2021; Özer and Anıl, 2011; Patterson et al. 2003).

According to another result obtained in the study, it was seen that academic motivation and self-efficacy variables did not have a statistically significant effect on the academic achievement of students. While these findings are in parallel with some studies in the related literature (Seyis, et al. 2013), differs from some studies (Breen and Lindsay, 2002; Neisi and Yamini, 2010; Boyd, 2002; Gottfried, 2001; Yüner, 2020; Klomegah, 2007; Liu and Koirala, 2009).

As a result of this study, in which the significant effect of self-esteem and study habits on academic achievement is determined, families, school management and teachers have important duties in the childhood period when the personality structures of the students are formed and in the following

period. In this context, the results of the study present some important findings in increasing the academic success of students. Families can be provided with expert support to organize their communication with their children, counselor teachers can follow their students more closely, and roadmaps for individual and career development of the students by teachers and parents can be determined together.

Finally, the findings of the study are limited to accounting students studying at vocational high schools in Uşak. In this respect, this study is an important infrastructure for studies that can be developed for students studying in different programs in different provinces and vocational high schools.

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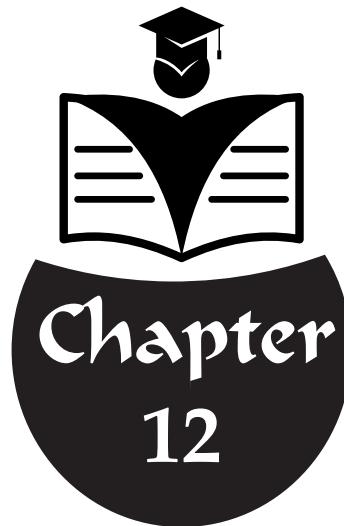
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BEHAVIORAL DESIGN IN THE CONTEXT OF PERSUASIVE TECHNOLOGIES: USER EXPERIENCE AND ETHICAL INTERACTIONS

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1. INTRODUCTION

The rapid rise of persuasive digital technologies in recent years has significantly increased the capacity of online systems to direct user behavior. In this context, behavioral design has assumed a strategic and important role in user experience (UX) research. Persuasive technologies are defined as systems that use persuasion-oriented design principles and social influence mechanisms to shape individuals' attitudes and behaviors (Adams et al., 2015). These systems, which have the potential to promote positive behavioral change, particularly in areas such as health and well-being, also raise ethical issues such as privacy, autonomy, and informed consent. Therefore, the limitations of persuasive technologies should be reevaluated within a perspective that prioritizes user well-being and ethical integrity (Beattie, 2021).

The rapid integration of persuasive technologies into various areas of daily life has enabled digital platforms to become tools that can systematically direct individual behavior. These technologies, used across a wide range of applications, from personal health applications to corporate behavioral regulation (Aldenaini et al., 2020; Al-Ramahi et al., 2017), make their power to shape behavior increasingly apparent and place significant responsibilities on designers regarding both behavioral effectiveness and the protection of user rights. In this context, the risk of powerful persuasion strategies unwittingly turning into manipulative processes necessitates that ethical considerations become an integral part of system design (Aldenaini et al., 2020).

In this context, digital behavioral engineering stands out as a discipline that systematically integrates behavioral science findings into technology design processes. Theoretical frameworks such as the Health Belief Model, the Theory of Planned Behavior, and the Transtheoretical Model of Change are applied to increase the impact of digital applications on user behavior (Naslund et al., 2017; Taj et al., 2019). Digital interventions developed using these theoretical models offer motivating experiences and deliver effective results aimed at goals such as increasing physical activity, reducing sedentary behavior (a lifestyle characterized by either no or irregular physical activity), and supporting mental well-being. However, the success of these applications depends not only on their behavioral effectiveness but also on the accurate understanding of user needs and the clear definition of ethical boundaries (Anagnostopoulou et al., 2018).

From an ethical perspective, the increasing amount of data processed by persuasive technologies; This raises fundamental concerns such as privacy, data security, and the possibility of manipulation (Frolova et al., 2022). The principles of autonomy, transparency, trust, and responsibility must be taken into account in the design of these systems, which have a high capacity to direct user behavior. Ethical guidelines developed in this direction provide

frameworks that ensure persuasive designs can be effective without violating user rights; they increase both the reliability and user acceptability of systems. Thus, technology becomes a tool that empowers the user, while the risks of coercive interactions are minimized (Janssen & Schadenberg, 2024). In this context, this research aims to examine how persuasive technologies affect the user experience in behavioral design processes and how they shape the ethical dimensions of these processes.

2. CONCEPTUAL FOUNDATIONS OF PERSUASIVE TECHNOLOGIES

The theoretical foundations of persuasive technologies are based on multilayered conceptual frameworks derived from the disciplines of behavioral science, cognitive psychology, and behavioral economics. Among these frameworks, the Fogg Behavior Model (FBM), behavioral manipulation strategies known as nudging and framing, and trigger design principles for triggering user actions stand out. Each theoretical approach offers comprehensive explanations of how user behavior can be systematically and effectively manipulated through technology (Idrees et al., 2024).

These theoretical approaches produce measurable impacts, particularly in the areas of health promotion, environmental sustainability, and financial self-management. A holistic approach to these theoretical approaches reveals not only the behavior-changing capacity of persuasive technologies but also the ways they shape the user experience and the ethical responsibilities they entail. Therefore, these frameworks enable designers to develop effective, sustainable, and ethically compliant user interactions (Pugatch et al., 2018).

2.1. Fogg Behavior Model

Developed by B.J. Fogg, the Fogg Behavior Model (FBM) proposes that motivation, ability, and triggers must exist simultaneously for a behavior to occur. The FBM provides a powerful conceptual framework for understanding user behavior by simplifying the complex interactions in the behavior change process. The model states that when motivation is high or the user possesses sufficient skill to perform the behavior, a well-formulated trigger can activate the behavior (Taj et al., 2019; Idrees et al., 2024).

The FBM's fundamental contribution to technology design is its clear demonstration of the conditions under which user-directed interventions will be effective. For example, in a mobile health app, motivation can be supported through gamification to increase physical activity, while the ability dimension can be strengthened by making the interface design user-friendly. Fogg also

proposed a design process that provides a systematic path from user needs assessment to application evaluation for developing persuasive technology (Al-Ramahi et al., 2017; Aldenaini et al., 2020).

The process envisioned by this model prioritizes personalization, taking into account the fact that users are not homogeneous and that behavioral responses can vary from individual to individual. Personalizing feedback mechanisms to increase user engagement is crucial. Feedback sensitive to user habits and motivational notifications strengthen the persuasive potential of systems (Kaptein et al., 2015; Anagnostopoulou et al., 2018).

2.2. Nudging and Framing

Nudging, a concept derived from behavioral economics literature, refers to subtle interventions that aim to direct individuals' behavior in a desired direction without limiting their freedom of choice. This strategy leverages cognitive biases to induce meaningful behavioral changes with small touches. For example, presenting healthy food at eye level in a cafeteria can lead to significant improvements in dietary habits (Guan et al., 2023).

The framing approach, on the other hand, emphasizes the impact of information presentation on user decisions and can work in conjunction with nudging. Positively framed messages are generally more effective in changing behavior. Presenting user progress through a positive frame in digital applications increases intrinsic motivation, supporting the sustainability of behavior (Milero & Forchheimer, 2024; Corbett, 2013).

Therefore, nudging and framing have become essential components of persuasive technologies due to their ability to manipulate user behavior through gentle interventions and play a crucial role in sustainable habit formation. However, prompts implemented without the user's consent or awareness can be perceived as manipulative. Therefore, technologies should be designed in a way that does not violate user autonomy, is transparent, and establishes trust (Cugelman et al., 2011).

2.3. Trigger Design

Trigger design refers to the structuring of reminders and alerts presented at the appropriate time, content, and context to trigger behavior. It is the design perspective application of the prompt component in FBM. Effective triggers can significantly support the target behavior when presented at the right time, in the appropriate format, and in the appropriate context for the user (Tiffany et al., 2018; Al-Ramahi et al., 2017).

Triggers can be designed as notifications, reminders, social interactions, or in-app prompts. For example, in a mobile health app, a trigger requesting a post-meal food record should be naturally integrated into the daily routine. Timing is a key variable in trigger design, and personalizing triggers and supporting them with systems that learn from context increases sustainability by facilitating user action (Cugelman et al., 2011).

Trigger design also carries an ethical dimension. Systems that send excessive notifications or constantly pressure the user into action can be considered manipulative. Therefore, designers should carefully determine the number, frequency, and context of triggers. When ethical boundaries are observed, triggers become powerful and responsible tools that increase the sustainability of behavioral change (Idrees et al., 2024).

3. APPLICATIONS OF BEHAVIORAL DESIGN IN DIGITAL ECOSYSTEMS

Behavioral design stands out as an interdisciplinary approach that is rapidly spreading across various areas of the digital ecosystem and aims to optimize user interaction. Various digital environments, such as social media platforms, health technologies, e-commerce systems, and educational technologies, systematically integrate these principles to guide user behavior and foster sustainable usage habits. Each context benefits from specific application modes of persuasive technologies (Idrees et al., 2024).

Each application area demonstrates the high adaptability and broad impact of behavioral design. However, the broadening scope of user guidance simultaneously increases the importance of ethical responsibilities and discussions related to user autonomy. This highlights the need for transparent mechanisms that prioritize user well-being in the design process (Mileros & Forchheimer, 2024).

3.1. Social Media

Social media is frequently highlighted as one of the digital platforms where behavioral design is most intensively applied. Platforms are integrating design tools such as notifications, social proof elements, gamification mechanisms, and personalized content feeds to increase user engagement and ensure continued participation. Highlighting content with high likes or shares, in particular, triggers users to engage more intensely based on the principle of social proof (Idrees et al., 2024; Mileros & Forchheimer, 2024).

Personalized content feeds, a central component of social media architecture, utilize data analytics-based feedback loops to offer user-specific recommendations.

User behavioral history, liking trends, and interaction patterns constitute the primary data sources for this personalization. This is consistent with previous research demonstrating the impact of feedback and tailored content recommendations on behavior change (Guan et al., 2023; Pugatch et al., 2018).

However, the ethical implications of these design elements are increasingly being debated. Users developing platform addiction, the attention economy obscuring user well-being, and the proliferation of manipulative interaction strategies pose significant risks to social media use. Therefore, the application of behavioral design in the context of social media should be evaluated within the framework of a balanced approach that not only aims to increase user engagement but also considers psychological well-being (Beattie, 2021).

3.2. Health Applications

Health technologies are one area where the capacity of behavioral design to positively shape user behavior is clearly observed. These applications aim to encourage individuals to adopt healthy lifestyles and are based on behavior change models such as the Fogg Behavior Model. For example, step counting, calorie tracking, and water consumption reminders are designed to increase user motivation and provide structures that facilitate the establishment of daily habits (Idrees et al., 2024; Wray et al., 2021).

Personalized feedback and gamification play a central role in behavior change processes in health applications. Applications analyze users' historical data to visualize their progress toward goals and deliver encouraging messages upon success. This approach, supported by gamification elements such as levels, rewards, reminder tasks, and achievement badges, facilitates user engagement with health goals (Guan et al., 2023; Bardus et al., 2015).

These methods play a motivational role, particularly in chronic disease management, and enable users to monitor their treatment progress more regularly. However, data privacy is crucial in healthcare apps. The high sensitivity of users' health information necessitates transparent consent processes for apps (Maimone et al., 2018; Tiffany et al., 2018).

3.3. E-Commerce

E-commerce platforms are a prominent application of behavioral design in guiding consumer behavior. Platforms extensively utilize strategies such as scarcity, urgency, social proof, and personalized recommendations to influence purchasing decisions. Statements like "Last 2 items left" or "120 people viewed this product" create psychological pressure on consumers, accelerating the purchasing process (Mileros & Forchheimer, 2024; Guan et al., 2023).

Personalized recommendation systems offer a dynamic shopping experience based on user behavior. User-specific recommendation streams are generated by analyzing past purchases, products added to carts, and review habits. Furthermore, product reviews, comments, and ratings serve as powerful social proof mechanisms that build perceptual trust in consumers and support purchasing decisions (Idrees et al., 2024; Aldenaini et al., 2020).

These approaches are effective behavioral design tools that increase consumer satisfaction and boost conversion rates on platforms. However, the ethical dimensions of behavioral design in e-commerce are the subject of intense debate. The blurring of boundaries in personalized advertising and the manipulative use of user data have the potential to undermine consumer autonomy (Beattie, 2021).

3.4. Educational Platforms

Educational technologies are also an important application area demonstrating behavioral design's capacity to make learning processes more interactive, motivating, and personalized. Gamification and feedback-based approaches, in particular, are among the design principles frequently used in educational environments. Students can manage their own learning processes more consciously thanks to tools that allow them to track their progress (Idrees et al., 2024; Wray et al., 2021).

Behavioral design not only increases individual motivation on educational platforms but also strengthens social interactions. Student comparisons, group work, and competitions leverage social influence to increase academic engagement. An important aspect of educational platforms is their ability to provide continuous feedback. Tools such as goal setting and learning journey maps allow students to monitor their progress (Nichols et al., 2020; Pugatch et al., 2018).

These applications strengthen students' intrinsic motivation, making the learning process sustainable. However, the high volume of child and young users in educational environments requires special sensitivity in ethical design. Issues such as data privacy, referral limits, and protection from manipulation are important in educational technologies (Idrees et al., 2024).

4. INTERACTION FROM A USER EXPERIENCE PERSPECTIVE

Evaluating interaction within the framework of user experience (UX) is one of the key components that determine the effectiveness of persuasive technologies. Interaction quality, attention management, and the delicate line between targeted behavior and user will directly shape the connection

individuals form with digital platforms. When these elements are examined holistically, it becomes clear how users are guided within technological environments and whether these guidance conforms to ethical standards.

4.1. Interaction Quality

Interaction quality describes the overall level of satisfaction users experience when interacting with persuasive applications. Elements such as usability, the functionality of feedback mechanisms, and emotional engagement directly impact user satisfaction and loyalty. High interaction quality facilitates user acceptance of suggested behavioral changes (Pugatch et al., 2018).

Emotional engagement constitutes one of the fundamental dimensions of user experience. Individuals' empathy with the platform, positive feelings, and feelings of support enhance the effectiveness of persuasive technologies. Research shows that positive emotions help users adhere more consistently to behavioral goals (Cugelman et al., 2011).

Poor-quality interaction experiences, on the other hand, can negatively impact motivation. Unfriendly interfaces, incomplete feedback mechanisms, complex navigation paths, or unnecessary process steps can undermine user trust and cause them to deviate from behavioral change goals. This can severely limit the effectiveness of persuasive technologies (Gemert-Pijnen et al., 2011).

4.2. Attention Economy

Attention economy is a concept based on users' limited cognitive capacity. In today's world, where digital environments are oversaturated with information, effectively managing user attention is a crucial responsibility of designers. In this context, designing eye-catching yet simple and understandable content is essential (Aldenaini et al., 2020).

Properly managing user attention in mobile applications is a decisive factor in achieving behavioral goals. Apps use notifications, reminders, or visual cues to guide users toward necessary actions. However, when these elements are excessive, user alert fatigue can occur, leading to the user abandoning the app entirely (Palmier-Claus et al., 2013).

However, attention economy is not limited to simply capturing attention; it is also about directing it in the right direction. From an ethical design perspective, it is crucial to protect users' attention from manipulative or coercive prompts. Every prompt or prompt presented should align with user goals and support decision-making processes (Guan et al., 2023).

4.3. The Boundary Between Intended Action and User Will

One of the most controversial aspects of persuasive apps is how the designer manages the boundary between the intended action and the user's genuine will. In some cases, prompts intended to change user behavior can be perceived as manipulative by the user. This situation can pose risks, even in areas focused on well-being, such as health and environmental sustainability (Wray et al., 2021; Vandormael et al., 2021).

User will is shaped by personal motivation, expectations, and the right to free choice. Intense nudges, coercive messages, or aggressive notification strategies implemented by designers without respecting user will can create user resistance. This resistance can lead to a complete reversal of user behavior; this phenomenon is described in the literature as "psychological reactance" (Aldenaini et al., 2020; Frolova et al., 2022).

At this point, transparency stands out as an important method. When users are clearly informed about why certain notifications are being sent, how their data is processed, and what purposes the prompts serve, trust in the design increases. Transparent and accountable design principles contribute to protecting user will (Neimeijer et al., 2021; Bardus et al., 2015).

5. ETHICAL CONSIDERATIONS AND DISCUSSIONS

Despite the high capacity of persuasive technologies to manipulate individual behavior, serious ethical debates arise regarding their use. These debates are particularly shaped by the distinctions between user manipulation, the relationship between information, transparency, and consent, and dark patterns and smart guidance. The lack of clear ethical principles allows for the proliferation of design practices that could violate user will, privacy, and autonomy.

5.1. User Manipulation

One of the fundamental ethical issues regarding persuasive technologies is the extent to which these systems can manipulate user behavior. In particular, targeting cognitive biases or emotional responses carries the potential risk of causing individuals to make decisions contrary to their own interests. This raises the question of whether user actions are truly based on their own will or are guided by the system's design (Cugelman et al., 2011; Idrees et al., 2024).

Research shows that manipulative design can undermine trust in technology by diminishing user autonomy. Designing systems solely for the purpose of increasing user interaction or maximizing economic benefit can lead to persuasive technologies deviating from their fundamental ethical goals

and the proliferation of practices that disregard user well-being. This poses serious ethical problems, particularly in trust-based fields such as healthcare, finance, and education (Pugatch et al., 2018; Aldenaini et al., 2020).

A key method for limiting the risk of manipulation is to develop comprehensive ethical frameworks that can assess the impact of design decisions in both the short and long term. Designers must develop ethical reflexes that question whether each intervention serves the user's interests. Tools that support behavioral change can only be considered ethical when they strengthen user autonomy (Idrees et al., 2024; Gemert-Pijnen et al., 2011).

5.2. Information, Transparency, and Consent

Transparency in persuasive technologies is crucial for users to understand the workings of the interventions presented to them. Failure to provide clear information to users significantly undermines the reliability of the technology, particularly when it creates uncertainty about how data is collected and for what purposes it is used. Undermining user trust also hinders the sustainability of persuasive effects (Mileros & Forchheimer, 2024; Cugelman et al., 2011).

Transparency is not limited to data disclosure; it also requires clear communication about the behaviors the technology encourages and the mechanisms by which it achieves this. When users are unaware of why an intervention is being offered and how it aims to influence their behavior, the interaction can be perceived as manipulative. Therefore, designers must provide clear and accessible explanations that enable users to understand the system's operation. Equally important as information is clear and informed consent. Simply granting users permission to process their data once is insufficient, as behavior manipulation is a continuous process. Therefore, consent mechanisms must be dynamic, updateable, and easily revocable by the user (Wray et al., 2021).

5.3. Dark Patterns and Smart Guidance

Dark patterns refer to manipulative design techniques that manipulate users into making decisions that are against their own interests. These design patterns typically involve practices such as hiding information, misleading guidance, or structuring decision options to the user's disadvantage. The fundamental problem with dark patterns is that organizational goals override user well-being (Vandormael et al., 2021; Aldenaini et al., 2020).

In contrast, smart guidance is an ethical guidance strategy that prioritizes user benefit and supports behavioral change. This approach encourages users to make informed decisions, transparently explains the operation of interventions, and strengthens user autonomy. Therefore, smart guidance represents a design

approach that aims to support the user without manipulating them (Aldenaini et al., 2020; Frolova et al., 2022).

Reducing ethical risks stemming from dark patterns requires collaboration among designers, policymakers, and researchers. The development of ethical guidelines, the dissemination of user-centered design principles, and the strengthening of oversight mechanisms facilitate the implementation of the smart guidance approach. In this context, smart guidance offers a balanced and ethical model for both inducing behavioral change and protecting user rights (Cugelman et al., 2011; Vandormael et al., 2021).

6. FUTURE PERSPECTIVE AND RESPONSIBLE DESIGN

The increasing prevalence of persuasive technologies in various fields necessitates the development of a forward-looking vision for the ethical design and implementation of these tools. Responsible design paradigms require the adoption of user-friendly guidance methods, the incorporation of good persuasion principles into design processes, and the creation of comprehensive ethical guidelines for designers. This perspective not only improves the user experience but also establishes solid ethical foundations that protect user autonomy, trustworthiness, and digital well-being.

The future-focused approach to be developed should offer a dynamic, user-centered, and ethically sensitive design approach in line with the pace of technological innovation. Because persuasive systems directly impact human behavior, ethical design criteria should be equally important to usability and security standards in the future of these technologies. This way, individuals interacting in a digital environment can be confident that they are guided in their own best interests.

6.1. User-Friendly Guidance

User-friendly guidance is a fundamental reference point for future persuasive system designs. This approach includes guidance mechanisms that do not manipulate the user but rather support behavioral change processes. User-friendly interfaces, transparent feedback mechanisms, and simple interaction flows enable individuals to interact with systems more confidently and consciously (Idrees et al., 2024).

Considering user psychology and motivations is crucial in designing persuasive guidance. Empathy-focused design approaches focus on understanding user needs and expectations, enabling more inclusive and human-centered interactions. Recognizing users' personal journeys increases engagement and commitment, leading to high-impact results (Guan et al., 2023; Pugatch et al., 2018).

These methods also require avoiding ethically problematic practices such as misinformation, unnecessary pressure, or emotional exploitation. Designers must prioritize protecting users' cognitive limitations, emotional sensitivities, and personal data. This approach fosters user trust and strengthens long-term acceptance of the technology (Milero & Forchheimer, 2024).

6.2. Principles of Good Persuasion

Good persuasion is a fundamental concept that enables persuasive technologies to induce behavioral change within ethical boundaries. This approach encompasses design principles that are informative, transparent, and respectful of user autonomy. Unlike manipulative nudge strategies, good persuasion encourages users to make informed choices based on their own values and goals (Frolova et al., 2022).

A key dimension of good persuasion principles involves clearly presenting the system's reasons for guiding behavior to the user. When the user understands why they are being guided to a certain behavior, they perceive this guidance as part of their own decision-making process, not as external pressure. This increases trust in the technology and ensures the retention of recommended behaviors (Aldenaini et al., 2020).

Furthermore, these principles lead to design requirements that consider individual differences. Because people's motivations, cognitive capacities, and behavioral tendencies differ, systems should provide personalized guidance, enabling users to make decisions that align with their lifestyles. As the digital ecosystem becomes increasingly complex, the importance of good persuasion principles will only increase in the future (Vandormael et al., 2021).

6.3. Ethical Guide for Designers

The evolution of persuasive technologies makes the ethical responsibilities of designers more visible and significant. Therefore, the development of comprehensive ethical guidelines for designers is an essential element of the future of responsible design. These guidelines should include standards based on avoiding manipulative dark patterns, strengthening user consent, and ensuring data privacy (Milero & Forchheimer, 2024).

One of the primary functions of ethical guidelines is to ensure that designers maintain a high level of ethical awareness in their decision-making processes. Incorporating ethical literacy into educational processes ensures that designers are equipped not only with technical skills but also with moral sensitivities that prioritize user well-being. Such training creates a sustainable culture that places people at the center of technology design (Nichols et al., 2020).

Ethical guidelines should also clearly define data security policies and provide mechanisms for users to effectively exercise their data rights. Finally, ensuring stakeholder participation in design processes, particularly integrating the views of vulnerable groups, allows for the early identification of ethical risks (Neimeijer et al., 2021; Taj et al., 2019).

7. CONCLUSION

In parallel with the rapidly expanding use of persuasive technologies, ethical design principles and responsible guidance strategies have become increasingly important. Beyond improving the user experience, protecting individual autonomy, trust, and digital well-being are among the fundamental goals of ethical design. User-friendly guidance mechanisms, empathy-focused design principles, and transparent feedback practices are important tools for ensuring behavioral change is both sustainable and beneficial to the user. Good persuasion principles prevent the potential harms of manipulative strategies and provide users with the opportunity for informed choice within an ethical framework. In this context, personalized guidance, consideration of user differences, and the establishment of transparent communication channels increase trust in technology and support the retention of recommended behaviors.

From a future perspective, the development of comprehensive ethical guidelines for designers plays a crucial role in building a culture of responsible design. These guidelines make strengthening user consent, safeguarding data privacy, and avoiding manipulative practices fundamental responsibilities. Furthermore, integrating stakeholder participation and the views of vulnerable groups into design processes allows for the early identification of ethical risks and the development of solutions focused on user benefits. Ultimately, it is clear that ethical standards for persuasive technologies should be given the same importance as usability and security criteria, and this holistic approach effectively contributes to the social acceptance and sustainable use of the technology.

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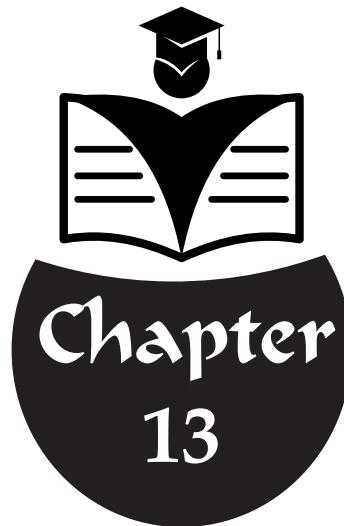
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THE ROLE OF THE ACADEMIC MANAGEMENT INFORMATION SYSTEM IN USER SATISFACTION

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INTRODUCTION

In this century, speed and accuracy are highly demanded in the business world, enabling businesses to compete very competitively. Management Information System is one of the most important components in an organization or company. This system is one of the most influential keys in the running of activities in an organization. Management Information System can facilitate business operations. This system can also assist all activities that occur within an organization. Information system technology is currently developing rapidly. This is in line with the diverse functions of technology and the large number of organizations or agencies that need information technology to support all their activities. In addition, the system within an organization can reflect the quality of the organization's management itself. Before the development of information technology, all organizations or companies provided services manually, and most used paper-based processes. However, over time, the use of paper in every company or organization began to decline. In order to manage all academic activities effectively, many companies and organizations have switched to using information technology, which has been replaced by computer-based electronic services.

The use of information systems is widely used in the business world, as well as in the world of education. Academics also need systems to support these institutions to compete in the world of education. In addition, systems can also help meet the desires and needs of students participating in education (Cravens, 2006). According to Davis (1989), a system that can help academic activities run smoothly is one that can receive data input and instructions, process data according to instructions, and produce output in accordance with previous instructions. Information systems can help academics or education to improve effectiveness by integrating business processes into the school's organizational structure (Utami, 2015). The purpose of an academic information system is to assist and facilitate all members of the academic community, such as students, teachers, and staff, to accelerate academic services (Abd Rasyid Syamsuri, 2024). User satisfaction is certainly a benchmark for an academic management system, because user satisfaction will be influenced by the academic services offered by the academic information system, especially since the majority of users of the system in academia are students.

One of the successes of implementing an Academic Management Information System is user satisfaction. This satisfaction is evident after users use the system, after which they can evaluate it. User experience is a factor that greatly influences user satisfaction. In addition to experience, the quality of services provided in the information system can also influence user satisfaction. Many important aspects can increase positive perceptions of the system, such as responsive services, available technical assistance, and the system's ability to resolve user problems.

Management Information Systems also greatly influence the overall performance of educational institutions, as these systems can accelerate services, improve coordination between units, and support better decision-making. Thus, Academic Management Information Systems are not just digital tools, but also have the potential to help improve the quality of educational services and the competitiveness of institutions. Based on the above statement, it is certain that the Academic Management Information System plays a significant role in influencing user satisfaction. Thus, this chapter will discuss in depth the factors that can influence user satisfaction with academic information systems.

THEORETICAL BASIS

1. Academic Management Information System

Academic Management Information System is a technology-based system that is deliberately created to collect, manage, process, and provide

Information related to academic activities in educational institutions. According to O'Brien and Marakas (2010), MIS is defined as an information system that uses computers and also presents information for decision making by processing data from various organizational functions. In educational institutions, Academic MIS facilitates many things such as filling out study plans, managing schedules, inputting grades, academic reporting, and administrative services for students. Thus, the information system in an academic setting not only serves as a data recording tool but can also become a central information tool that helps institutions run academic processes in a more integrated manner.

In addition, Turban, Volonino, and Wood (2015) argue that a Management Information System is a system capable of providing all information to all parts of management. This system not only helps and facilitates the leadership of the institution but is also very helpful for students, lecturers, and staff who play a role in the academic environment. Another view comes from Stair and Reynolds (2017), who emphasize that information systems are made up of interconnected components to process and disseminate information. This is very much in line with the information systems found in the field of education, which connect various parts of the campus, including student data, curriculum, financial administration, and other academic services. Thus, Management Information System can be defined as an information system found in an educational institution and based on computer technology with the aim of facilitating and supporting all academic operational activities effectively, efficiently, and in an organized manner. This system can also

support the provision of accurate, fast, and easily accessible information to all stakeholders in the higher education sector.

2. User Satisfaction

User satisfaction is an individual's perspective after interacting with an information system or service that has been used. Kotler and Keller (2016) provide the view that satisfaction is a feeling of pleasure or disappointment that occurs when the performance of a product or service is compared to user expectations. This means that when the performance of the system meets or exceeds user expectations, the user will feel satisfied. Conversely, if the performance of the system does not meet expectations, the user will feel disappointed. This refers to the extent to which academic information systems can assist users in their activities at higher education institutions.

Zeithaml, Bitner, and Gremler (2018) also argue that user satisfaction is an assessment of an individual's experience in using a service or system, which includes service quality, perceived benefits, and ease of interaction. In their explanation, they say that satisfaction does not only come from the technical functions of the system, but is also seen from the service process, including technical support capabilities and user comfort. Therefore, system stability, ease of navigation, and responsiveness of support services have a significant effect on user satisfaction with academic information systems. Thus, it can be concluded that MIS user satisfaction in an academic context is a psychological condition that occurs when users perceive that the system effectively meets their needs.

In relation to the system, customer satisfaction is an evaluative assessment. This assessment is conducted after a person or user of the system interacts directly with the information system. The aim is to determine the extent to which the system meets the needs, expectations, and preferences of users while completing tasks or interests within the system. User satisfaction in this context indicates the level of assessment of students, lecturers, or staff regarding the features, ease of use, reliability, and superiority of the system in supporting academic activities. There are many new studies that find that user satisfaction is a construct that has many aspects, such as cognitive categories (e.g., understanding the interface easily), emotional categories (feeling comfortable and trusting the system), and utilitarian categories (benefits and advantages in using the system). The factors that influence this satisfaction include system quality, information quality, service quality, and user experience during direct interaction with the system (Fatima, 2021).

3. System Quality

In the context of academic information systems, system quality is very important for the success of the system itself, as stated by DeLone and McLean (2003) that system quality can be assessed from various technical attributes, including Reliability, ease of use, and security. A high-quality academic system can be seen from its effectiveness in improving user experience by facilitating important activities such as course registration and access to publications. Reliable operations and an intuitive interface are important for maintaining user satisfaction (Laudon, 2016). Meanwhile, O'Brien and Marakas (2010) chose to explore system quality in greater depth by describing data processing and transaction management capabilities. They also stated that frequent disruptions are often caused by poor system quality, which impacts user satisfaction.

Many researchers have participated in expanding the understanding of system quality, such as Bodnar and Hopwood. They argue that system quality is the capacity of a system to process data accurately, produce correct and fast output, and maintain operational reliability (Bodnar, 2004). In addition, Stair and Reynolds (2017) also argue that system quality assesses the extent to which the relationship between system components can run effectively. They define system quality as the extent to which the system's capacity meets technical performance criteria while providing users with an efficient, secure, and easy-to-understand experience. Several aspects can determine the success of a system, including the integration of student data, grades, curriculum, and financial administration.

Lie et al. (Li X, 2022) also provide their opinion on system quality. They define system quality as the capacity of an information system to produce consistent, fast, error-free performance and a responsive interface to facilitate efficient user interaction. With the many views above, it can be concluded that system quality is a series of technical and functional attributes that determine reliability, stability, security, usability, processing speed, interoperability, and the system's ability to accommodate user needs. These broad definitions are relevant to the context of academic information systems, where the technical performance of the system is closely related to the user experience, academic operational efficiency, and the overall success of the system implementation.

4. Information Quality

Information quality is one of the important factors for users of academic systems in influencing user confidence in making decisions. According to David and Olson (1985), information quality in academic systems is viewed from the

accuracy, speed, relevance, and completeness of information provided through the system, such as announcements of class schedules and grade processing. Alter (2002) also explains that good information must be easy to understand and accessible. Meanwhile, Wang and Strong (1996) categorize information quality into four parts. The four dimensions include quality of truth and accuracy, relevance and timeliness, clarity and consistency of format, and ease of access. In an academic environment, these four dimensions can provide a more comprehensive understanding of information quality. Data collection and processing methods can also affect information quality, so verification and validation are necessary to maintain accuracy (Gelinas, 2012). Ultimately, information quality is the main determinant in determining the effectiveness of systems that support all academic activities.

Inaccurate and inconsistent information in the system will affect the effectiveness of the system and cause user dissatisfaction. In this context, the system is not the only thing that determines the quality of information. There are also other indicators, such as the data input process, internal verification procedures that ensure accuracy, and data consistency (Stair R. &., 2017). Similarly, Bodnar and Hopwood (2004) argue that information quality is greatly influenced by several factors, such as data integrity, system control, and the accuracy of the display format, which enables users to process and understand information clearly. In recent years, many studies have shown that the concept of information quality is contextual and focuses on user needs. Therefore, Taleb et al. (2023) proposed the concept of semantic completeness, which assesses the extent to which information maintains semantic consistency and avoids conflicting interpretations within an organizational unit.

On the other hand, Li et al. (2022) proposed the concept of context-dependent relevance, which emphasizes that high-quality information is information that is only relevant to the specific needs of users at a certain time. Other studies also emphasize the dimension of data veracity, which is the aspect of authenticity and resilience of data against distortion, which is increasingly important in a dynamic digital environment. By combining the definitions put forward by the experts above, it can be concluded that information quality is the level of accuracy, relevance, completeness, consistency, timeliness, clarity of meaning, and reliability in facilitating decision-making for users. Quality information will have an impact and can increase user productivity while strengthening trust and satisfaction with the system.

5. Service Quality

In the context of academic information systems, service quality is an important aspect for user satisfaction and long-term use of the system. In

addition to technical support, service quality in an academic environment also includes guidance on system usage, availability of accurate information, timeliness of service, and ease of obtaining assistance. In the information system success model proposed by DeLon and McLean (2003), they state that service quality is one of the important variables in the model, along with system quality and information quality. Good service quality can increase user trust and perception, thereby encouraging system users to continue using MIS. System users will feel more satisfied if the system is provided quickly, staff are able to answer questions clearly and comprehensively, and the system is supported by easily accessible assistance services.

In higher education, service quality is considered good if it includes the provision of training, online resources, and clear information about system changes or disruptions. Therefore, good service quality will affect the user experience, increase MIS utilization, and effectively strengthen academic operations. This feature significantly affects user satisfaction and can influence the sustainability of system usage, especially in organizational environments that are highly dependent on digital technology. The definition put forward by Zeithaml, Parasuraman, and Berry (2006) emphasizes that good service is not only seen through technical support, but also assessed through service provision attitudes, communication skills, and concern for user needs. Recent studies have found that service quality in digital systems has evolved into a more interactive and user-oriented platform.

Prentice (2021) identifies the concept of *co-produced digital service quality*. This concept occurs through cooperation between two parties, namely service providers and users. This shows that users are not only recipients of assistance, but also active parties who provide feedback and contribute to maintaining system quality. In higher education, it has also been found that a good quality service is one that is able to increase user trust, system usage effectiveness, and user comfort when interacting directly with the system. This can affect user satisfaction with the academic information system (Aldholay, 2018). Service quality is one of the aspects that facilitates the efficient functioning and operation of the system and is a major factor in the success and sustainability of an academic information system.

DISCUSSION

1. The Concept of Academic Management Information System

Academic Management Information System is a system designed to manage educational processes in an integrated manner, such as academic administration, student registration, scheduling, grade management, and

information services for the academic community. The role of the academic system is very important due to the increasing need of educational institutions for this system because it can provide fast and accurate academic services and is even easier to use because it is technology- based. With this in mind, many have studied and discussed the relationship between Academic Management Information Systems and user satisfaction.

Academic Management Information Systems, conceptually, lead to the use of information technology to improve educational services, such as effectiveness, efficiency, and service quality. Academic processes will run more structured, transparent, and measurable with integration. With accurate, fast, and easily accessible data integration for users through the academic information system, this will simplify administrative processes and improve service quality (I Gusti Ngurah Agung Suaryana, 2016). According to Utomo, Ardianto, and Sisharini. Management Information Systems do not only depend on technical capabilities in processing data, but also on expertise in presenting information that is relevant, timely, and easy to understand. This is in line with the main components of Management Information Systems that directly affect user satisfaction levels. These components are system quality, information quality, and service quality.

MIS in the context of higher education is considered a strategic tool that can facilitate planning and decision making. A high-quality information system can improve the efficiency of academic operations (Melgis, 2023). A good system not only supports one aspect or routine academic process, but many aspects such as work analysis, curriculum planning, learning evaluation, and academic reporting. In addition, this system also plays a role in improving the user experience. An effective system that is easy to use, responsive, and reliable can increase user satisfaction, thereby encouraging them to take full advantage of the features offered in the system (Azzahra, 2022). One important indicator of a system's success is user satisfaction. This shows that the implementation of MIS can effectively meet the information needs of users.

Based on the above explanation, it can be seen that the Academic Management Information System is a tool that is very much needed by an educational institution with the aim of processing data and academic services quickly, accurately, and in an integrated manner, as well as maximizing the quality of information services. Good academic MIS management can improve the quality of education and the competitiveness of the institution.

2. Information System Success Model (DeLone & McLean IS Success Model)

The most commonly used model for analyzing the success of an information system is the DeLone & McLean IS Success Model. This model was first introduced by DeLone & McLean and then revised in 2003.

This model has six dimensions that can influence the results and success of an information system. The dimensions proposed by DeLone & McLean are System Quality, Information Quality, Use, User Satisfaction, Individual Impact, and Organizational Impact (DeLone, Information Systems Success: The Quest for the Dependent Variable.3(1), 1992). According to this concept, user satisfaction and system usage are influenced by system quality. User satisfaction and usage will also be influenced by information quality. Individual Impact will ultimately be influenced by usage and user satisfaction, while Organizational Impact will ultimately be influenced by the accumulation of Individual Impact. The six variables are interrelated. According to William H. DeLone and Ephraim R. McLean, the overall success of the system will be affected if any of these six factors fail.

Many academics, including Seddon and Kiew (1996), attempted to test the validity of this model on various systems under various conditions after its release. *Use* (in this context, usage) must be distinguished from *usefulness*, according to Seddon and Kiew. They argue that widespread use of a system does not necessarily mean that the system is “useful.” Many scholars agree with Seddon and Kiew that the variable Service Quality should also be included in the model. William H. DeLone and Ephraim R. McLean conducted additional research in 2003 to update the model after many other researchers criticized and modified it. To keep up with technological advances, this updated model includes Service Quality and modifies several factors. According to this updated model, six factors will influence the success of a system, according to William H. DeLone and Ephraim R. McLean. Here are the six variables (DeLone, 2003):

í The Information Quality variable discusses output features, such as whether the information is useful, clear, and consistent.

í The System Quality variable discusses the features of the information system used, such as flexibility, reliability, and ease of use.

í The Service Quality variable discusses the level of service received by system users, such as responsiveness, accuracy, and reliability.

í The Intention to Use variable analyzes how and to what extent users utilize the capabilities of the information system, including usage needs, frequency, and level of usage.

í User Satisfaction Variables discuss how users respond to and perceive system services, including User Interface (UI) and User Experience (UX)

3. The Relationship between Academic Management Information Systems and User Satisfaction

The Academic Management Information System is a strategic information ecosystem, not just a system used to store student data or grades, but a system capable of integrating various campus operational subsystems such as student registration, KRS / KHS, learning schedules, financial reporting, and academic information (Zulfa, 2025). In addition, academic information systems also play an important role in academic administration, as they can provide a platform for data exchange between units such as faculties, departments, and central administration, as well as support managerial decision-making.

According to DeLone & McLean (2003), there are six dimensions that support the success of an information system. However, there are three dimensions that are referred to as the main pillars in the evaluation of Academic Information System management, namely system quality, information quality, and service quality. Many people and studies agree with this because when an academic institution presents a high-quality system and provides accurate and timely academic information, supported by good technical support services, it will significantly increase user satisfaction.

In addition, Academic MIS must also consider the framework of technology adoption and acceptance. Many models are used to understand and analyze academic information systems, such as TAM (Technology Acceptance Model). This model is often used to explain systems that have good quality in terms of user perception of ease of use and perceived benefits of the system in order to influence users to use it and user satisfaction (Yusren Riziqi, 2023). There are many things that must be considered in Academic Information Management Academic System Management should not only consider operational efficiency.

In managing Academic MIS, the long-term benefits must be considered, as this also includes the strategic impact on the institution. Some examples of long-term benefits include reduced administrative burden, academic transparency, enhanced reputation of the university, and improved student experience. Academic Management Information Systems must be tailored to the needs of the institution. This is because higher education organizations have a wide variety of users, such as students, lecturers, administrative staff, and management teams, who have different needs for the system. Therefore, the information systems available in academia must be measured and managed segmentally (Zulfa, 2025).

4. Factors that can Increase User Satisfaction with Management Information Systems

User satisfaction with a system is one of the key indicators of the success of the system itself. Many factors can influence user satisfaction with information systems, including Academic MIS. One of the most important factors in information systems is system quality. A good quality system is one that includes reliability, speed, ease of use, and consistency of system operation. Many users are satisfied with systems that work stably, have a logical interface, and do not present obstacles in the process of use.

Another factor that can increase user satisfaction is the quality of information provided by the academic system. The information in question includes class schedules, grades, and registration status. Users' perception of the system will be good if the information provided to users is accurate, complete, clear, relevant, and timely (Laudon, Management Information Systems: Managing the Digital Firm (16th ed), 2019). In addition, the quality of user service is also a factor in user satisfaction. According to O'Brien and Marakas (2011), information systems also include personnel and support procedures, not just software and hardware. The factors of user service quality include when users encounter obstacles, the system can provide fast and accurate technical support when users encounter problems, and the system can perform maintenance and updates to remain stable and relevant. To understand the features within the system, academics can provide training and education to users.

In addition to technical aspects and services, ease of use and perceived usefulness of the system are also factors that can influence user satisfaction. McLeod and Schell (2007) argue that users' perceptions of the benefits and ease of use of a system determine their positive attitudes, thereby increasing satisfaction. Users, especially students, will be interested in using the system again if the benefits of using the system can simplify their affairs or problems they are facing. They will also pay attention to the ease of use of the system. If the system provided is easy to use, users will choose to use that system again rather than using a manual system, for example, such as taking care of administration that requires them to come to the academic office. Other factors that can influence user satisfaction in using academic information systems include the interface display, navigation regularity, integration between modules, and the system's ability to cope with peak usage periods (McLeod R., 2007).

Challenges in Implementing Academic Management Information Systems

In the implementation of Academic Management Information Systems, technical, organizational, and human obstacles often arise. The main problems in technical obstacles include integration between system modules, accurate data maintenance, and system resilience and scalability, such as when system usage is maximized, for example during student registration and grade announcement periods. Failures in system design or inadequate data standardization can lead to inaccurate information, which in turn will have a negative impact on user trust and satisfaction (Stair R. &., 2019). Academic MIS obstacles can also arise from organizational aspects, such as resistance to change, inadequate management support, and poor collaboration between departments. When there are updates to the information system, many users experience difficulty adapting to the system. Therefore, O'Brien & Marakas argue that the success of implementing a system depends heavily on the readiness of the organization itself, managerial commitment, and effective change management strategies.

The biggest challenge related to individuals is technological literacy and the wide variety of user abilities. Users with limited understanding may experience difficulties and hesitation in using new systems, while users who are knowledgeable and skilled in information systems will feel dissatisfied if the system does not meet their needs. Therefore, McLeod & Schell (2007) discuss the importance of continuous training and education as a solution to this problem. In addition, there are also things that can hinder information systems, namely the costs associated with implementation and maintenance. Academic MIS also requires investment in the maintenance of hardware, software, networks, and human resources, which are often limited in educational institutions. System updates carried out with the aim of adapting to new needs require additional time and costs. If this is not considered and ignored, this factor will cause the implementation project to fail to be optimized (Laudon, Management Information Systems: Managing the Digital Firm (16th ed), 2019).

CONCLUSION

In the higher education environment, Management Information System is one of the important indicators for improving user satisfaction. This system is a tool that not only functions as a data recording and administration tool. But this system can also be used as an information center for students, lecturers, and academic staff who support integrated academic operational activities. The academic processes referred to include student data management, class

schedules, assessments, and administrative services. Several factors influence the effective implementation of Academic MIS, including system quality, information quality, service quality, and many more. With these factors, Academic MIS can influence user perception, experience, and satisfaction. System quality can influence users by covering reliability, ease of use, and operational consistency. Meanwhile, information quality information also influences user perception by providing accurate, relevant, complete, and timely information. To increase user satisfaction, service quality must involve responsiveness, technical support, and education and guidance in using the system. Not only that, ease of use and perceived benefits are also able to increase user confidence to use the system consistently. Even though the Academic MIS makes it easier for many parties to carry out academic processes, obstacles in implementation remain. The obstacles that often occur in implementing Academic MIS include technological constraints, organizational readiness, user expertise, and financing for system maintenance and updates. By focusing on the above factors and combining them with effective management, it can be ensured that the Academic MIS is capable of improving operational efficiency, the quality of educational services, user experience, and the overall competitiveness of the institution.

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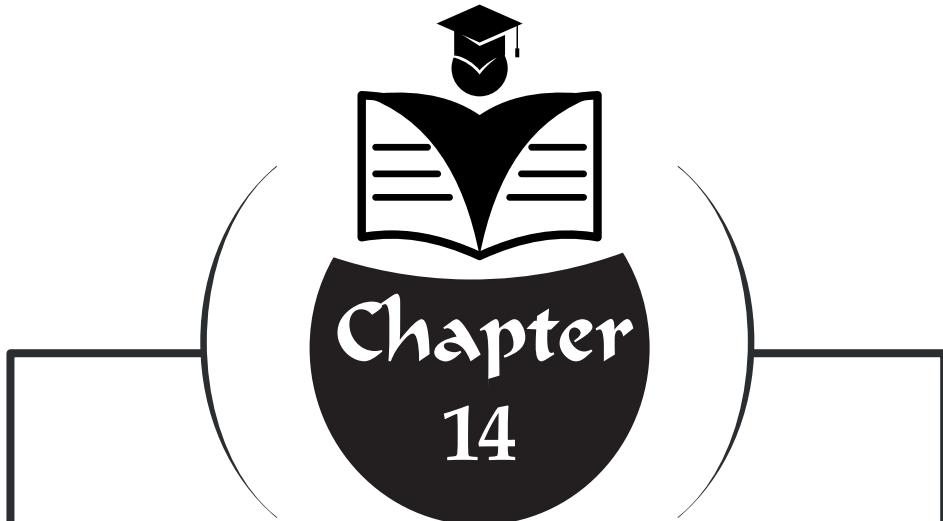
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REASSESSING BANKING SECTOR RESILIENCE AFTER THE 2023 UNITED STATES BANKING CRISIS¹

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Introduction

A banking crisis holds a negative place in the collective memory. When individuals and firms fail to pay their debts, a crisis emerges. In the aftermath, processes such as restructuring typically follow. Negative events stored in the memory are reflected in behavior and attitudes during subsequent stages. For example, when confidence in the banking sector declines, alternative financial institutions and payment systems begin to gain prominence.

The regional bank failures in the 2023 United States (US) Banking Crisis reminded financial markets to focus on interest rate risks, the credit volume and conditions of innovative sectors, and the level of deposit insurance (NBC, 2023; Gruenberg, 2024).¹ Silicon Valley Bank and Silvergate Bank collapsed (Ozili, 2024). They showed us digital assets, cryptocurrencies and even the environmental firms' financial performance as mentioned by D'Ercole and Wagner (2024) are interconnected. Therefore, there is an apparent need for revised risk management techniques and regulations in banking.

Silicon Valley Bank, once considered a key lender to the startup and venture capital ecosystem and thus heavily exposed to the tech sector and digital assets, was among the first to succumb to these pressures. Its case reminded markets of the vulnerabilities in the banking and cryptocurrency sectors and led to new regulation demands. See Trapanese et al. (2025), which summarize the key points of the crisis and debates on the current regulations. One of the key factors behind the crisis was the mismatch between long-term assets of the banks, such as the US Treasury bonds, and their short-term liabilities, primarily depositor withdrawals. See Fagetan (2024, pp. 32-33) for the causes of 2023 crisis in terms of risk management point of view and regulation comparisons among the US and the EU. When interest rates began to rise sharply², the value of long-term bonds held by these banks declined, causing significant unrealized losses on their balance sheets (NPR, 2023). The depositors' confidence level dropped off, customers started to withdraw their money, and the cryptocurrency platforms such as FTX collapsed (Gallup, 2024).

A notable aspect of the 2023 US Banking Crisis is its intersection with digital financial technologies, particularly cryptocurrencies and Decentralized Finance (DeFi) systems. Beyond individual institutional failures, the crisis highlighted a broader systemic problem. While initially counted as disruptive financial innovations offering decentralization and low transaction costs, as well as the increasing complexity of risk management in a financial ecosystem

¹ Correia et al. (2024) analyze the underlying factors contributing to bankruptcies in the US banking sector within a historical context, emphasizing the role of impaired repayment ability and increased credit risk. Cirillo, Pennesi and Liviola (2024, p. 2) also mention taking over risk in terms of sectoral density, fragility and unbalancing the maturity.

² According to Arteta et al. (2025) rising interest rates in the US following 2022 also had a negative effect on the emerging markets due to the perceptions of the Fed.

increasingly dependent on digital assets, they introduced a new layer of risk to the banking system. Many of the affected banks have strong ties to the cryptocurrency sector, which has further strengthened their risk profile. The volatility in the crypto market caused Silvergate Bank to suffer losses (Shillsalot, 2023).

The roles of digital currencies and the systemic risks may arise due to their proliferation, and people started to question their meaning for the stability of the entire market. Their volatility and extent of creating unexpected events are debated among the researchers and policymakers. At the beginning, cryptocurrencies such as Bitcoin and Ethereum had been perceived as substitutes for traditional financial instruments. But the stochastic nature of their behavior and movements was ignored, and they started to be used widely. Financial institutions had engaged with these tools either to make transactions or to provide services.³ The strong connection of cryptocurrencies with banks was another risk for banks because their prices, volatility and safety concerns created liquidity problems and decreased public confidence. The adequacy of traditional financial risk management techniques was questioned in terms of their capacity to address risky digital assets.

The Federal Deposit Insurance Corporation (FDIC) and the United States Federal Reserve (Fed) had some difficulties in handling the crisis. There was a need for a quick response to the events and interventions. Protecting the depositors and stabilizing the sector were their aims and they tried to prevent the contagion of the financial panic (NBC, 2023). The current rules' sufficiency and the need for new rules are discussed to address innovative shocks (Choi et al., 2023). The new payment and banking systems are at the stage for being tested for their confidence. Mobile banking, open banking and DeFi are now alternatives to traditional banking models. Their flexibility and lower reliance on intermediaries aroused curiosity and attraction in people. The digitalization concept with its widening internality overlapped with the future of banking as institutions needed low transaction costs, speed and security (Financial Times, 2023).

This study aims to investigate the key factors contributing to the 2023 US Banking Crisis and their impacts along with the implications. These factors are examined in order to generate new insights about the 2023 US Banking Crisis. The roles of cryptocurrencies and digital assets, as well as their interactions with balance sheets are discussed. Evaluation of the banks that were in a problematic situation are assessed and an event study methodology is employed. Digital assets and cryptocurrency markets are examined using currently available data and existing knowledge. The study adopts a mixed approach combining case analyses of specific banks, quantitative market analysis and policy impact evaluations.

³ For detailed information, see Şahin and Bulut (2021) and Dağtekin and Şahin (2024).

While digital currencies and DeFi are increasingly prominent, the roles of the authorities are evaluated for the prevention stage. The complexity of the financial system became apparent following the turbulence. Promoting resilience of the financial institutions in the face of future challenges is crucial to protecting the financial system and keeping it stable. Alternative banking and payment systems are discussed within the study and the importance of the digitalization concept is highlighted. The main features of the 2023 US Banking Crisis are explored and its roots in digital currencies, as well as financing of technology and innovation, are analyzed.⁴ Contagion effects on other banks and countries are also examined. The crisis is further analyzed by focusing on interest rate decisions and key insights and lessons learned from the crisis are presented. The study is concluded by key observations regarding the impacts of the crisis and provides recommendations for future risk management. Concepts, including trust in banking, financial innovation and some of the key risk management issues are provided, and the transformative role of advancements is linked to behavior finance concepts. The integration of behavior finance, risk management and digitalization is examined with the context of the crisis, taking into account possible spillover effects.

Metaverse, Banking and Trust: Changing Dynamics in Banking and Alternative Finance

In the US, confidence in the banking system was partially shaken in March 2023, as can be seen in Figure 1, and the FDIC seized the management of these banks in the following period.⁵ The crisis had its effects in the US and the European Union (EU), and the governments quickly intervened it. The problematic areas in the sector were limited in scope and the global impact was restricted. Even according to Huang and Charteris (2025), the crisis did not have an influence on Chinese banking sector. Safe-haven assets such as the gold accelerated its demand among the investors due to the increasing uncertainty.⁶ On the other hand, in this process, the search for alternative payment channels such as mobile payments and open banking has been on the rise among market players. Notable events occurred such as Twitter changing its logo and briefly replacing it with the Dogecoin symbol. Interestingly, however, Dogecoin prices lost more than 20% of their value during this period (Shillsalot, 2023). Likewise, the development of payment systems is likely to

4 See Şahin and Şahin (2024) concerning the artificial intelligence and banking relationship.

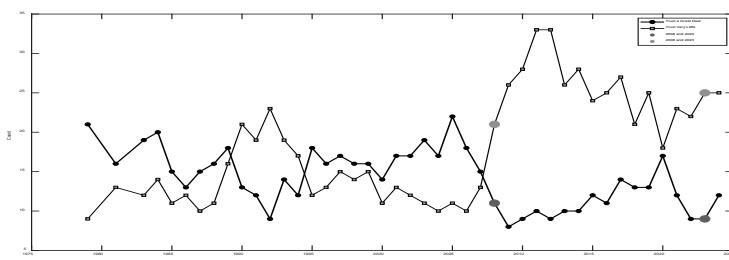
5 Şahin (2022, Figure 2, p. 4) points to the high correlation between the logarithmic first difference in the stock prices of the banking sector in the US and the logarithmic first difference in the Gallup (2024) Poll data, which also aims to measure confidence in the banking sector in the US, and draws attention to the fact that both can be used to measure confidence in the banking sector.

6 It can be said that gold is accepted as a safe haven in financial markets, considering the studies put forward by many researchers such as Baur and McDermott (2010). However, whether digital currencies such as Bitcoin are safe havens is a matter of debate in the literature. For example, Kurtar (2024) shows that Bitcoin is not a safe haven in developing countries.

shift away from banks towards other channels. The high transaction costs of the banking system in terms of money transfers, etc. compared to alternative payment and financial systems have led to the emergence of substitutes. In particular, financial technologies and new digital banking attract attention in this process.

It seems that social media tools have a potential to fulfill banking services and increase financial depth, access to finance and inclusion in the financial system with their advantages such as reduced transaction costs, easy money transfer, location-independent deposit and loan use. Virtual or digital money, with its widespread use, is used both as a means of payment and as money in the internet world. Alternative tools to cash, which started with the use of credit cards, have now evolved into virtual currency. The costs and loss of time created by banks have begun to be compensated by faster and cheaper systems. With new systems solving the problem of information security to a large extent, virtual currency and social media have started to show themselves at the point of low-cost access to finance.⁷

Figure 1. Banking crises in the US in 2008 and 2023



Note: Gallup (2024) US Confidence in Institutions Survey. The level of confidence in the banking sector used in this study was measured by using an index constructed from the Gallup Survey data by the authors.

The future proliferation of the Metaverse virtual environment, coupled with the use of digital currency, may enable banking and financial transactions to be carried out faster and more cost-effectively on the internet. One can refer to Sahiner (2023) for the usage of Metaverse within the DeFi concept. This platform has the potential to radically change the way of banking transactions are conducted. The transition from branchless banking to banking in the Metaverse is expected to be rapid. As a matter of fact, it is now evident that a number of banks also in countries such as Türkiye have established units and have begun preparations in terms of adaptation to the Metaverse world. Although the positive aspects of the new environment come to the forefront,

⁷ Despite these benefits, the fact that virtual currencies are also used extensively in harmful transactions such as money laundering indicates that it has its cons as well as its pros.

there may also be negative effects. For example, in this environment, software and computer security will come to the forefront, and trust in transactions and people may come to the fore. Perhaps unemployment in the banking sector will increase due to the widespread use of artificial intelligence and virtual currencies. The widespread use of the Metaverse platform and the fast and reliable execution of banking transactions in this environment will bring about radical changes in the future of the sector, and in countries like Türkiye, where the banking sector is dominant in financial markets, the system may offer new opportunities to improve itself in terms of efficiency and effectiveness.⁸

The price of digital assets compared to real assets is determined by the value investors attribute to digital assets. Among these, the substitution relationship between digital money and cash has continued to increase since the 2000s. Today, with the introduction of cryptocurrencies, the banking sector's interaction with digital assets has also increased. The increasing adaptation of crypto-assets with high volume startup financing were among the crisis maturing factors (Kelly & Rose, 2025, pp. 12-13). The second growth-generating change has been the relationship of startup companies with banking in relation to entrepreneurship financing and innovation.

The Role of the US Banks in the 2023 Banking Crisis

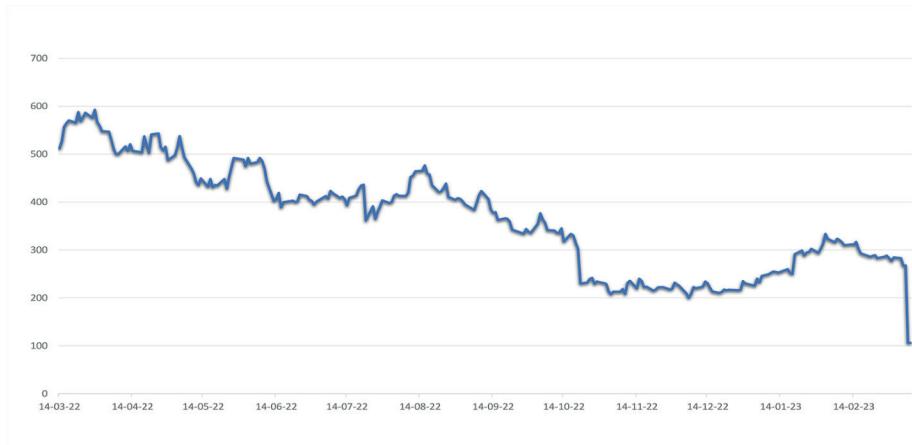
Silvergate Bank is a large-scale bank established in the US during the 1980s. An analysis of Silvergate Bank's balance sheet between 2021 and 2022 shows that following the decline in confidence in digital assets, the bank's transaction revenues related to digital assets decreased by approximately 50% in the fourth quarter of 2022 compared to the fourth quarter of 2021 (Silvergate, n.d.). The unfavorable balance sheet data foreshadowed a collapse that would soon take place. The bank discontinued the Silvergate Exchange Network (SEN), a system that allowed companies to transfer crypto assets between their accounts, citing the volatility of the crypto market. On March 8, 2023, Silvergate Bank became a troubled bank. Since Silvergate Bank was put into liquidation, it was planned to pay its debts through the sale of its assets.

On March 10, 2023, subsequent to the bankruptcy of Silicon Valley Bank, which was founded in 1983 in California, and following the appointment of a

8 In the case that the customer shares the password received on his/her mobile phone with the bank employee after making a purchase from a point-of-sale device with his/her credit card, the issue of whether the customer's will be impaired comes to the fore. If the customer shared the password with the bank employee, who is a third party, with his/her own will and consent, the bank or the bank employee's fault will still be investigated by government authorities. The bank employee may also deceive the customer with methods such as cheating, etc. and made the customer share the password received on his/her mobile phone, then the bank/customer will be suffered a loss and the bank employee will be deemed to have committed the crime of embezzlement. In the Metaverse virtual environment, such transactions and actions may also be encountered in the process. It is thought that the sanctions for such actions in the metaverse environment will be the same as the sanctions in the real world.

trustee to the bank, bank failures began to worry the markets (NBC, 2023). In particular, the fact that Silicon Valley Bank is among the 16 largest banks in the United States economy and has more than 150 billion dollars in deposits has brought the issue of the reliability of the system and the measures to be taken to the table. A significant amount of deposit outflows from Silicon Valley Bank started to take place. On March 12, 2023, the banking crisis became evident. See Kelly and Rose (2025, Table 1) for the evolution of the crisis. Silicon Valley was taken over by the FDIC on March 10, 2023 and the announcement that customers could withdraw their deposits from the bank came shortly afterwards in order to eliminate the panic atmosphere and restore confidence in the banking system. HSBC acquired Silicon Valley Bank's UK unit for £1 on March 13, 2023 (Financial Times, 2023).

Figure 2. Silicon Valley Bank Financial Group (SVB) Stock Prices (USD)



Source: Yahoo Finance (n.d.c).

Following Silicon Valley Bank's sale of its existing Bitcoin portfolio to cover its losses, the value of Bitcoin fell below \$20,000 (CNBC, 2023). In the following period, the upward and downward movement of the Bitcoin price again points to the high volatility of cryptocurrencies. The increasing interest of investors in crypto assets and the need for banks to provide resources for the development of innovation have diversified the risk group. Innovation which is a key for growth had also inverted the timeline for Solow's residual due its financing problems. Furthermore, see Choi (2023) for the chronology of the crisis.

The fact that Silicon Valley Bank has assumed significant risks in financing startups in countries such as the UK has raised concerns about innovation

and entrepreneurship. Financial development and economic growth are two elements that feed each other in this sense. For example, Silicon Valley Bank was positively affected by the technology boom and subsequent rapid growth in the US in the 1990s. Technology-oriented firms and venture capital played a role in the development of Silicon Valley Bank. It became one of the most important banks in the US in financing startups and entrepreneurship, created a financial risk for economic growth in the relevant period.

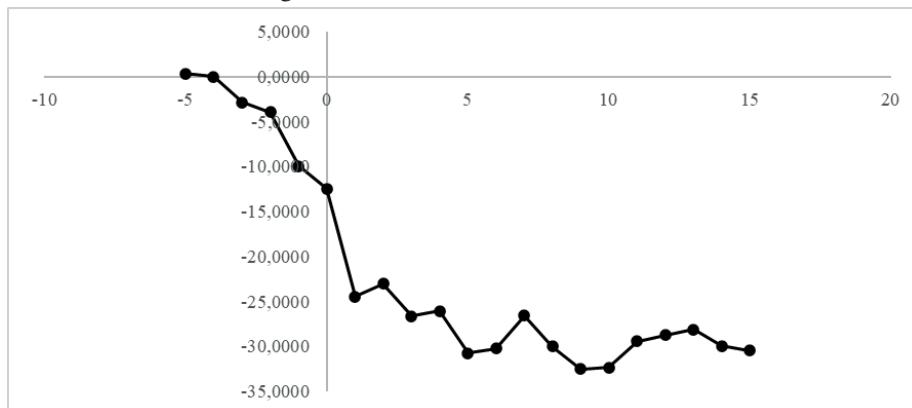
Spill-over to Other Banks and Adverse Transition

A spark in the banking sector quickly spreads throughout the forest. As in past crises, the collapse of one bank in the 2023 US Banking Crisis caused other banks to undergo a resilience test. Studies on the interaction of other banks accelerate at this point. Choi et al. (2023) measure how other banks are affected after the bankruptcy of Silicon Valley Bank by the stock price reactions of these banks.⁹ In addition, the study provides detailed information on the bankruptcy process of Silicon Valley Bank and the underlying factors.

Bank failures have caused new upheavals in the US markets within days. On March 12, 2023, Signature Bank, another large bank dealing with cryptocurrencies, went bankrupt. President Joe Biden emphasized the nature of capitalism on March 13, 2023, stating that those who had investments in these banks would not be protected by the state and that they were taking risks themselves (The White House, 2023). The question that the markets were waiting for was whether the bankruptcy of these three banks would be followed or whether it would have a forest effect by spilling over to other banks. Moreover, as Figure 3 shows, the banking crisis in the US on March 10, 2023 had a negative impact on banking sector returns for a long time.

The fact that all three banks concentrated their balance sheets on certain assets in terms of bankruptcy management reminds us of excessive risk-taking, maturity and interest rate risk management. When treasury bonds are concentrated on the balance sheet in a low-interest rate environment, banks incur losses in the event of sudden interest rate hikes. Or, the banks are adversely affected by a highly volatile investment instrument such as Bitcoin. Fixed-rate securities held to maturity were much more likely to be held in the Silicon Valley Bank's portfolio than those valued by market pricing (Choi et al., 2023; Ertürk, 2023, p. 252). Therefore, as in the Demirbank scandal in Türkiye on December 6, 2000, the value of bonds fell after sudden interest rate hikes, increasing the capital requirement. While the Fed's interest rate hikes negatively affected the value of bank balance sheets in this process, this situation also raised concerns about growth for the economy as a whole.

⁹ See also Figure 2 for the stock prices of Silicon Valley Bank.

Figure 3. Cumulative abnormal returns

Note: Data for the KBW Nasdaq Bank Index (BKX) was obtained from Yahoo Finance (n.d.a). The NASDAQ Composite Index (IXIC) was used to calculate market returns in the The Capital Asset Price Model (CAPM) model and to estimate the beta of the banking index ($\beta = 0.82$), with data also retrieved from Yahoo Finance (n.d.b). For more information about the case study methodology used in the analysis, see Kalodimos (2023). Based on the analysis conducted by the authors using Excel, the graph presents the cumulative abnormal returns (CAR) within the $[-5, 15]$ event window, calculated using daily percentage changes for the period between February 22, 2022, and July 16, 2024. The event of interest is the banking crisis that occurred in the US on March 10, 2023, and its impact on the daily returns of the KBW Nasdaq Bank Index (BKX).

Following the banking crisis in the US, other countries also experienced concern. Many countries made statements that the system was safe. The EU member states also mentioned that banks were safe. However, the internal and external calmness and low volatility required for confidence did not manifest itself in the markets. These developments pointed to the important and courageous steps that need to be taken in terms of supervision and risk management in banks. As a matter of fact that Credit Suisse Bank, a European bank, has been causing unease in the market for a long time. On March 15, 2023, Credit Suisse's shares lost approximately 30% of their value. Saudi National Bank's announcement that it would not take any steps as a shareholder of Credit Suisse and the bank's liquidity problem was an important factor in the depreciation of the stock. Later, the Swiss National Bank said it would support Credit Suisse by giving it about 50 billion dollars to keep the bank stable (CNN, 2023). In addition, the Norwegian Wealth Fund decided to reduce its stake in Credit Suisse Bank. The sharp decline in other

bank stocks on March 15, 2023, caused by the fall in Credit Suisse stocks revealed the uneasiness about confidence in the banking system. On March 20, 2023, UBS Bank acquired Credit Suisse for USD 3.23 billion (Reuters, 2023a). This development showed that the liquidity crisis could lead to rapid spillovers and takeovers in the banking sector.

The banking crisis in the US in March 2023 undoubtedly had a negative impact on the banking of many developing countries, including Türkiye. At the very least, banking shares started to decline due to the news. Recommendations in foreign investor reports started to turn negative. For example, in its report dated March 21, 2023, J.P. Morgan recommended that the weight of state-owned banks in Türkiye's portfolio be reduced (Finans Gündem, 2023). As of July 5, 2024, J.P. Morgan's report maintained its recommendation to reduce the weight of state-owned banks (BloombergHT, 2024). Therefore, it can be concluded that the US banking crisis shook confidence in the Turkish banking sector for a long time, albeit partially, in 2023 as it did in 2008. This situation raised the question of whether a similar liquidity crisis would occur in the Turkish banking sector began to be discussed. Risk management measures to strengthen the balance sheet were taken quickly. On March 22, 2023, three banks in Türkiye [Vakıfbank (TL 32 billion), Halkbank (TL 30 billion), and Ziraat Bank (TL 45 billion)] increased their total capital by TL 107 billion (Dünya Newspaper, 2023).

The Effects of Bank Collapses on the US Monetary Policy

In the US, financial markets pressured the Fed to cut interest rates in March 2023. However, it became a matter of curiosity whether the Fed would raise interest rates in the face of rising inflation or cut interest rates to ease the problems faced by bankrupt banks and banks with high bond stocks. On March 22, 2023, the Fed raised its policy interest rate to 5% (NPR, 2023). In addition, Janet Yellen's statements that they would not extend the deposit guarantee to all banks caused stock prices to fall in the markets (Wilkie, 2023). The Fed's rate hike and Yellen's statements had a negative impact on the market. Moreover, on March 23, 2023, the CBRT announced that it left the policy interest rate unchanged at 8.5% (CBRT, 2023). In the aftermath of such interest rate changes, banks' management of interest rate risk was discussed. The Fed's announcements that it would continue to raise interest rates, startup companies being affected by the bank failures in the US, and the negative slope of the yield curve raised the question of how growth would be financed. Following the unease in the banking sector, Deutsche Bank's stock prices fell by 14% on March 24, 2023 (Aljazeera, 2023).

Developments in the banking sector and volatility in the crypto market continued to be mutually reinforcing factors. When other news was added, the volatility in the crypto market increased rapidly. On April 26, 2023, market

news that the US government was selling Bitcoin, thus increasing its supply, led to a decline in Bitcoin prices (Graves, 2023). However, on April 27, 2023 and the following days, Bitcoin prices rose again to \$29,000. On May 01, 2023, J.P. Morgan Investment Bank decided to purchase the assets of First Republic Bank (Reuters, 2023b). Although its assets expanded much higher than the sector, its fall became faster (Ertürk, 2023, p. 255). As of May 22, 2025, Bitcoin prices are nearly USD 110,760 and more than four times compared to 2023. Fed's rate is 4.5% and inflation rate is 2.3% yearly. The hope and regular structure are much higher compared to two years ago. Correspondingly, the institutions and policies are robust to combat with financial crisis.

Solutions and Recommendations

Reaching conclusive findings in the analysis of economic issues requires a stochastic inference different from Descartes' proposition that the universe can be studied with mathematical certainty. In the 1970s, 1995 Nobel Laureate in Economics Robert Lucas' analysis of the behavioral adaptation of individuals to new situations by learning from past experiences and the uncertainty of future situations gave us a new vision. In a way, the optimal control of the complex system with constraints requires the continuation of its activities with less uncertainty. For example, in the banking sector, an effort can be made to create predetermination through regulations and rules that act as a guide. These regulations will also determine the constraints and increase the foresight capability. With this certainty, the information set will be somewhat free from uncertainty. However, unexpected problems may arise, as happened in a bank in the US in March 2023. The burning of one tree in a forest may cause other trees to burn and the forest to burn down. In this respect, it would be an important step to put regulations on the agenda before the forest burns down. However, it is also a fact that the market has been pressuring public authorities to remove these regulations.

In the economies such as the Turkish economy, a number of measures were taken to protect against the possible spillover effects of the 2023 US Banking Crisis. An example of this is the reduction of the mandatory TL holding requirement of the Turkish banking sector from 60% to 57% and the reduction of the securities facility rate to 5% in June 2023, which the markets considered a sign of stability.¹⁰

The rapid increase in deposits of Silicon Valley Bank, heavy investment in government bonds, and concentration of banking activities in certain sectors such as technology and venture capital indicate that risks may increase and unexpected situations may occur at any time in the banking sector. Therefore, investing above the threshold in seemingly risk-free transactions may pose risks for the banking sector. In the event of a sudden interest rate

¹⁰ "Communiqué Amending the Communiqué on Securities Registration" was published in the Official Gazette (2023) dated June 25, 2023 and numbered 32232.

hike shock, if banks with high deposit volumes, such as Silicon Valley Bank, experience money outflows, these banks may have to sell the bonds they hold in their balance sheets in order to compensate for the money outflow. If their existing bonds have long maturities and fixed interest rates, as in the case of Silicon Valley Bank, a loss is incurred on their balance sheets. At this stage, the bank will need to protect its capital for unexpected situations with some measures such as capital increases. However, Silicon Valley Bank was unable to increase its capital, which created a panic atmosphere and led to sudden deposit outflows.¹¹

Bank collapses continued to be observed in the US in 2024. On April 26, 2024, Republic First Bank, a regional bank in the US, was closed by the FDIC (CNN, 2024). The branches of Republic First Bank, which was also affected by rising interest rates, were opened as Fulton Bank shortly afterwards (FDIC, 2024). The fact that a significant portion of the bank's portfolio consisted of real estate loans and that Covid-19 and the Fed's interest rate hikes negatively affected this sector also disrupted the bank's asset-liability structure through sectoral transfer (Investopedia, 2024). Accordingly, the rising interest rates in the US and international conflicts coincided with the collapse of Republic First Bank.

The interaction between digitalization, virtual currency, banking and the general economy is increasing day by day. Countries that produce and apply technology grow faster and come to the forefront in this process. Since developing countries lag behind developed countries in producing technology, they will grow faster to the extent that they can increase their human capital to learn technological innovations (Jones & Vollrath, 2013, pp. 141-143). On the other hand, after 1980, production per worker increased in many sectors, especially in developed countries, but the marginal product of the worker decreased (Acemoğlu & Johnson, 2023, pp. 262-263). As emphasized in neoclassical economics, since the marginal product of labor determines the wage, this decrease in wages will be considered natural. In the banking sector, as a result of the widespread use of digital banking such as internet banking and telephone banking, the profitability of banks has also started to be affected.¹² Banks started to save on labor and increased their assets per worker by the time being, but with the replacement of labor by digital banking, they saved on labor and the marginal product of labor decreased significantly. This underlies the decline in the wages of unskilled workers in the banking sector in recent years. Today, in many private banks, the transfer of teller operations to devices and software and the transfer of some transactions only to tellers has led to a significant reduction in the number of employees and branches. Although employment opportunities for engineers have emerged

11 For detailed information, see Choi et al. (2023).

12 Lian et al. (2025) claim that digitalization in banking decreases the operational costs but increases in efficiency in banking.

in the software field, employment in areas requiring less skill has contracted. Therefore, digital infrastructure and improvement of the software sector are essential for the sector.

Developments in the crypto market, start-up firms created by technological innovations, and their interaction with the banking sector have necessitated the evaluation of trust in a quantitative context through different methods. Traditionally, the Fed monitors confidence in the banking system through the market leverage and the credit default swap ratios. These gave a slightly negative signal following the bank failures in the US (Fed, 2023, p. 8). The Fed stated that the capital adequacy of large banks in the US was not problematic (Fed, 2023, p. 10). Caglio et al. (2024) also claim that customers found large banks safer than small banks and their deposits increased. Therefore, as the US Banking Crisis of 2023 demonstrated, new crises emerging simultaneously with banking and finance can lead to multiple imbalance problems (Ofir & Elmakiess, 2025).

Future Research Directions

Classical theories in finance and economics assume that individuals act rationally. The CAPM and competitive market theories are examples of this rational perspective. However, there is another side of the issue which assumes that feelings and narratives play a role during the phase of decision-making (Prosad et al., 2015, p. 2). The early works of Smith (1759; 1776) are considered foundational to behavioral finance since they were considering psychological factors during the decision-making phase (Prosad et al., 2015, p. 6).¹³ While investors make financial decisions, their psychological state also plays a significant role. Banks, in turn, are run by managers and investors who are similarly influenced by psychological factors. Thus, during the pre-crisis phase, cognitive psychology and behavioral tendencies were both impactful.

Learning and drawing lessons lead to many negative outcomes, primarily a loss of trust. After a banking crisis, the professional image of bank employees may deteriorate, and public perception becomes biased. Individuals who have suffered financial losses due to the actions of one banker may generalize that experience, developing a prejudice that other bankers will also cause harm. These examples demonstrate that banking crises are not economic events but are also shaped by human behavior and psychology such as greed, fear and overconfidence which contribute to both the emergence and deepening of banking crises. Therefore, as mentioned by Shamshadali et al. (2025), following a bibliometric analysis, there is a need for research on the effects of banking crisis.

¹³ Prosad et al. (2015, p. 10 and pp. 12-13) summarize the basic behavioral finance theories and biases with relevant references. Among these are bounded rationality (Simon, 1955), investor sentiment model (Barberis et al., 1998), overconfidence bias (Odean, 1998), optimism bias (Heifetz & Spiegel, 2001; Toshino & Suto, 2004).

The 2023 US Banking Crisis is a reminder of the vulnerability that can arise when traditional financial institutions fail to adequately adapt to rapid technological developments and changing market dynamics. The collapse of large institutions within the crisis underscores the systemic risks and vulnerability associated with poor liquidity management, excessive concentration of assets, and inadequate oversight of innovative sectors such as cryptocurrencies and technology startups. The regulatory interventions and government support were efficient and sufficient to prevent the spread of turbulence but the gaps about the regulatory framework for merging both traditional and digital finance still remained.

The relationship between financial innovation, digitalization, behavioral finance and banking sector resilience may be analyzed by new and micro-data. Specific bank-based cases may allow for comparative analysis and the extraction of insights relevant to policy-makers. Psychological factors influencing investor behavior and their effects on banking sector confidence may be investigated. Moreover, unresolved challenges and entropic events may be revealed by in-depth interview techniques.

Conclusion

The need for efficient and timely risk management techniques is essential for banking sector. The banks, at the beginning of the crisis, failed to manage their exposure to volatility in cryptocurrencies and tech startups. The diversification and liquidity strategies were not implemented. Relying too much on long-term assets like government bonds and managing liquidity poorly were problems. When the withdrawal of deposits increased, their response was not simultaneous and an external intervention was required. Silicon Valley Bank was not prepared for this shock and the complexity of the environment showed disarray. The market learned several lessons from the new turbulence. Rising interest rates and volatility entailed stable risk management. The response of supply side should be as high as the demand side and the process of liquidating assets should be managed adequately.

The role of Digital Finance and Financial Technology (FinTech) in the 2023 US Banking Crisis was significant and had a substantial influence on the economy. New risks emerge as the interaction between cryptocurrency markets and DeFi platforms strengthen. The innovation that is essential for digital finance should be continuous for the modernization of the financial system. Unique risks arising in this environment remind regulators that they should empower risk elasticity in the digital asset market. Revision to capital adequacy may be necessary for the banking sector due to need to reconsider new risks. It would help if regulators required banks to give more frequent and transparent updates about their digital asset holdings, liquidity and risk management. Confidence in the banking sector would be healthier and default

probability would be monitored. The global cooperation in the financial system should be strengthened to decrease the spillover effects. Coordination of the regulatory framework on digital assets and harmonizing rules among countries would increase confidence in the system. By encouraging international cooperation, regulators can better monitor and manage cross-border risks and ensure that financial institutions remain resilient in the face of global financial disruptions.

Since the 1990s, the concepts of technology and innovation have become central to economic growth. Robert Solow identified the portion of growth not explained by capital and labor as the residual attributing it primarily to technological process. Financial institutions emerged to fund technological advancements, and over time the banking sector increasingly financed firms operating in technology. Banks also began to hold digital currencies on their balance sheets, making the sector's profitability more sensitive to the pace of technological change and fluctuations in digital currency prices. As of 2025, investments in technology such as artificial intelligence and semiconductor production have increased and bitcoin prices saw historical high levels. Following Donald Trump's election victory, Bitcoin prices increased rapidly. Besides, Elon Musk's interest in the sector stimulated its prices. Throughout 2024 and 2025, banking sector in the US implemented sophisticated policies and quickly overcame the effects of the turbulence. The banking sector, now with its stronger structure in the US, shows promise in supporting the financing of future technological innovations.

The turbulence in the financial system also brought an opportunity to re-evaluate the financial resilience through innovation. Besides the heavy concentration in particular sectors, blockchain,¹⁴ digital currency and mobile banking are new innovative tools to boost the efficiency of the financial system. These technologies may brace the banking services where cost-effective and attainable remedies may be provided especially in vulnerable areas. Simply put, the 2023 US Banking Crisis highlights the importance of updating banking practices for the digital age. Policies and practices regulating them should advance together.

The integration of digital assets into mainstream banking presents both significant opportunities and risks. Moreover, policymakers can help ensure that the banking system remains resilient in the face of future technological and financial disruptions by adopting stricter regulatory measures, increasing transparency and promoting international cooperation. Accordingly, the healthy financial transformation will have positive externalities to the overall

¹⁴ Crypto assets are actually based on blockchain technologies. In general, Bitcoin can be transferred across borders easily and without much restriction. When Bitcoin is bought and sold online, the user pays a commission and the transactions are conducted through the internet. Therefore, account security is one of the most essential concerns regarding crypto assets.

economy. In addition to the modern and widely discussed risks highlighted in this study, the banking sector should also address emerging structural risks such as climate change which may negatively impact bank loans and profitability, as emphasized by Li and Wu (2023).

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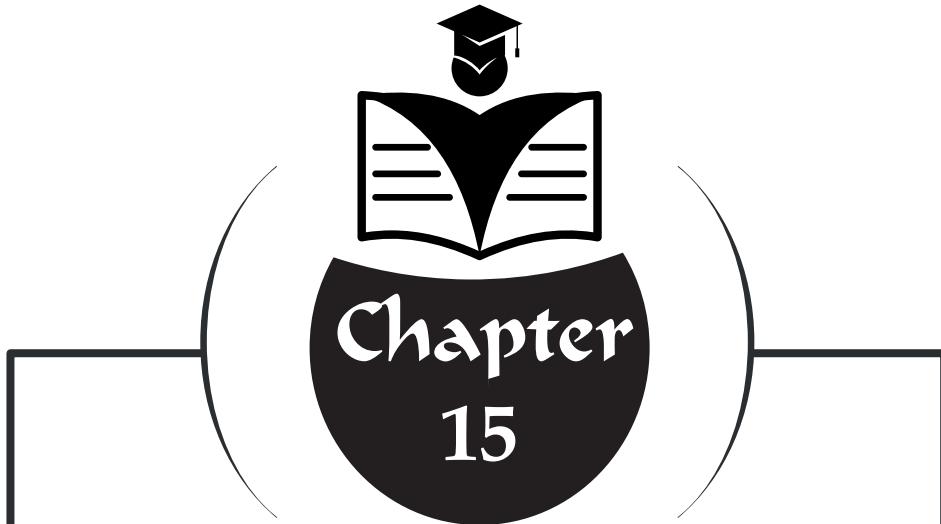
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EXAMINING THE RELATIONSHIP BETWEEN LIQUIDITY MANAGEMENT AND EFFICIENCY IN BANKING USING ARTIFICIAL NEURAL NETWORKS

“ _____ ,”

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1. INTRODUCTION

In the banking sector, measuring and managing liquidity risk is a strategic management area for sustainable finance and stability for financial markets. Commercial banking is a mainstream financial intermediation system that operates on an interest and fee/commission-based revenue model, collecting deposits from those with surplus funds and lending them to households and businesses with funding shortages. A bank's basic margin is the difference between its passive cost (deposit/interest expenses) and its return on assets (loan/interest income). Operations are supported by a wide range of products (deposit accounts, consumer and commercial loans, bond and securities transactions, derivatives, payment services) and ensure the continuity of credit supply and payment systems throughout economic cycles.

Banks must strike a balance between return and risk in liquidity management. In the event of liquidity shortages, especially small-scale banks with insufficient capital will rapidly be forced to exit the system. If this crisis is not limited to a single bank but spreads throughout the system through a domino effect, it can cause a major crisis. Therefore, the aim of this study is to investigate the importance of liquidity management in banks by analyzing bank-specific factors affecting liquidity using an artificial neural network based on machine learning.

The study consists of six sections. The first section is the introduction which explains the importance of study. The second section discusses the concept of liquidity and its importance for banks. The third section includes a literature review on liquidity in banks. The fourth section introduces the data set, variables, and methodology of the study. The fifth section presents the analysis results and their evaluation. The sixth section concludes with a summary of the overall findings of the study.

2. LIQUIDITY AND ITS IMPORTANCE IN BANKING

Liquidity is used in many senses. Its primary meaning is asset liquidity. The easier and less costly an asset can be converted into cash, the more liquid that asset is. Its second meaning is money. Its final meaning is the ability to pay. A business or a bank can be considered liquid if it can meet its due payments without resorting to forced sales (Fettahoğlu, S & Fettahoğlu, A., 2018). Liquidity risk management encompasses the efforts of financial institutions to balance the cost of illiquidity with sufficient liquidity. Banks are required to maintain sufficient liquid funds to meet the needs of investments, lending activities, and depositors in a timely manner; they also need to hold optimal liquid assets to mitigate the liquidity risk caused by maturity mismatch. The liquidity risk management process provides the necessary environment

for banks to maintain their effectiveness in the face of new risks that may arise due to changes in the operating environment or increases in existing risk levels (Akkaya & Azimli, 2018). Banks face two fundamental problems related to liquidity: Banks are responsible for both creating liquidity and managing liquidity risk. Liquidity creation helps depositors and companies remain liquid. When companies seek credit to meet some of their financing needs, banks are the primary providers of capital. Often, they act as a point of support that companies turn to during periods when access to finance becomes difficult. Companies achieve this by establishing credit lines with banks and securing funds that will provide liquidity when needed. It is important to strike a balance between the bank's own liquidity and its role as a liquidity provider (Chen et al., 2025).

Liquidity management is not only an operational requirement but also a strategic priority in the banking sector. Banks have a dual responsibility: to secure their own liquidity positions and to create liquidity throughout the economic system. The balance between these two functions becomes crucial, especially during financial crises. When banks hold more liquid assets to increase their own liquidity, the amount of liquidity they can provide to the market decreases. This can lead to a contraction in credit supply and financing difficulties in the real sector. The financial crisis of 2008, which began in the US housing market and had global effects, clearly demonstrated the strategic importance of liquidity management. A low-interest rate environment, insufficient regulatory oversight, and the proliferation of complex financial products led banks to operate with excessive leverage; the financial system, which had become dependent on short-term debt instruments, was dragged into a liquidity crisis with a sudden loss of confidence. In this process, banks that created a liquidity buffer and effectively managed their risks played an extremely critical role in keeping the system afloat. Therefore, it has been seen that liquidity management should be considered a strategic priority not only in terms of the sustainability of banks, but also in terms of maintaining financial stability and supporting economic growth. (Akkaya & Azimli, 2018).

Türkiye experienced a financial crisis in 2001, known as the banking crisis. Following this crisis, the Banking Regulation and Supervision Agency was established in 2001. The Basel Committee on Banking Supervision, an international banking regulatory authority, regulated the liquidity risk measurement standard with BASEL III. Liquidity coverage ratio and net stable funding ratio were prepared to prevent liquidity risk. In Türkiye, regulations regarding liquidity have been made in parallel with Basel III regulations. The "Regulation on the Calculation of Banks' Liquidity Coverage Ratio", which was published in the Official Gazette dated March 21, 2014, and numbered 28948, by the Banking Regulation and Supervision Agency, aims to determine the procedures and principles regarding banks'

requirement to maintain sufficient high-quality liquid assets to cover net cash outflows, on a consolidated and non-consolidated basis, in order to determine the minimum liquidity level (Official Gazette, <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=19498&MevzuatTur=7&MevzuatTertip=5, 20.12.2025>).

Lax credit policies implemented by banks can increase the probability of default and affect the bank's operating performance. Danisman & Tarazi (2024) suggest that bank liquidity can enhance the bank's stability by eliminating the need for costly financing during times of economic uncertainty and providing protection against sudden cash withdrawal requests.

3. LITERATURE REVIEW FOR LIQUIDITY FOR BANKS

Öndeş & Asfia (2020) examined the relationship between liquidity and profitability of the 10 largest banks operating in Türkiye for the period 2008-2017. In the study, it was determined that there was a negative relationship between the loan-to-deposit ratio, the liquid asset ratio, and return on assets, return on equity; a negative relationship between the deposit ratio and return on assets, and finally, a negative relationship between liquid assets/deposits-other sources and return on equity. Karakaş & Acar (2022) examined the relationship between liquidity and profitability in commercial banks. The study included 20 banks. Using panel data analysis method, the study stated that the liquid asset ratio and current ratio positively affect the return on assets ratio and negatively affect the return on equity ratio and net interest margin; and the findings generally indicate a negative relationship between liquidity and profitability. Sumi (2024) predicted liquidity risk for Indian banks over the period 2009-2019 with artificial neural networks (ANNs). In their study, Göçer & Cengiz (2024) identified bank-specific factors that determine the profitability of commercial banks operating in the Turkish banking sector. The analysis was conducted for the period 2018-2022. They determined that the factors affecting profitability differ according to bank groups. Sakarya & Gürsoy (2021) examined the long-term performance of 9 deposit banks included in the BIST Banking Index by averaging their selected financial ratios for the years 2010-2020 in their study. Ağırtaş & Mollaahmetoğlu (2024) evaluated the relationship between liquidity indicators and profitability indicators using panel data method in their study. In the models using quarterly data from the 2010-2023 period, 22 deposit banks and 6 participation banks in the Turkish banking sector were included. They determined that there was a positive relationship between the liquid asset/total asset ratio and profitability indicators. To effectively manage liquidity risk, banks need to identify the factors affecting liquidity risk and determine the degree of their impact. In their study, Şahut & Afşar (2024) analyzed the bank-specific and macroeconomic factors affecting the liquidity risk of banks using regression method for 4 commercial banks trading on the BIST 30 index for the period 2013-2023. It

has been determined that banks' liquidity risk is affected by interest rates, CDS, and Total Deposits/Total Assets ratios. Lu and Wang (2023) determined that accumulating liquidity increases a bank's operational stability and reduces the risk associated with its assets. Erdoğan (2024) analyzed the factors affecting liquidity risk by utilizing data from 19 commercial banks in Türkiye for the period 2012- 2022.

4. DATA AND METHODOLOGY

4.1. Data and Variables of the Study

The aim of this study is to examine the bank-specific financial variables affecting the liquidity of banks listed in Table 1 below, for which quarterly sub-period data are available for the period 2019-2025, as included in the BIST Banking sector index. The analysis was made with data from 9 commercial banks included in the BIST Banking Index; participation and development banks were excluded. The data used in the analysis was obtained from the Banks Association of Turkey's data query system (<https://verisistemi.tbb.org.tr/>). Discussions about analysis results are limited to the relevant banks, period, and variables. These are the limitations of the study.

Table 1
Banks' Information which are Listed in BIST Banks (XBANK) Indices for Examining in the Study

BANK_CODE	BANK_NAME
AKBNK.E	Akbank T.A.Ş.
SKBNK.E	Şekerbank T.A.Ş.
GARAN.E	Türkiye Garanti Bankası A.Ş.
HALKB.E	Türkiye Halk Bankası A.Ş.
ISCTR.E	Türkiye İş Bankası A.Ş.
VAKBN.E	Türkiye Vakıflar Bankası T.A.O.
YKBNK.E	Yapı ve Kredi Bankası A.Ş.
ICBCT.E	ICBC Türkiye Bank A.Ş.
QNBTR.E	QNB Finans Bank A.Ş

In this analysis, the bank liquidity ratio was used as the input variable. The outputs were return on assets, return on equity, equity to assets ratio, loans to assets ratio, deposits to assets ratio, loans to deposits ratio, and total assets. Details regarding the variables and their definitions could be seen in Table 2.

Table 2
Variables and Their Definitions

Ratio	Formulation	Symbol
Liquidity Ratio (<i>Dependent Variable</i>)	Liquidity Assets / Total Assets	LIQ_RATIO
Return on Assets	Net Profit / Total Assets	ROA
Return on Equity	Net Profit / Total Equity	ROE
Equity to Assets Ratio	Total Equity / Total Assets	EQ_A_RATIO
Loans to Assets Ratio	Total Loans / Total Assets	LA_RATIO
Deposits to Assets Ratio	Total Deposits / Total Assets	TM_TA
Loan- to- Deposit Ratio	Total Loan / Total Deposit	KMTM_RATIO
Total Assets	LN(Assets)	LN(Assets)

Return on assets shows the profit a bank earns from its assets. Return on equity shows the profit earned by the bank's shareholders. The ratio of equity to assets is also known as capital adequacy. It is calculated by dividing total equity by total assets. This ratio indicates whether banks have sufficient equity capital. Loans to assets ratio is important for interpreting both profitability and liquidity. Since an increase in loan volume can create high risk, bank's capital adequacy should also be examined. The deposit to asset ratio shows the proportion of debt that banks have borrowed from depositors within their total assets. This ratio indicates the extent to which debt is covered by assets. The loan to deposit ratio indicates that loans are being financed primarily from deposits, which are a significant source of funds. A high loan to deposit ratio increases the likelihood of a bank experiencing liquidity stress. A low loan to deposit ratio suggests that the bank cannot credit effectively and is experiencing lower profitability. The size of the banks was also used in the analysis by calculating the Ln value of their assets. Bank size can also affect the level of liquid assets. Smaller banks with less capital tend to invest more in liquid assets to avoid financial fragility. Additionally, larger banks are better able to maintain sufficient funds in adverse market conditions because they possess more capital and are less likely to default (Loutsikina, 2011).

4.2. Methodology

ANNs are a type of machine learning algorithm that can learn complex patterns from data and make predictions based on those patterns. ANNs have been shown to be effective in predicting various financial events, including liquidity risk (Sumi, 2024). ANNs are computer systems that can learn examples and determine how to respond to events from the environment. ANNs imitate the neuron as a simple simulation of a biological nervous system.

(Yurtoğlu, 2005). As the layered structure of ANNs increases, the data analysis becomes deeper. Especially in a world dominated by noisy and uncertain data, such as finance, this layered structure of artificial neural networks exhibits performance that surpasses standard methods in many complex areas, from stock prediction to credit risk analysis (Milana & Ashta, 2021; Bahoo et al., 2024). Figure 1 shows the ANN model components.

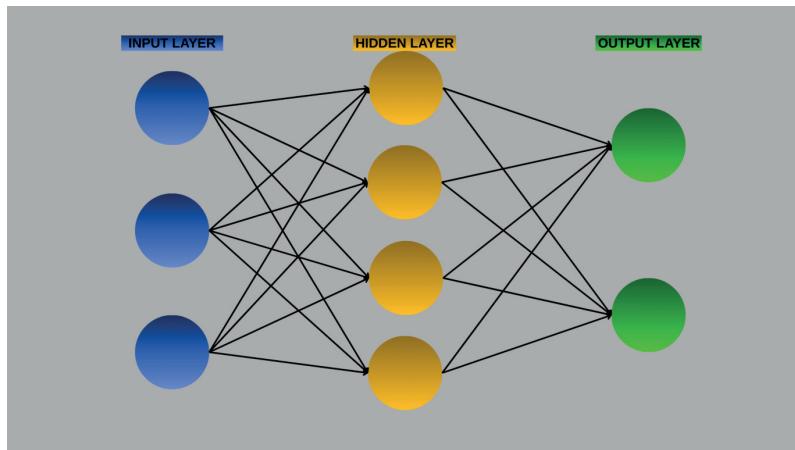


Figure 1
ANN Model Architecture

The structure of ANNs consists of three elements: (1) The neuron, which is the basic processing element, (2) The connection that provides the input and output path, (3) The connection weight, which shows the robustness of these connections. Each of the input values is multiplied by a connection weight. These multiplications are summed and sent to a transfer function to produce a result. This result is then converted into an output. The transfer function is usually a nonlinear function. Linear functions are generally not preferred because in linear functions the output is proportional to the input. Commonly used transfer functions are threshold, sigmoid, hyperbolic tangent, etc. functions. Sigmoid and Tanh functions (Smooth Transitions) compress incoming information into a probability range between 0 and 1 (or -1 and +1). They are particularly used in banking to measure “how risky” a transaction is. For example, instead of simply labeling a loan application as “yes” or “no,” they allow for the generation of intermediate values such as “%85 probability safe.” However, these functions also have a sluggishness (saturation problem) that can slow down the learning rate as the data becomes deeper (Tektaş & Karataş, 2004; Dubey et al., 2022).

For ANNs to operate reliably, they must first be trained and their

performance tested. To train each network, the available samples are divided into two separate sets. The first is the training set used to train the network, and the second is the test set used to test the network's performance. The training is considered complete when the network starts giving correct answers to all the examples. Then, examples from a test set that the network has never seen before are sent to the network, and the network's answers are examined. If the network can give acceptable answers to the examples, it has never seen before, its performance is considered good. If the network's performance is insufficient, then it will need to be retrained. One point to note here is overfitting. Artificial neural networks sometimes "memorize" all the random fluctuations and noise in the data instead of grasping the overall logic within it. As a result, a model that shows 100% success in tests with past data completely collapses when faced with new market data it has never seen before. This is because it has learned only to perfectly imitate the past, not to predict the future (Walczak & Cerpa, 2003; Milana & Ashta, 2021).

5. ANALYSIS RESULTS AND DISCUSSION

Table 3 shows the descriptive statistics for the variables in the study. The average ROA was calculated as 2.33%. ROE, on the other hand, has a higher average value of 13.5%. The positive skewness observed in the distributions of both profitability measures indicates that some banks exhibit above-average return performance. High kurtosis coefficients can be interpreted as the relatively high concentration of returns relative to the average. The average EQA_RATIO is 16.7%. Its low skewness (0.66) and kurtosis (0.44) indicate a relatively balanced distribution among banks. The average LIQ_RATIO is 7.5%. All variables' statistics can be seen detailed in Table 3.

Table 3
Descriptive Statistics

	Mean	Skewness	Kurtosis	Std.
				Deviation
ROA	0.023322275	2.676565227	10.88407133	0.023252658
ROE	0.135018957	3.233055451	20.37220221	0.119530509
EQA_RATIO	0.167327014	0.662491829	0.440732429	0.060790916
LA_RATIO	0.602066351	-1.769978191	4.334818623	0.140663514
LIQ_RATIO	0.074995261	0.969600661	0.436053312	0.054811842
KMTM_RATIO	1.187331754	-0.212120066	0.025128071	0.365567144
LN(Assets)	19.53797156	-0.993833439	0.251654686	1.655543153
TM_TA	0.523909953	0.134196805	-0.496268279	0.109383756

As shown in Table 4, 67.8% of the 211 data were used in training and 32.2% were used in testing.

Table 4
Case Processing Summary

		N	Percent
Sample	Training	143	67,8%
	Testing	68	32,2%
Valid		211	100,0%
Excluded		0	
Total		211	

In this study, an ANN model was developed to explain the liquidity ratio of banks. The structure of the model is detailed in Table 5. Accordingly, seven financial indicators were standardized and given as inputs to the model. These inputs are passed to three units, denoted by “H,” located in the hidden layer, which models interrelationships. The H units use a hyperbolic tangent activation function to capture complex and nonlinear relationships in the data. Finally, the information from these units is passed to a unit in the output layer that directly generates a prediction, thus obtaining the predicted value of the liquidity ratio. This architecture goes beyond traditional econometric models, offering a flexible way to analyze the interactive and dynamic links between financial variables and liquidity.

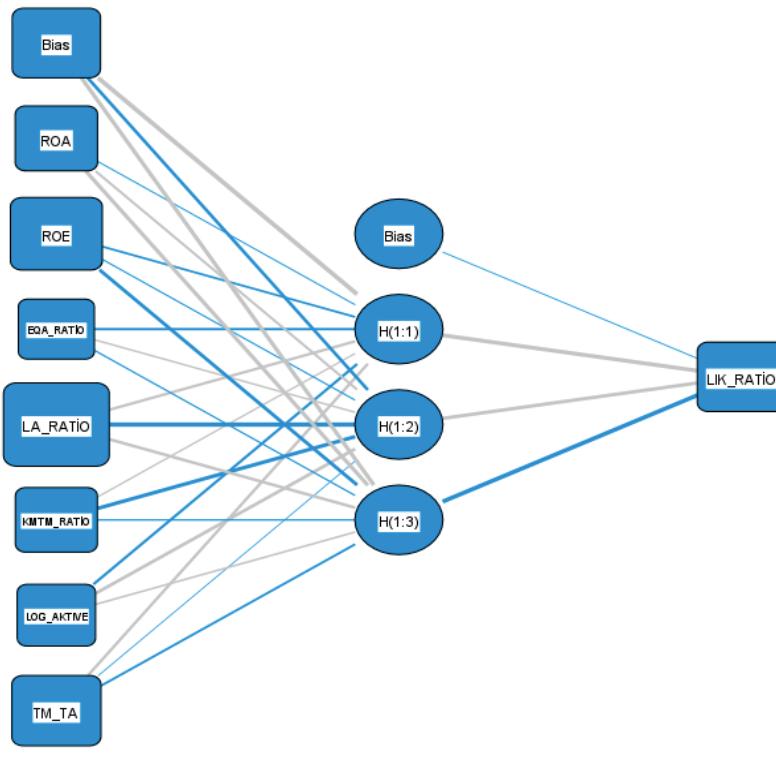
Table 5
Network Information

Input Layer	Covariates	1	ROA
		2	ROE
		3	EQA_RATIO
		4	LA_RATIO
		5	KMTM_RATIO
		6	LN(Assets)
		7	TM_TA
	Number of Units ^a	7	
Hidden	Rescaling Method for Covariates		Standardized
Layer(s)	Number of Hidden Layers	1	
	Number of Units in Hidden Layer 1 ^a	3	
	Activation Function		Hyperbolic tangent
Output Layer	Dependent Variables	1	LIQ_RATIO
	Number of Units	1	
	Rescaling Method for Scale Dependents		Standardized
	Activation Function		Identity
	Error Function		Sum of Squares

a. Excluding the bias unit

Figure 2 shows the ANN model for the study. Liquidity ratio was dependent variable in the study. The other seven variables which were defined in Table 2 were independent variables.

— Synaptic Weight > 0
— Synaptic Weight < 0



Hidden layer activation function: Hyperbolic tangent

Output layer activation function: Identity

Figure 2
ANN Model for the Study

Table 6

Model Summary

Training	Sum of Squares Error	21,253
	Relative Error	,299
	Stopping Rule Used	1 consecutive step(s) with no decrease in error ^a
	Training Time	0:00:00,02
Testing	Sum of Squares Error	7,398
	Relative Error	,179

Dependent Variable: LIQ_RATIO

a. Error computations are based on the testing sample.

Table 6 shows the model summary. Performance analysis of the artificial neural network model shows that the model has high explanatory power in both training and test data. A variance explanation rate of 70.1% was achieved in training data and 82.1% in test data. The fact that the model's test performance exceeded its training performance indicates a high generalization capacity. Early stopping based on test error was applied during the training process, preventing overfitting.

Table 7
Parameter Estimates

Predictor		Predicted			Output Layer LIQ_RATIO
		Hidden Layer 1			
		H (1:1)	H (1:2)	H (1:3)	
Input Layer	(Bias)	1,985	-,745	1,088	
	ROA	-,040	,391	1,087	
	ROE	-,323	-,055	-,862	
	EQA_RATIO	-,370	,233	-,099	
	LA_RATIO	,509	-1,628	,717	
	KMTM_RATIO	,201	-1,002	-,171	
	LN (Assets)	-,456	,794	,312	
	TM_TA	,658	-,015	-,324	
Hidden Layer 1	(Bias)				-,018
	H (1:1)				1,342
	H (1:2)				,915
	H (1:3)				-1,355

Table 7 shows the learned connection weights of the artificial neural network model, i.e., the strength and direction of the mathematical relationship between the variables. The upper part of the table reveals how much each of the seven financial inputs affects the three units (H1, H2, H3) in the hidden layer. Looking at the coefficients here, for example, loans to asset ratio (LA_RATIO) has a very strong and negative effect (-1.628) on the second hidden unit. This means that the model significantly takes changes in this variable into account at one stage of its internal calculations. Similarly, variables such as asset size (LN(Assets)) and deposits to asset ratio (TM_TA) also have significant weights on different hidden units. The lower part of the Table 7 shows how these three hidden units contribute to the final liquidity ratio estimate. The effect of the first and second hidden units is positive (1.342 and 0.915, respectively), while the effect of the third unit is negative (-1.355). This situation shows that the model, when estimating liquidity, uses different feature representations created in the hidden layer by weighing and balancing them against each other. As a result, in this model each variable's contribution to the prediction has a measurable numerical value.

Table 8
Independent Variable Importance

	Importance	Normalized Importance
ROA	,105	33,4%
ROE	,191	60,7%
EQA_RATIO	,050	15,9%
LA_RATIO	,315	100,0%
KMTM_RATIO	,102	32,4%
LN (Assets)	,070	22,2%
TM_TA	,166	52,7%

Table 8 and Figure 3 show that the Loans to Assets Ratio (LA) is the most effective variable in the model, with a normalized significance value of 100%. This is followed by Return on Equity (ROE) (60.7%), Deposit to Assets Ratio (TM_TA) (52.7%), Return on Assets (ROA) (33.4%), Loans to Deposits Ratio (KMTM) (32.4%), LN (Assets) (22.2%), and Equity to Assets Ratio (EQA) (15.9%).

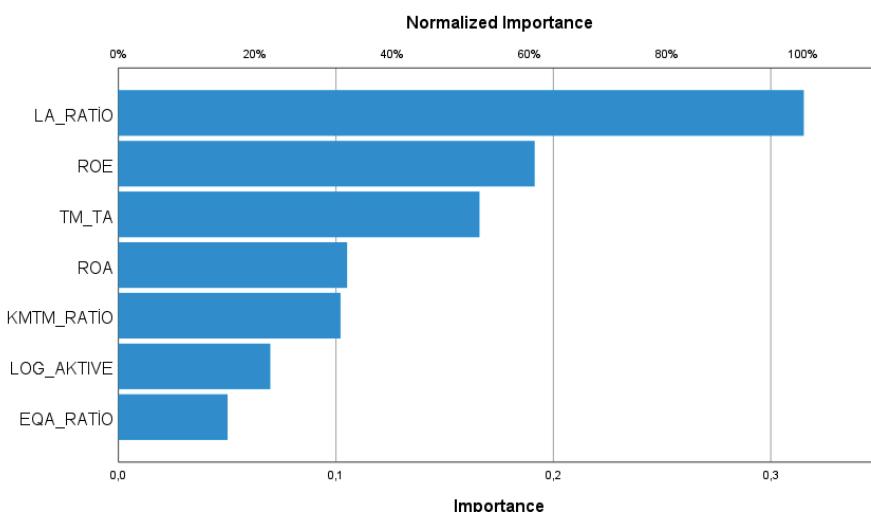


Figure 3
Variables' Significance Analysis Results for Liquidity

Loans to Assets Ratio (LA_RATIO) variable, which is obtained by dividing credits by total assets and also represents credit risk, has been identified as the most important factor affecting liquidity according to the analysis results. If the bank is unable to collect the credits it has extended, a liquidity problem

will arise for the bank. Therefore, a high ratio can lead to liquidity risk, while a low ratio will result in lower profitability. If a bank's scale is larger, it may face challenges in managing its liquidity due to having more complex and diverse financial products. Additionally, larger banks, having a wider customer base and being exposed to larger transaction volumes, may encounter sudden and high-volume cash outflows. In this study, bank size variables were ranked sixth in importance among the seven variables affecting liquidity. This result may be causing the banks in the sample were similar banks listed in the BIST Banking Index. Profitability and liquidity are targets that move in opposite ways. Banks may hold liquid assets to maintain their ability to pay. However, when they hold excessively liquid assets, their profitability will decrease because they cannot benefit from the leverage effect of credit. According to the analysis results, among the variables affecting liquidity, ROE ranks second in importance, followed by ROA in fourth place. High ROA in banks can be interpreted as a sign that they may face liquidity risk due to holding less liquid assets. This finding is similar to the analysis results of Akkaya & Azimli (2018) and Şahut & Afşar (2024). Similarly, low ROE can be interpreted as a sign that liquidity risk may be encountered. Therefore, it ranks second in importance among the factors affecting liquidity. The analysis results are consistent with the analysis results of Çelik & Akarim (2012). Khan et al. (2017) stated that banks with excess deposits are less likely to experience liquidity deficits and are more inclined to engage in different profit-generating activities. Acharya & Naqvi (2012) also showed that banks will increase their loan volumes and generate profits when they have large amounts of deposits. According to our analysis, the third most important variable affecting liquidity was the deposit-to-asset ratio. Commercial banks try to maximize their profits in the economies of the countries in which they operate by lending to market actors using the deposits they collect or by engaging in various non-interest-based commercial transactions other than lending. As the loan-to-deposit ratio increases, the cost and income items of the banking sector can be affected by various factors. A low deposit-to-loan conversion ratio indicates that income from loans or commercial earnings cannot cover expenses from deposits, thus indicating inefficient use of resources; while a high ratio leads banks to seek foreign funding (Aydemir et al., 2018). The EQA_RATIO, representing capital adequacy, indicates that as equity increases, a bank's liquidity risk may decrease. Banks' equity adequacy is a variable controlled by both national and international standards. Its ranking as the last variable may be due to the high capital adequacy requirements for banks.

6. CONCLUSION

This study aims to examine the liquidity of banks listed in the BIST Banking Index and the impact of bank-specific financial variables affecting their liquidity during the 2019-2025 period, using artificial neural networks

based on machine learning, unlike traditional analysis methods. According to the analysis results, the loans to asset ratio was determined to be the primary factor affecting liquidity. The fact that profitability and liquidity objectives are conflicting goals each other, so this situation makes a necessity the optimization both. Insufficient liquid assets lead to payment problems, while excessive liquid assets reduce profitability. Therefore, an optimal balance must be struck between these two goals. The role of liquidity position is not limited only to a bank's internal risk management. It also directly affects the credit channels and the effectiveness of the monetary transmission in an economy. Banks with high liquidity positions have the capacity to maintain credit supply during crises, while banks with weak liquidity positions have been forced to restrict credit channels. During financial crises, liquidity is not only an operational necessity for banks but also a strategic decision area. A bank's liquidity position determines its flexibility to sudden fund outflows, credit demands, and market uncertainties. In this context, excess liquid assets, enable banks to meet their obligations and provide credit to the market during a crisis. To prevent crises the liquidity ratios that banks must maintain are standardized by both the Banking Regulation and Supervision Agency and the Bank of Settlements (BIS) with BASEL-III. Thus, precautions are taken against liquidity-related crises.

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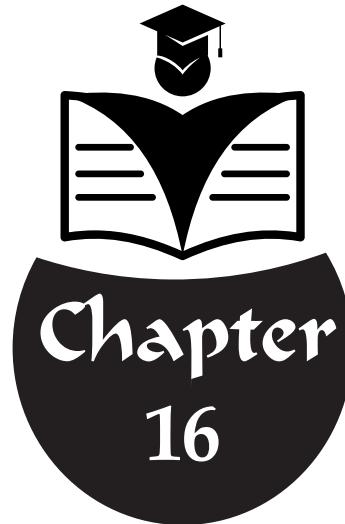
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THE POWER OF RETURNING TO THE PAST: DEMOGRAPHIC REFLECTIONS OF RETRO MARKETING TRENDS

“ _____ ”

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INTRODUCTION

The concept of retro marketing refers to the inclusion of elements from the past in marketing activities, reinterpreted in the context of today's conditions. The concept of retro, which means "belonging to the past" or "reminiscent of the past," is considered not only as an approach that refers to the past but also as a dynamic understanding that establishes a connection between the past and the present (Castellano et al., 2013: 385). In this context, retro marketing can be defined as the reuse and reinterpretation of a product, brand, or symbol or practice reminiscent of the past in line with today's consumer expectations (Tekeoğlu & Tiğlı, 2016: 280; Demir, 2008: 32).

The recent resurgence in popularity of products inspired by the past has led to this approach gaining more attention in the field of marketing (Arşit & Arslan, 2025: 44). Indeed, retro brands and products incorporate modern features in terms of functionality and performance, while referencing past eras in terms of design and emotional experience. The combination of old-fashioned forms with contemporary functions ensures that retro products are compatible with both nostalgic and contemporary consumption patterns (Merlo & Perugini, 2015: 94). In this context, retro marketing involves the relaunch of products or services that were previously on the market, often revised in terms of performance, function, or quality to meet today's conditions (Brown, Kozinets & Sherry, 2003: 20; Ogechukwu, 2014: 33-34).

In retro marketing, the relationship established with the past stands out as an important element in terms of brands operating for a long time, building lasting reputation, and ensuring consumer trust (Loveland et al., 2010: 393). Particularly during periods of social and historical transition, individuals' need to preserve their identities strengthens consumer nostalgia and brings emotional ties with classic brands to the forefront. In this context, retro marketing is considered a marketing approach that explains consumers' longing for the past and the continuity between the past and the present, while also providing a commercial response to this need (Brown, 2013: 522; Castellano et al., 2013: 385).

Studies on retro marketing aim to reveal the factors that shape consumers' attitudes toward retro-looking products. Research examining the relationship between demographic variables and consumers' attitudes toward retro-looking products in particular points to different results in this area. Some studies show that demographic factors such as gender, age, education level, and income have a significant impact on consumer attitudes; however, marital status does not play a decisive role in attitudes towards retro products (Arslan & Yetkin, 2017; Arslan & Öz, 2017). These findings reveal that perceptions of retro products can vary depending on individuals' socio-demographic characteristics.

On the other hand, some studies in the literature show that the effect of demographic variables is limited. While some studies reveal that the retro brand trend differs only according to gender, others conclude that no

significant difference was found in terms of age and marital status (Şahin & Kaya, 2019). Similarly, a study conducted on Generation Y consumers determined that marital status, gender, education level, and family economic status did not affect the perception of retro products; it was concluded that individuals belonging to the same generation had similar product perceptions even if they had different demographic characteristics (Güleç & Tabanlı, 2018).

Studies examining awareness and trends related to retro products have yielded more detailed results. In a study specifically on retro furniture, a significant difference was found between the gender variable and awareness of retro furniture, while no significant difference was found in terms of the trend toward retro furniture. In contrast, analyses related to the age variable determined that there were differences in retro furniture trends between generations, but that the level of awareness did not change according to age. These findings show that age is a factor that can influence trends towards retro products, but that it does not have the same degree of effect on awareness (Doğan et al., 2022).

In the field of consumer behavior and marketing strategies, the influence of past trends on shaping today's consumer preferences is gaining increasing importance. In this context, examining consumers' attitudes toward retro marketing trends, particularly in the ready-to-wear sector, provides valuable insights for both industry applications and academic literature. While there are studies in the literature that address the relationship between consumer attitudes towards retro marketing trends and demographic factors, these studies focus on different sectors and product groups, and there is a limited number of studies specifically on the ready-to-wear clothing sector. In this context, the study aims to contribute to the existing literature by analyzing the effects of demographic variables such as gender, age, education level, income, and marital status on the retro marketing tendency of ready-to-wear consumers. The findings are expected to enrich the academic literature on retro marketing and provide guidance for businesses operating in the ready-to-wear clothing sector in terms of target audience identification, product design, and marketing strategy development.

RESEARCH METHODOLOGY

Research Aim

The aim of this study is to evaluate retro marketing trends in the context of the demographic characteristics of ready-to-wear consumers living in İstanbul.

Sampling Process

The main mass of the research consists of ready-to-wear consumers living in İstanbul. Due to ethical reasons such as "time, cost, and data obsolescence," sampling was used instead of reaching the whole population. The sample size was determined to be 384, taking into account the number of consumers in

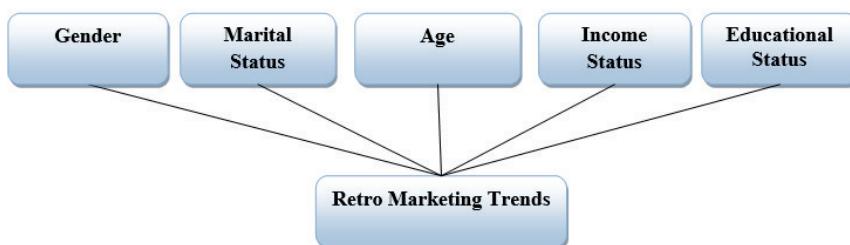
the ready-to-wear clothing sector living in Istanbul, with “95% reliability and (-/+) 5% sampling error” (Yazıcıoğlu and Erdoğan, 2004). The data was collected using the convenience sampling method and survey technique. The online surveys were applied to 484 individuals on a voluntary basis between October 1, 2024, and March 1, 2025.

Data Collection Method and Tool

The survey prepared for the research consists of two sections. The first section includes the Retro Marketing Attitude scale developed by Holak et al. (2005) and used in Türk's (2021) study, which is one-dimensional and consists of 16 items. The second section contains 5 questions aimed at determining the demographic characteristics of the participants. The scale questions are 5-point Likert type.

Research Model and Hypotheses

Figure 1: Research Model



The hypotheses of the research are as follows:

H1: There is a significant difference in the levels of retro marketing tendencies among ready-to-wear consumers living in Istanbul in terms of their gender.

H2: There is a significant difference in the levels of retro marketing tendencies among ready-to-wear consumers living in Istanbul in terms of their marital status.

H3: There is a significant difference in the levels of retro marketing tendencies among ready-to-wear consumers living in Istanbul in terms of their age.

H4: There is a significant difference in the levels of retro marketing tendencies among consumers in the ready-to-wear sector living in Istanbul in terms of their monthly income.

H5: There is a significant difference in the levels of retro marketing tendencies among consumers in the ready-to-wear sector living in Istanbul in terms of their education levels.

Methods Used

The data obtained in the study were analyzed using the SPSS (Statistical Package for Social Sciences) for Windows 25.0 program. Descriptive statistical methods were used when evaluating the data. The normality of the data distribution was assessed using skewness and kurtosis values. The reliability of the scales used in the study was assessed by calculating Cronbach's Alpha. Factor analysis was performed on the scale measuring retro marketing tendencies. T-tests and ANOVA tests were performed to determine differences in retro marketing tendencies in the context of participants' demographic factors.

Data Analysis and Research Findings

Normality Distribution Analysis

Table 1: Normality Test Analysis

Retro Marketing Trend	Skewness Test	Kurtosis Test
RMT 1	-,428	-,946
RMT 2	-,801	-,081
RMT 3	-1,150	1,297
RMT 4	-,424	-1,038
RMT 5	-,856	,639
RMT 6	,388	-,894
RMT 7	-,646	-,343
RMT 8	-1,217	1,889
RMT 9	-1,298	1,440
RMT 10	-1,657	2,790
RMT 11	-,909	-,143
RMT 12	,210	-,867
RMT 13	-,227	-1,209
RMT 14	-,746	-,273
RMT 15	-1,225	1,201
RMT 16	-1,048	-,007

The normality of the data was checked using kurtosis and skewness values. The skewness values of the scale items measuring retro marketing tendency were found to be between -1.657 and .388, and the kurtosis values were found to be between -1.209 and 2.790. It is stated that if the values obtained as a result of the analysis are "between -3 and +3," the distribution can be considered normal (Kalayci, 2009). When the data was evaluated, it was determined that the normal distribution assumption was met.

Reliability Analysis

The Cronbach Alpha reliability coefficient of the scale is evaluated as follows: " $0.00 \leq \alpha < 0.40$ indicates that the scale is not reliable, $0.40 \leq \alpha < 0.60$ indicates that the scale is moderately reliable, $0.60 \leq \alpha < 0.80$ indicates that the scale is quite reliable, and $0.80 \leq \alpha < 1.00$ indicates that the scale is highly

reliable" (Arslan and Nur, 2018; Küçük and Nur, 2019; Can, 2022: 396).

Table 2: Reliability Analysis Results

Factor Name	Cronbach's Alpha	Number of Items
Retro Marketing Trend	.931	16

Table 2 shows that the reliability of the scale used in the study was assessed using Cronbach Alpha reliability coefficients. The Cronbach's Alpha (α) value of the scale measuring retro marketing tendency is 0.931. The analysis results indicate that the scale is highly reliable.

Factor Analysis

Factor analysis was applied to the 16 items measuring retro marketing tendency included in the study.

Table 3: Factor Analysis

	Retro Marketing Trend
KMO and Bartlett's Test of Sphericity	0,785 ($p < 0.05$)
Total Explained Variance by Factor Loadings	1 Factor 50,620

The KMO value of the retro marketing tendency scale used in the study is 0.785, which is statistically significant ($p < 0.00$). It was determined that the retro marketing tendency scale used in the study has a unidimensional structure.

Demographic Findings

The demographic distribution of the individuals participating in the study is presented in Table 4.

Table 4: Frequency Distributions for Demographic Factors

Gender	N	%
Female	259	53,5
Male	225	46,5
Total	484	100
Marital Status	N	%

Married	212	43,8
Single	272	56,2
Total	484	100
Age	N	%
18-30	169	34,9
31-40	201	41,5
41-50	83	17,1
51 and above	31	6,5
Total	484	100
Monthly Income	N	%
Less than 30,000 TL	92	19,0
30001-40000 TL	39	8,1
40001-50000 TL	169	34,9
50001-60000 TL	146	30,2
More than 60,001 TL	38	7,8
Total	484	100
Education Level	N	%
High school and below	46	9,5
Associate degree	40	8,3
Bachelor's degree	314	64,9
Graduate degree	84	17,3
Total	484	100

Testing the Hypotheses

H_1 : There is a significant difference in the levels of retro marketing tendencies among ready-to-wear consumers living in Istanbul in terms of gender.

Table 5: Results of the t-Test Analysis for Retro Marketing Tendencies in Terms of Gender

Gender	N	\bar{x}	s	t	Sig.
Female	259	3,6156	,75316		
Male	225	4,0469	,63392	-5,984	,000

The analysis revealed that there is a significant difference in the level of retro marketing tendency based on participants' gender, as the p-value obtained for the retro marketing tendency was $p=0.000 < 0.05$. According to the analysis results, men were found to have a higher retro marketing tendency than women. H1 was supported.

H₂: There is a significant difference in the level of retro marketing tendencies among ready-to-wear consumers living in Istanbul in terms of their marital status.

Table 6: Results of the t-Test Analysis for Retro Marketing Tendencies in Terms of Marital Status

Marital Status	N	\bar{x}	s	t	Sig.
Married	212	3,7415	,82666		
Single	272	3,9214	,62505	-2,636	,009

The analysis revealed that, given the p-value of $0.009 < 0.05$ for the retro marketing tendency, there is a significant difference in the level of retro marketing tendency based on participants' marital status. According to the analysis results, singles were found to have a higher retro marketing tendency compared to married individuals. H2 is supported.

H₃: There is a significant difference in the level of retro marketing tendency among ready-to-wear consumers living in Istanbul in terms of age levels.

Table 7: ANOVA Test Analysis Results for Retro Marketing Tendency in Terms of Age Levels

Age	N	\bar{x}	s	F	Sig.
18-30	169	3,7918	,05094		
31-40	201	3,9660	,04212		
41-50	83	3,7764	,08978	8,767	,000
51 and above	31	3,1103	,33536		
Total	484				

The ANOVA test conducted to determine whether there was a difference in retro marketing tendencies based on participants' age levels yielded a p-value of $p=0.000 < 0.05$, indicating that there was a significant difference in retro marketing tendencies among participants based on their age levels. It was concluded that participants in the 31-40 age group had a higher retro marketing tendency compared to participants in other age groups. H3 was supported.

H₄: There is a significant difference in the levels of retro marketing tendencies among ready-to-wear consumers living in Istanbul in terms of their monthly income.

Table 8: ANOVA Test Analysis Results for Retro Marketing Tendencies in Terms of Monthly Income Levels

Monthly Income	N	\bar{x}	s	F	Sig.
Less than 30,000 TL	92	3,6882	,09174		
30001-40000 TL	39	3,9605	,10298		
40001-50000 TL	169	3,9021	,04374		
50001-60000 TL	146	3,8806	,06155	2,461	,045
More than 60,001 TL	38	3,5313	,09853		
Total	484				

The ANOVA test conducted to determine whether there was a difference in retro marketing tendencies based on participants' monthly income levels yielded a p-value of $0.045 < 0.05$, indicating that there was a significant difference in retro marketing tendencies among participants based on their monthly income levels. It was concluded that participants in the 31,000-40,000 TL income group had a higher retro marketing tendency compared to participants in other income groups. H4 was supported.

H_5 : There is a significant difference in the levels of retro marketing tendencies among ready-to-wear consumers living in Istanbul in terms of their education levels.

Table 9: ANOVA Test Analysis Results for Retro Marketing Tendencies in Terms of Education Level

Education Level	N	\bar{x}	s	F	Sig.
High school and below	46	3,0288	,18005		
Associate degree	40	3,3125	,15772		
Bachelor's degree	314	3,9458	,03400	18,942	,000
Graduate degree	84	3,7857	,08644		
Total	484				

The ANOVA test conducted to determine whether there was a difference in retro marketing tendencies based on participants' educational levels yielded a p-value of $0.000 < 0.05$, indicating that there was a significant difference in retro marketing tendencies among participants based on their educational levels. It was concluded that participants with a bachelor's degree had a higher retro marketing tendency compared to participants with other educational levels. H_5 was rejected.

CONCLUSIONS AND RECOMMENDATIONS

This study was conducted to evaluate retro marketing trends in the context of the demographic characteristics of ready-to-wear consumers living in Istanbul. The main population of the research consists of ready-to-wear consumers living in Istanbul. Due to ethical reasons such as time, cost, and data obsolescence, sampling was used instead of surveying the entire population. Data was collected using convenience sampling and survey techniques. Online surveys were administered to 484 individuals on a voluntary basis.

Normality tests were performed to determine the normality of the distribution of the data collected in the study. The normality of the data was checked using kurtosis and skewness values. When the data was evaluated, it was concluded that the data for the retro marketing tendency variable was normally distributed. The reliability of the scale used in the study was calculated using Cronbach's Alpha. The reliability of the scales used in the study was evaluated by calculating Cronbach's Alpha. When the analysis results were evaluated, it was determined that the scale was highly reliable. Factor analysis was performed on the scale measuring retro marketing tendencies. It was determined that the retro marketing tendency scale used in the study had a unidimensional structure. T-tests and ANOVA tests were performed to determine differences in retro marketing tendencies in the context of participants' demographic factors.

Difference tests were performed to determine differences in the level of retro marketing tendency in the context of demographic factors such as

gender, marital status, age level, education level, and income level.

A t-test analysis was conducted to determine the difference in retro marketing tendency levels based on gender and marital status. The analysis revealed that men have a higher retro marketing tendency than women. Furthermore, the analysis showed that, in terms of marital status, singles have a higher retro marketing tendency than married individuals.

An ANOVA test analysis was conducted to determine the difference in retro marketing tendency levels in terms of age level, monthly income level, and education level. The analysis revealed significant differences in retro marketing tendencies based on age level and monthly income level. To determine which age groups showed differences in retro marketing tendencies, the analysis concluded that participants aged 31-40 exhibited higher retro marketing tendencies compared to participants in other age groups. Furthermore, the analysis conducted to determine which income groups showed differences in the level of retro marketing tendency revealed that participants in the 31,000-40,000 TL income group had a higher retro marketing tendency compared to participants in other income groups.

The limitations of the study include the use of convenience sampling as the sampling method and the survey method as the primary data collection method. The use of different sampling methods and data collection techniques in future studies is important for the generalizability of the study's results. The level of retro marketing tendency was evaluated in terms of demographic factors, and the study was conducted on consumers in the ready-to-wear clothing sector. This can also be stated as another limitation of the study. Repeating subsequent studies in different sectors with different sample groups is another important issue in terms of generalizing the results of this research. Furthermore, it is also important to examine the level of retro marketing tendency with different variables.

As a result of the literature review, there are studies on retro marketing tendency in both national and international literature. However, sample and temporal differences are important in terms of examining previous studies.

The scientific contribution of the research is that the data obtained as a result of this study will primarily guide managers in all sectors where the level of retro marketing tendency is important in determining their marketing strategies on the subject, and will also guide academics in their future academic studies on the subject.

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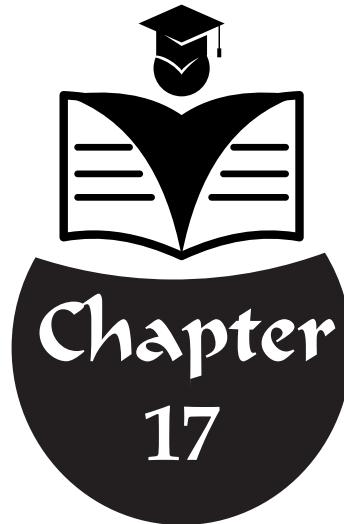
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MOBILE SHOPPING ADOPTION IN TÜRKİYE: A RESEARCH WITH THE UTAUT2 MODEL¹

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1. Introduction

The introduction of the internet at the end of the 20th century and the proliferation of internet-based technologies have led to radical changes in many areas of daily life. Many services, such as education, healthcare, financial transactions, and social activities, have become accessible through internet-connected technologies. This technological transformation has changed individuals' daily habits and brought significant innovations to shopping. By eliminating the need for buyers and sellers to be physically present, the internet has enabled the widespread adoption of online shopping.

The advancement of mobile internet technologies and mobile devices has taken online shopping to a new level and given rise to mobile shopping. Mobile devices allow individuals to shop anytime, anywhere, regardless of location, making mobile shopping a frequently preferred method in daily life. Mobile shopping channels offer numerous advantages to both consumers and businesses. Consumers can save time, easily compare products and prices, and receive instant notifications about promotions. On the other hand, sellers can reach wider audiences, reduce their costs and increase their product range.

Numerical indicators reveal that individuals increasingly prefer mobile devices over fixed devices to access the Internet (Coppola, 2021). The fact that the number of mobile subscribers in Turkey has reached three times the combined number of all other subscription types (TÜİK, 2023) demonstrates the dominance of mobile usage across the country. According to Statista's (2024) projection, the number of global mobile internet users is projected to exceed 6 billion by 2029. Turkish Statistical Institute data indicates that 87.1% of the country's population uses the internet, and 49.5% of these users engage in mobile shopping (TÜİK, 2023). These remarkable figures clearly demonstrate the need for academic research on the adoption of mobile internet technologies.

Understanding why and how mobile shopping is adopted is important for both academic circles and industry. Technology acceptance models are frequently used to explain the user adoption processes of new technologies. In this context, UTAUT2 was chosen as the theoretical framework for this study due to its relevance to the nature of mobile shopping. In the model, variables such as performance expectancy (PE), effort expectancy (EE), social influence (SI), price value (PV), hedonic motivation (HM), habit (HAB), facilitating conditions (FC), behavioral intention (BI) and usage behavior (USB) are used to explain the adoption of mobile shopping.

In this article, first the conceptual framework regarding mobile shopping and technology adoption process is presented and then the research in the literature is summarized. The methodology section describes the data collection process, sample, model, and analysis methods; the findings section presents

the analysis results. The discussion section compares the findings with the literature, and the conclusion section presents the research's key conclusions and recommendations for practice.

2. Theoretical Background

Shopping is an activity of exchange and interaction that has emerged since the dawn of humanity to meet basic needs. Beginning with simple barter methods in prehistoric times, shopping evolved into a modern economic activity with the introduction of money, the transition to settled life, the development of trade routes, and urbanization. While defined in the literature as the exchange of goods or services between consumer and seller, shopping is viewed not only as an economic transaction but also as an activity that reflects individuals' lifestyles and strengthens their social relationships (Solomon, 2019; Mair, 2018). During a purchasing process, consumers go through stages such as identifying their needs, evaluating alternatives, comparing prices, purchasing, and, if necessary, returning or exchanging.

Technological advances, particularly the emergence and rapid proliferation of the internet, have radically changed the way shopping is done. Thanks to the internet, buyers and sellers can shop without physically meeting. Manufacturers can offer their products and services to a wide audience through websites, and consumers can purchase these products and services from anywhere using devices such as computers, smartphones, and tablets (Kotler & Armstrong, 2018). Internet shopping has become a powerful alternative to traditional shopping, offering advantages such as time and energy savings, greater product options, ease of price comparison, and access to user reviews (Adıgüzel, 2010; Alreck & Settle, 2002).

As a natural extension of this transformation, online shopping evolved into mobile shopping with the availability of the internet via mobile devices. The development of mobile internet technologies since the 1990s, particularly the acceleration of mobile internet with 3G and then 4G/LTE technologies, the proliferation of smartphones, the growth of application ecosystems, and the increased availability of constant connectivity have made mobile shopping possible and attractive (Turan, 2008; Hung et al., 2012). Mobile devices have transformed shopping into a location-independent activity, providing consumers with the ability to browse online sites, research products, compare prices, and purchase anytime, anywhere (Lu & Su, 2009). This has also led manufacturers to mobile platforms, enabling the personalization of products and services, monitoring user behavior, and improving the customer experience (Jain et al., 2022).

Mobile shopping is defined in the literature as the activity of purchasing goods or services anytime, anywhere, using a mobile device with a wireless internet connection (Yang & Kim, 2012; Wong et al., 2012). Mobile shopping,

considered both an economic transaction and a consumer behavior, has become increasingly widespread thanks to its features such as speed, flexibility, personalization, accessibility, and ease of use (Ko et al., 2009). For this reason, businesses have had to adapt to mobile shopping channels and analyze customer expectations accurately.

In this context, the question of why consumers adopt or fail to adopt mobile shopping becomes important. The technology adoption literature offers various models and theories aimed at explaining individuals' motivations for using new technologies and their usage behaviors. These theories and models are generally based on social psychology theories such as the Theory of Reasoned Action (Fishbein & Ajzen, 1975), the Theory of Planned Behavior (Ajzen, 1991), Social Cognitive Theory (Compeau & Higgins, 1995), and Diffusion of Innovations Theory (Moore & Benbasat, 1991). The information systems adoption literature includes the Technology Acceptance Model (TAM) (Davis et al., 1989) and its extended versions, UTAUT and UTAUT2 (Venkatesh et al., 2003; Venkatesh et al., 2012).

TAM suggests that intention to use technology is shaped by perceived usefulness and perceived ease of use (Davis et al., 1989). However, one of the most comprehensive models in the field of technology adoption is the UTAUT and its expanded version, UTAUT2. Developed by Venkatesh and his colleagues, UTAUT is a combination of eight different models and examines the effects of PE, EE, SI, and FC on BI and USB (Venkatesh et al., 2003). The later developed UTAUT2 model added three new variables: HM, HAB, and PV to better explain adoption, particularly in the context of consumer technologies (Venkatesh et al., 2012).

The UTAUT2 model offers a very suitable theoretical framework for explaining mobile shopping because it includes both functional benefits (PE, FC, EE, PV) and social and psychological aspects (SI, HM, HAB) (Venkatesh et al., 2012). In this context, the UTAUT2 model provides a comprehensive explanatory approach in studies focusing on mobile shopping adoption and is used as the theoretical basis in this study.

3. Literature Review

A review of the literature reveals that the UTAUT2 is the most widely preferred theoretical framework for explaining consumers' mobile shopping intentions and usage behaviors (Venkatesh et al., 2012). The fact that the UTAUT2 model was developed to explain individual consumer behavior and offers high explanatory power in application areas such as mobile shopping reinforces its dominance in the literature. Therefore, numerous studies in the field of mobile shopping have either used the UTAUT2 model directly or examined mobile shopping behavior by expanding the basic variables of the model with context-specific elements. This suggests that using UTAUT2 is

the most appropriate approach, both theoretically and methodologically, in research on mobile shopping adoption.

One of the first studies on mobile shopping adoption in Turkey was conducted by Der (2014). The study expanded the UTAUT2 model by adding trust and mobility variables and applied it to mobile device users in Turkey. Findings from 344 participants revealed that trust has a significant and strong impact on mobile shopping intention, and mobility level also positively impacts BI. However, the study found no significant impact of HM and FC on BI.

Another prominent study in the international literature was conducted by Chopdar et al. (2018) in India and the United States. The study expanded the UTAUT2 model by adding privacy risk and security risk variables and analyzed data from a total of 366 users. The findings indicate that risk perceptions differ significantly across cultures. While privacy and security risks negatively impact both BI and USB for users in India, no significant impact of risk factors was found in the US sample. This result suggests that mobile shopping behavior is influenced by cultural, economic, and trust-based environmental factors, and therefore, UTAUT2 should be expanded and applied to different contexts.

Gündoğan and Kazançoğlu's (2021) study, conducted in the Turkish context, provides a good example of extending UTAUT2 with variables reflecting online consumer behavior. The study added online review and online support variables to the model and analyzed data from 394 participants. The findings showed that SI, HM, PV, PE, and HAB variables, in particular, had positive and significant effects on mobile shopping intention. However, the relationship between the combined "FC - EE" variable created in the study and HAB was not found to be significant. This suggests that ease of use and infrastructure conditions in mobile shopping may not always lead to habit formation and highlights the impact of context differences on the theory.

Examining mobile shopping in the fashion category, Soni et al. (2019) extended the UTAUT2 model with the variables of personal innovativeness and physical image and studied 209 participants in India. The research findings indicated that personal innovativeness, PE, EE, FC, HAB, and PV had significant effects on BI. However, it is noteworthy that SI, HM, and physical image did not have significant effects on mobile shopping intention. This result suggests that mobile shopping behavior in the fashion context is driven by personal innovativeness and functional benefits rather than social interaction.

Another study conducted in Turkey on mobile shopping was conducted by Kizir and Bozbay (2020). In the study, data were collected from 401 users who purchased fashion products via mobile devices in Turkey and the basic variables of the UTAUT2 model were tested. The findings showed that HAB, HM, EE, and PV had the strongest effects on BI, while PE, FC, and SI had no significant impact on mobile shopping intention. This suggests that mobile

shopping behavior, particularly in the fashion category, is driven by habit and experiential motivations.

Durukal's (2020) study from Turkey extended the UTAUT2 model with the perceived risk variable and analyzed data obtained from 301 users. The research findings showed that PE, EE, SI, FC, HM, PV, and HAB had significant effects on mobile shopping intention, while BI positively influenced usage behavior. However, perceived risk did not have a significant effect on BI. This result suggests that risk perception did not act as a strong deterrent to mobile shopping intention in the Turkish sample.

A study conducted in Romania by Vinerean et al. (2022) is one of the first to examine the impact of COVID-19 perception on mobile shopping intentions within the UTAUT2 framework. Findings from 351 participants indicated that COVID-19 perception did not negatively impact mobile shopping intentions. Conversely, PE, SI, HM, and trust were found to have strong effects on BI. These findings support the notion that mobile shopping represents an advantage for consumers during crisis periods and that UTAUT2 is a suitable model to explain these behaviors.

Another study was conducted by Huang (2023) in China on users aged 60 and older. The study expanded the UTAUT2 model by adding the variables of utilitarianism, anxiety, and trust, and analyzed findings from 389 participants. The results revealed that, in addition to these variables, PE, EE, SI, FC, and HAB directly influence mobile shopping intentions in older age groups. These findings demonstrate that mobile shopping behavior may be shaped by different psychological and functional factors across age groups, and that UTAUT2 offers a flexible and powerful framework for explaining these differences.

One of the studies that addressed mobile shopping behavior in Turkey within the scope of the Technology Acceptance Model was conducted by Tuna (2024). The study linked perceived usefulness, ease of use, and risk variables to initial trust, and findings from 458 participants showed that ease of use and usefulness increased initial trust, while perceived risk decreased it. While initial trust had a positive effect on mobile shopping attitude, it was found that attitude strongly determined intention, and intention strongly determined behavior. The results suggest that trust formation in mobile shopping is a key determinant of consumer decisions, and risk perception plays a debilitating role in this process.

One of the most recent studies examining mobile shopping motivations in Turkey was conducted by Bical (2024). The study examined hedonic and utilitarian motivations together, and the model was tested on 202 users, supported by perceived value and usage intention. The findings indicate that both motivations influence perceived value; however, only discount seeking

makes a significant contribution to the hedonic dimension, while shopping for gratification remains ineffective. Among utilitarian motivations, ease of use, ease of information acquisition, and perceived savings increase perceived value, while avoiding social interaction has no significant effect. The strongest result is the significant effect of perceived value on usage intention. These findings suggest that users still evaluate mobile shopping apps primarily based on functionality and utility.

A general review of the literature reveals that the vast majority of studies focusing on mobile shopping have either used the UTAUT2 model directly or conducted their analyses by adding additional context-specific variables. In this context, HAB, PE, HM, and PV stand out as the most consistent determinants of mobile shopping intention, while the model has been expanded by adding risk perception, cultural factors, online experience elements, and demographic characteristics depending on the context. All these findings clearly demonstrate that UTAUT2 is the most frequently used theory in the literature, has the highest explanatory power, and is easily adaptable to the context for explaining mobile shopping adoption. Therefore, in this study, the use of the UTAUT2 model was deemed the most appropriate theoretical choice for analyzing mobile shopping adoption.

4. Methodology

The widespread use of mobile devices in daily life and the digitalization of consumer behavior are increasingly increasing the importance of mobile shopping within online shopping. While the increase in the number of mobile shoppers may at first glance suggest that this shopping style is being adopted, scientific verification of this and the factors that influence its adoption can only be achieved through systematic academic research. In this context, this study examines the factors influencing mobile shopping adoption using quantitative research methods.

4.1. Data Collection Method

The survey technique was chosen as the data collection method in the study. The survey form was based on the UTAUT2 scale developed by Venkatesh and colleagues (2012). The scale's statements were adapted to the mobile shopping context, and the survey was structured into two sections. The first section included eight demographic questions, while the second section included 38 statements grouped under nine factors answered on a 7-point Likert-type scale. Thus, a total of 46 questions were administered to the participants.

4.2. Population And Sample

The population of this study encompasses users with mobile shopping experience in Turkey. The method proposed by Saruhan and Özdemirci (2020) was used to determine a representative sample size. Assuming a homogeneous

population and a 95% confidence level, the minimum required sample size was calculated as 138 individuals. However, to ensure a more balanced distribution across demographic strata, we aimed to reach a larger number of participants. The online survey form designed for this purpose was distributed using the snowball sampling method to users who had experienced mobile shopping at least once. During the data collection process, 288 responses were obtained, and after eligibility checks, 254 data were included in the analyses.

4.3. Research Hypotheses

Studies on the adoption of information technologies are based on numerous theories and models based on social psychology. These models can be applied to different areas of use of new technologies, either directly or by expanding them with various variables (Gürses, 2016). This study uses the UTAUT2 model developed by Venkatesh et al. (2012); however, the moderator variables of age, gender, and experience were not included in the model, and all other variables were used in their original form. The hypotheses formulated based on the relationships between the variables in the model are presented below:

- H1: The relationship between PE and BI is significant.
- H2: The relationship between EE and BI is significant.
- H3: The relationship between SI and BI is significant.
- H4: The relationship between FC and BI is significant.
- H5: The relationship between FC and USB is significant.
- H6: The relationship between HM and BI is significant.
- H7: The relationship between HAB and BI is significant.
- H8: The relationship between HAB and USB is significant.
- H9: The relationship between PV and BI is significant.
- H10: The relationship between BI and USB is significant.

4.4. Data Analysis Method

The hypotheses developed in the study were tested using Structural Equation Modeling (SEM). SEM allows for the analysis of relationships among multiple dependent and independent variables by placing them within a holistic model. Before proceeding with hypothesis testing, Confirmatory Factor Analysis (CFA) was conducted to verify the validity of the scale structure and assess whether the model accurately measured the variables (Saruhan & Özdemirci, 2020).

The model's acceptability was assessed using goodness-of-fit indices. While various fit indices are used in the literature, according to Ayyıldız and Cengiz (2006), for a model to be accepted, at least four fit indices must be within acceptable limits. Accordingly, the goodness of fit indices and acceptable value ranges used in this study are presented in Table 1.

Table 1: Goodness of Fit Indices

Fit Index	Acceptable Fit	Explanation
CMIN/DF (χ^2/df)	$0 \leq \chi^2/df \leq 3$	Chi-Square / Degrees of Freedom
CFI	$,90 \leq CFI \leq 1$	Comparative Fit Index
RMSEA	$,00 \leq RMSEA \leq ,08$	Root Mean Square Error of Approximation
SRMR	$,00 \leq SRMR \leq ,10$	Standardized Root Mean Square Residual
IFI	$,90 \leq IFI \leq 1$	Incremental Fit Index

Source: Gürses, 2016; İlhan and Çetin, 2014.

Following validity analyses, Cronbach's Alpha test was applied to each factor to measure the reliability of the variables. Once the measurement model was deemed suitable in terms of validity and reliability, hypotheses were tested. Before hypothesis testing, the condition of normality, one of the assumptions of SEM, was assessed, and the data set was tested for normal distribution.

Descriptive statistics, reliability analyses and normality tests performed within the scope of the research were performed using the SPSS program; confirmatory factor analysis and structural model tests were performed using the AMOS program.

5. Results

5.1. Demographic Information About Participants

Table 2 below presents statistics on the demographic information of the participants. When considering the distribution of participants by gender, it is seen that female participants constituted a larger proportion than male participants, at 59.8%. Looking at the distribution by age group, it is seen that a significant portion of the participants, 83.7%, were 35 years old and under. Regarding marital status, it is understood that 60.6% of the participants were married.

Table 2: Description of the sample.

		n	%
Gender	Female	152	59,8 40,2
	Male	102	
Age	16-25	120	47,2 36,5
	26-35	90	14,4
	36-45	30	1,9
	46 +	14	
Marital Status	Married	154	60,6
	Single	100	39,4
Education	Primary Education	4	1,6
	High School	57	22,4
	Associate Degree	41	16,1
	Undergraduate	127	50
	Master's Degree	13	5,1
	PhD	3	1,2
Income	Minimum Wage	119	46,9
	Min. Wage - 15.000 ₺	41	16,2
	15.001 ₺ - 25.000 ₺	56	22,0
	25.001 ₺ +	38	14,9
Employment Status	Working	138	54,3
	Not Working	116	45,7

When participants were evaluated in terms of their educational background, it was found that the highest percentage of graduation degrees were at the undergraduate level; when postgraduate degrees are also included, the overall undergraduate graduation degree was 56.3%. Looking at the monthly income distribution, it was found that approximately half of the participants (46.9%) had an income at or below the minimum wage level. Finally, when participants were evaluated in terms of their employment status, it was found that more than half of the participants (54.3%) were currently actively employed.

5.2. Validity Analysis

The validity of the scale used in this study was tested using Confirmatory Factor Analysis (CFA) performed via the AMOS program. The main purpose of CFA is to evaluate the extent to which a previously theoretically defined or designed model fits the collected data (Bayram, 2010; Seçer, 2017). Accordingly, all constructs in the measurement model were analyzed, and the resulting goodness-of-fit values are reported in Table 3. In the initial analysis, it was observed that the model's fit values were below acceptable limits.

Table 3: Goodness of fit results of measurement model.

	CMIN/DF	CFI	IFI	SRMR	RMSEA
Acceptance Values	≤ 3	≥ .90	≥ .90	≤ .10	≤ .08
The Initial Model	3,005	,879	,880	,0657	,089
Revised Model	2,599	0,904	0,905	,0632	0,08

To improve the model's fit, item FC5 (0.574), which had a factor loading below 0.70, was removed from the scale. In addition, necessary improvements were made to the model using modification indices from AMOS. Covariance was defined between the variables PE1–PE2, BI4–BI5, and HAB2–HAB4, which had the highest modification index values. Following these adjustments, the model's fit reached an acceptable level, and the results of the corrected model are presented in Table 3.

After adjusting for goodness-of-fit values, the standardized regression coefficients (factor loadings) of the items representing each factor were examined. The findings showed that all factor loadings were above 0.70. The factor loadings of the adjusted model are shown in Table 4.

Table 4: Standardized Regression Coefficients

Item	Factor loading	Item	Factor loading
PE1	,803	HM1	,894
PE2	,758	HM2	,950
PE3	,808	HM3	,942
PE4	,846	HM4	,917
PE5	,824	HAB1	,913
PE6	,845	HAB2	,824
EE1	,857	HAB3	,865
EE2	,842	HAB4	,732
EE3	,824	PV1	,756
EE4	,880	PV2	,723
SI1	,762	PV3	,826
SI2	,885	BI1	,901
SI3	,900	BI2	,919
SI4	,915	BI3	,907
FC1	,842	BI4	,770
FC2	,841	BI5	,773
FC3	,831	USB1	,913
FC4	,834	USB2	,935
		USB3	,753

5.3. Reliability Analysis

To assess the reliability of the scale, a separate reliability test was conducted for each variable. In this study, reliability analysis was performed using Cronbach's Alpha, a method commonly used in social sciences. Cronbach's Alpha was calculated separately for each factor included in the research, and the obtained values are given in Table 5.

Examining the results in Table 5, it can be seen that the lowest Alpha coefficient is in the PV variable (.816), while this value is quite high in all other variables. The fact that the vast majority of factors have values of 0.90 and above indicates that the scale generally has a high degree of internal consistency.

Table 5: Factor based reliability analysis.

Factor	Item Count	Cronbach's Alpha Value
PE	6	,926
EE	4	,913
SI	4	,921
FC	4	,903
HM	4	,959
HAB	4	,908
PV	3	,816
BI	5	,933
USB	3	,899
Total	37	,917

5.4. Normality Analysis

Since Structural Equation Modeling (SEM) method was used to test the hypotheses put forward in the research, it was evaluated whether the data met the assumption of normal distribution before proceeding to the analysis process. The suitability of the data to normal distribution was examined through skewness and kurtosis coefficients. According to Garson (2012), these values falling within the ± 2 limits indicate that the normality assumption is met.

When the findings in Table 6 are evaluated, it is seen that the skewness and kurtosis coefficients for all factors remain within the accepted limits. This indicates that the data set used in the study satisfies the assumption of normal distribution and is suitable for the application of Structural Equation Modeling analyses.

Table 6: Kurtosis and Skewness Values

Factor	Skewness	Kurtosis
PE	-1,040	,456
EE	-1,156	,665
SI	-,791	,098
FC	-1,385	1,484
HM	-1,247	1,402
HAB	-,601	-,611
PV	-,875	-,017
BI	-1,066	,967
USB	-,899	,184

5.5. Hypothesis Test Results

At this stage, the structural model, established based on the research hypotheses, has been tested. The goodness-of-fit indices for the structural model are presented in Table 7, and the obtained values show that the model fits the data at a satisfactory level.

Table 7: Goodness of fit values of the structural model.

	CMIN/DF	CFI	IFI	SRMR	RMSEA
Acceptance Values	≤ 3	≥ .90	≥ .90	≤ .10	≤ .08
Goodness of fit values	2,584	0,904	0,905	,0633	0,079

After determining that the model met the goodness of fit criteria, the hypotheses were tested. Acceptance or rejection of the hypotheses was evaluated based on the p-values (significance level) and t-values (critical ratio) calculated by the AMOS software. Within the scope of Structural Equation Modeling, t-value greater than 1.96 for $p \leq 0.05$ and greater than 2.576 for $p \leq 0.01$ indicates that the relationship is statistically significant (Saruhan & Özdemirci, 2020). The hypothesis test findings obtained in this regard are presented in Table 8.

Table 8: Hypothesis test findings

Hypothesis	C.R.	p value	Support
H1: PE → BI	,681	,496	No
H2: EE → BI	,125	,900	No
H3: SI → BI	,050	,960	No
H4: FC → BI	,756	,449	No
H5: FC → USB	-1,151	,250	No
H6: HM → BI	2,900	,004	Yes
H7: HAB → BI	,491	,623	No
H8: HAB → USB	6,920	,000	Yes
H9: PV → BI	8,167	,000	Yes
H10: BI → USB	5,194	,000	Yes

According to the analysis results, hypotheses H6, H8, H9, and H10 tested within the model were statistically supported, while the other hypotheses were not. In this context, it was observed that HM and PV have a significant and positive effect on BI towards mobile shopping. Furthermore, it was determined that HAB and BI variables positively influence mobile shopping usage behavior. In contrast, PE, EE, SI, and FC were found to have no statistically significant effect on the adoption process of mobile shopping.

6. Discussion

This section compares the findings of this study with studies conducted using the UTAUT2 model regarding the adoption of mobile shopping. While some of the research reviewed in the literature included additional variables such as trust, privacy, mobility, anxiety, personal innovativeness, Covid-19 perception, and cultural factors in the model, this study only considered results related to the core components of UTAUT2. Accordingly, the key factors influencing mobile shopping BI and mobile shopping USB are discussed.

6.1. Effects on Mobile Shopping Intention

In this study, the effects of PE, EE, SI, FC, HM, HAB, and PV on BI were tested under seven hypotheses. The analysis findings revealed that only HM and PV variables had a positive and significant effect on mobile shopping intention. The other variables were found to have no significant relationship with BI.

The study found no significant effect of PE on BI. This result is similar only to the findings of the study by Kizir and Bozbay (2020) in the literature. All other studies have reported that PE positively influences the intention to make mobile purchases. For example, Alalwan et al. (2017) stated that PE is a strong determinant of BI in the context of mobile banking; Baptista and Oliveira (2015), Der (2014), Hew et al. (2015), Huang (2023), Palau-Saumell et

al. (2019), Soni et al. (2019), Vinerean et al. (2022), and Hanif et al. (2022) also reached similar results in their studies.

The study found that EE did not significantly affect BI. This finding is consistent with the results reported by Baptista and Oliveira (2015) and Chopdar et al. (2018). In contrast, many studies, including Alalwan et al. (2017), Der (2014), Durukal (2020), Hew (2015), Huang (2023), Kizir and Bozbay (2020), Palau-Saumell et al. (2019), Soni et al. (2019), Hanif et al. (2022), and Tak and Panwar (2017), have found that EE significantly increases BI.

It was determined that the social influence variable did not have a significant effect on BI. Similarly, Der (2014), Durukal (2020), Huang (2023), Palau-Saumell et al. (2019), Vinerean et al. (2022), Tak and Panwar (2017), and Gündoğan and Kazançoğlu (2021) also reported that social influence did not have a significant effect on mobile shopping intention. In contrast, Alalwan et al. (2017), Baptista & Oliveira (2015), Chopdar et al. (2018), Hew (2015), Kizir & Bozbay (2020), Soni et al. (2019), and Hanif et al. (2022) found that social influence was a significant determinant. The results show that there is considerable diversity in the literature regarding this variable.

Research findings have shown that facilitating conditions do not have a significant effect on BI. Similar results have been reported by Baptista & Oliveira (2015), Der (2014), and Kizir & Bozbay (2020). On the other hand, studies by Chopdar et al. (2018), Hew (2015), Huang (2023), Palau-Saumell et al. (2019), Soni et al. (2019), Hanif et al. (2022), and Tak & Panwar (2017) indicate that FC have a significant effect on BI. The findings suggest that there may be differences depending on context and sampling.

This study found that HM has a strong and significant effect on mobile shopping intention. Numerous studies in the literature support this finding. For example, Alalwan et al. (2017), Baptista & Oliveira (2015), Chopdar et al. (2018), Durukal (2020), Hew (2015), Kizir & Bozbay (2020), Palau-Saumell et al. (2019), Vinerean et al. (2022), Tak & Panwar (2017), and Gündoğan and Kazançoğlu (2021) have shown that HM significantly increases consumer intention. However, three studies by Der (2014), Soni et al. (2019), and Huang (2023) reported that HM did not have a significant effect.

The research results show that the habit variable does not have a significant effect on BI. This result is consistent only with Chopdar et al. (2018) in the literature. In contrast, studies conducted by Baptista & Oliveira (2015), Der (2014), Durukal (2020), Hew (2015), Huang (2023), Kizir & Bozbay (2020), Palau-Saumell et al. (2019), Soni et al. (2019), Tak & Panwar (2017) and Gündoğan and Kazançoğlu (2021) reported that the HAB factor has a positive and significant effect on BI.

The study found that price value had a significant and positive effect on the

intention to make mobile purchases. This finding is supported by Alalwan et al. (2017), Der (2014), Durukal (2020), Kizir & Bozbay (2020), Palau-Saumell et al. (2019), Soni et al. (2019), Tak & Panwar (2017), and Gündoğan and Kazançoğlu (2021). On the other hand, Baptista & Oliveira (2015), Chopdar et al. (2018), Hew (2015), Huang (2023), and Hanif et al. (2022) reported that price value was not a significant determinant.

6.2. Effects on Mobile Shopping Usage Behavior

The study also evaluated the role of HAB, FC, and BI variables on mobile shopping usage USB. The analysis results show that HAB (H8) and BI (H10) significantly and positively influence mobile shopping USB. In contrast, hypothesis H5, which measures the effect of FC on USB, was not supported.

This study found that FC did not have a significant effect on mobile shopping USB. The only study in the literature that coincided with this finding was conducted by Chopdar et al. (2018). However, a significant portion of other research shows that FC have a positive and significant effect on USB. For example, Alalwan et al. (2017) showed that mobile banking use, Baabdullah et. al. (2019) mobile services, Baptista and Oliveira (2015) mobile banking application use, Huang (2023) mobile shopping behavior of elderly consumers, and Palau-Saumell et al. (2019) restaurant application use were significantly influenced by FC. Similarly, Tak and Panwar (2017) reported that FC play a critical role in models explaining mobile shopping USB. These contrasting findings indicate that the effect of FC may differ depending on context, culture, or technology usage habits.

The research results show that HAB is one of the strongest determinants of mobile shopping USB. This finding is supported by many studies in the literature. For example, Alalwan et al. (2017), Baabdullah et. al. (2019), Baptista & Oliveira (2015), Chopdar et al. (2018), Huang (2023), and Palau-Saumell et al. (2019) have shown that habit directly affects the use of mobile technologies. Furthermore, Tak & Panwar (2017) and Gündoğan and Kazançoğlu (2021) stated that mobile shopping usage is largely related to habitual behavioral patterns. In this respect, the present study shows a high degree of consistency with the literature and it is seen that habit has an undeniably strong influence on USB.

Another important finding of the study is that BI positively and significantly influences mobile shopping USB. This result is entirely consistent with the literature. For example, Der (2014), Baptista & Oliveira (2015), Chopdar et al. (2018), Durukal (2020), Palau-Saumell et al. (2019), Tak & Panwar (2017), and Gündoğan and Kazançoğlu (2021) show that BI is one of the strongest determinants of mobile shopping USB. No studies were found in the literature suggesting that BI has no significant effect on USB. This indicates that the theoretical framework regarding BI as a key determinant of USB is strongly supported in the UTAUT2 model.

This study revealed that mobile shopping USB is primarily explained by HAB and BI, while FC do not play a significant role in this context. The results show that the UTAUT2 model has a strong structure in explaining USB in the consumer context, and that HAB is one of the key variables explaining the use of mobile technologies.

7. Conclusion And Recommendations

This study examines the factors influencing the adoption of mobile shopping in Turkey and identifies the factors shaping mobile shopping BI and USB based on the UTAUT2 model. The findings show that HM and PV significantly and positively influence mobile shopping BI; while HAB and BI strongly determine mobile shopping USB. In contrast, PE, EE, SI, and FC were found to have no significant impact on the adoption of mobile shopping.

The research results reveal that the variable with the strongest influence on mobile shopping BI is price value ($t = 8.167$). While the effect of HM ($t = 2.900$) is positive, it is lower compared to PV. These findings indicate that the perceived benefit-cost balance plays a critical role in Turkish users' preference for mobile shopping. Although most mobile shopping applications can be downloaded for free, indirect costs such as acquiring a mobile device and securing an internet connection are decisive for users. Furthermore, the fact that some applications offer paid premium features makes this cost dimension even more visible. Therefore, reducing mobile shopping costs has the potential to strengthen consumers' intention to make mobile purchases.

According to research findings, another important factor influencing mobile shopping BI is HM. Users' perception of mobile shopping as a fun, enjoyable, and satisfying activity increases their tendency to shop on mobile devices. Therefore, presenting the mobile shopping experience in a pleasurable, simple, fast, and aesthetically pleasing way will have a positive impact on intention.

The findings also revealed that HAB ($t = 6.920$) is a stronger predictor of mobile shopping adoption than BI. The routinization of mobile shopping behavior over time leads consumers to use this channel more frequently and naturally. While BI ($t = 5.194$) also had a significant effect on USB, it was not as strong as HAB. This indicates that mobile shopping USB does not remain solely at the intention level, but becomes automatic and transforms into a habit through repeated use.

Although the research was conducted with a consumer focus, the findings also reveal significant implications for businesses offering mobile shopping services. Current data shows that despite the widespread use of mobile devices and mobile internet in Turkey, approximately half of users do not engage in mobile shopping. This situation necessitates that mobile shopping platforms

effectively develop strategic approaches to attract this high-potential user base. Based on these findings, businesses should prioritize practices that enhance PV (campaigns, discounts, free shipping, and membership privileges), make the mobile shopping process user-friendly, fast, and enjoyable (HM), and develop design and notification strategies that encourage repeat use (HAB). These strategies are critical for increasing brand loyalty and ensuring sustainable profitability.

The prevalence of mobile technologies has led to mobile shopping permeating almost all sectors. Mobile shopping alternatives exist in a wide variety of fields such as health, media, food, fashion, education, and entertainment. This study examines the general adoption of mobile shopping without focusing on a specific sector or demographic group. Therefore, it is important to consider this broad perspective when interpreting the results. While this can be considered a limitation of the study, it also presents an opportunity for future research. In this regard, the following suggestions can be made for future research:

- Studies can be conducted focusing on a specific sector (e.g., fashion, food, electronics, digital subscriptions).
- In-depth analyses can be performed on a specific mobile shopping application (e.g., Trendyol, Hepsiburada, Amazon).
- Comparative research can be conducted focusing on demographic segments such as gender, age group, and income level.
- Expanded models can be developed by adding additional variables such as user experience, trust, perception of privacy, personal innovation, or cultural factors.

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