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The Role of Digital Transformation in Enhancing Customer  
Experience in the Banking Sector: Opportunities and Challenges

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Patras, Greece, May 2025

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# The Role of Digital Transformation in Enhancing Customer Experience in the Banking Sector: Opportunities and Challenges

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*“The dissertation is dedicated to my parents, Petros and Alexandra and my brother  
Konstantinos.*

*Your love and your support were the driving forces that got me to the finish line.*

*With all my love.”*

*«Η διατριβή είναι αφιερωμένη στους γονείς μου, Πέτρο και Αλεξάνδρα, και στον αδερφό μου  
Κωνσταντίνο.*

*Η αγάπη σας και η υποστήριξή σας ήταν οι κινητήριες δυνάμεις που με έφεραν στην γραμμή  
τερματισμού.*

*Με όλη μου την αγάπη.»*

*I would like to sincerely thank my supervisor, **Dr. Chrysa Agapitou**, for her exceptional  
academic guidance, valuable insights, and unwavering support. Beyond her academic  
mentorship, I am deeply grateful for her personal support and encouragement during  
challenging moments.*

## **Abstract**

The dynamic technological environment requires that banks and financial institutions have to engage in digital transformation. This research aims to examine how the adoption of digital technologies such as artificial intelligence (AI), Internet of Things (IoT), mobile banking, and big data analytics, are enhancing customer experience in digital banking.

Moreover, this research aims to identify and examine the main challenges that banks face during their digital transformation, including cybersecurity issues, regulatory compliance, and organizational resistance to change.

The research concerns 187 responses from bank employees who work in the four systemic banks in Greece (Alpha Bank, Eurobank, National Bank of Greece and Piraeus Bank). The questionnaire was sent by email, and the responses were collected online.

Finally, this research provides guidance for banks to successfully manage the complexities of digital transformation, maintaining continuous enhancements in customer experience and competitive advantage within the dynamic financial environment. The findings indicate that digital transformation offers opportunities for banks to enhance customer experience by implementing strategies that affect factors such as trust and security, reliability, and convenience and accessibility. The findings also indicate that digital transformation leads to cost reduction, so banks improve their financial performance.

## **Keywords**

Artificial Intelligence, Customer experience, Customer loyalty, Customer Satisfaction, Digital Banking, Digital Transformation, Digital technologies

# Ο ρόλος του ψηφιακού μετασχηματισμού στη βελτίωση της εμπειρίας του πελάτη στον τραπεζικό τομέα: Ευκαιρίες και Προκλήσεις

Άννα Παναγιωταροπούλου

## Περίληψη

Το δυναμικό τεχνολογικό περιβάλλον απαιτεί από τις τράπεζες και τα χρηματοπιστωτικά ιδρύματα να συμμετάσχουν στον ψηφιακό μετασχηματισμό. Η έρευνα αυτή έχει ως στόχο να εξετάσει πώς η υιοθέτηση ψηφιακών τεχνολογιών, όπως η τεχνητή νοημοσύνη (AI), το Internet of Things (IoT), το mobile banking και η ανάλυση μεγάλων δεδομένων (big data analytics), βελτιώνουν την εμπειρία των πελατών στην ψηφιακή τραπεζική.

Επιπλέον, η παρούσα έρευνα στοχεύει στον εντοπισμό και την εξέταση των κύριων προκλήσεων που αντιμετωπίζουν οι τράπεζες κατά τη διάρκεια του ψηφιακού μετασχηματισμού τους, συμπεριλαμβανομένων των ζητημάτων κυβερνοασφάλειας, της κανονιστικής συμμόρφωσης και της οργανωσιακής αντίστασης στην αλλαγή.

Η έρευνα αφορά σε 187 απαντήσεις από τραπεζικούς υπαλλήλους που εργάζονται στις τέσσερις συστημικές τράπεζες στην Ελλάδα (Alpha Bank, Eurobank, Εθνική Τράπεζα της Ελλάδος και Τράπεζα Πειραιώς). Το ερωτηματολόγιο στάλθηκε μέσω ηλεκτρονικού ταχυδρομείου και οι απαντήσεις συλλέχθηκαν ηλεκτρονικά.

Τέλος, η έρευνα αυτή παρέχει καθοδήγηση στις τράπεζες για την επιτυχή διαχείριση της πολυπλοκότητας του ψηφιακού μετασχηματισμού, διατηρώντας συνεχείς βελτιώσεις στην εμπειρία των πελατών και ανταγωνιστικό πλεονέκτημα στο δυναμικό χρηματοοικονομικό περιβάλλον. Τα ευρήματα δείχνουν ότι ο ψηφιακός μετασχηματισμός προσφέρει ευκαιρίες στις τράπεζες να βελτιώσουν την εμπειρία των πελατών εφαρμόζοντας στρατηγικές που επηρεάζουν παράγοντες όπως η εμπιστοσύνη και η ασφάλεια, η αξιοπιστία, η ευκολία και η προσβασιμότητα. Τα ευρήματα δείχνουν επίσης ότι ο ψηφιακός μετασχηματισμός

οδηγεί σε μείωση του κόστους, με αποτέλεσμα οι τράπεζες να βελτιώνουν τις οικονομικές τους καταστάσεις.

### **Λέξεις – Κλειδιά**

Τεχνητή Νοημοσύνη, Εμπειρία Πελάτη, Αφοσίωση Πελάτη, Ικανοποίηση Πελάτη, Ψηφιακή Τραπεζική, Ψηφιακός Μετασχηματισμός, Ψηφιακές Τεχνολογίες

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## **List of Abbreviations & Acronyms**

AI	Artificial Intelligence
BDA	Big Data Analytics
BI	Business Intelligence
CBS	Core Banking System
CDP	Customer Data Platform
CEO	Chief Executive Officer
CRM	Customer Relationship Management
IBM	International Business Machines Corporation
IoT	Internet of Things
IT	Information Technology
KPMG	Klynveld Peat Marwick Goerdeler
NLG	Natural Language Generation
PMO	Project Management Office
PwC	PricewaterhouseCoopers LLP
VR	Virtual Reality

## **1. Introduction**

Banking sector experiences a significant transition led by fast changes in digital technologies. Digital transformation in banking has become vital for banks to maintain competitiveness and address changing customer demands. The integration of digital technologies, including Artificial Intelligence (AI), the Internet of Things (IoT), digital platforms, and dialogue-based chatbots, has transformed the manner in which banks engage with their customers, thus enhancing the entire customer experience.

A continuous and safe digital banking experience is essential for establishing trust with customers. In light of the escalating cyber risks, banks must allocate resources towards security measures to protect customer data. Furthermore, customization, driven by AI and data analytics, enables banks to provide customized financial solutions, enhancing consumer engagement and perceived value. Digital channels and mobile banking enhance convenience and accessibility, allowing users to conduct transactions and access financial services at any time and from any location.

The implementation of digital technologies offers banks various options, such as a redesign of business processes and enhancement of customer experience. By utilizing AI, IoT, and big data analytics, banks can develop innovative and customized products and services, establish new business models, and improve decision-making processes. Furthermore, digital transformation allows financial institutions to enhance operational efficiencies, decrease expenses, and optimize service delivery.

However, banks face challenges such as regulatory compliance, cybersecurity threats, unwillingness to change and substantial implementation costs. Further challenges involve the absence of a clear digital transformation strategy, difficulties in integrating legacy systems with digital technologies, financial limitations, skill problems, resistance from organizational culture, and the agility and rapidity of implementation. Changing customer demands, limited access, cybersecurity and data privacy issues, along with ethical considerations, provide considerable challenges.

## **1.1 Aims and Objectives**

The aims and objectives of this research concentrate on examining the following:

- The main research question is how Digital Transformation in banking sector enhances customer experience.
- The three research sub-questions are:
  - Opportunities and Challenges in Digital Banking
  - The most important factors that affect customer satisfaction and loyalty
  - Digital technologies that banks use to enhance customer experience

## **1.2 Contribution of Research**

The findings of this research can significantly help Banks in implementing successful digital transformation strategies in order to enhance customer experience and banks' financial performance. Understanding bank employees' opinions as it concerns the factors that affect customer satisfaction and loyalty, the opportunities and the challenges in digital banking and moreover the digital technologies that enhance customer experience will undoubtedly enhance any initiatives aimed at the advancement of the digital transformation.

## **2. Literature Review**

### **2.1 The Future of Digital Banking**

Digital transformation in the banking sector is an ongoing process that influences both the external and internal environment by reengineering internal processes. Digital transformation includes supplying remote areas without physical branches, differentiating from competitors, and reducing operating costs (Kitsios, Giatsidis & Kamariotou, 2021).

The modern and dynamic technological landscape requires all financial entities to pursue digital transformation. Digital transformation allows banks to provide new service

channels via digital platforms, while simultaneously decreases operational costs by minimizing the number of physical branches and required employees. The banking sector globally allocates the more funds to IT investments than any other industry sector. Digital technologies and innovation are transforming traditional business models and processes. Banks have to modify their business models in order to upgrade customer interactions, optimize banking operations, maintain competitiveness, and be prepared for the next day (Kitsios, Giatsidis, & Kamariotou, 2021).

The rapid digital transformation in banking and other sectors is astonishing, and results in generating CEO concerns regarding the evolution of their organizations. As to PwC's 2023 CEO poll, 56% of participants indicated that evolving customer demands or preferences may influence profitability; 49% recognized technology as a factor capable of affecting the bottom line (PwC, 2023).

Banks must be prepared to provide the digital experiences that corporate and retail customers require, as these customers may not be keen to wait. Banks are exhibiting digital competence, as mobile banking applications introduced during the pandemic have integrated into the daily lives of customers (PwC, 2023).

A comprehensive strategy for digital transformation enables banks to simultaneously enhance operations across several business units. This may be more efficient and effective than addressing each function that operates separately and facilitate banks in addressing the lack of coordination among business units. This ensures that no business units or essential operations are ignored, hence supports banks in developing operational resilience for the future. The final outcome is a bank capable of adapting to changes in the business model swiftly and efficiently (PwC, 2023).

Integrating digital transformation fosters success by providing employees with a comprehensive understanding of customer behavior. When data is integrated across business units, sales teams can identify unmet customer needs and leverage chances to enhance their relationship with the bank (PwC, 2023).

Banks try to implement a digital model to improve customer experience and foster loyalty. The primary objectives of improving financial wellbeing are to assist customers in attaining their financial goals, managing their finances, and sustaining financial stability in challenging circumstances. Four critical sectors contribute to the advancement of financial services: data, business models, regulation, and technology (KPMG, 2019):

### **Data**

With the increasing connectivity of items to the internet and the expansion of the Consumer Data Right across all financial sectors, customers will begin to leverage the significance to demand more security and transparency as it concerns the use of their data, as well as to derive greater value from the products and services offered to them (KPMG, 2019).

As data production increases, customers may have more challenges in monitoring and controlling the multiuse of data sources collected on them. Trust is going to come as the principal distinction among providers as customers increasingly become more data conscious. Cultivating customers trust is crucial, as they are increasingly aware of the value of their data (KPMG, 2019).

Future banks will use data to get a comprehensive understanding of their customers in order to enhance service value and ensure compliance with legal requirements. Customers will be able to make decisions more swiftly and effortlessly. By 2030, successful banks are going to thrive in delivering data-driven customer experience across several channels, facilitated by robotic automation and artificial intelligence (KPMG, 2019).

### **Business Models**

Data will be extensively available, fostering the emergence of new recruits such as neo banks and "over the top" financial services. Leading banks will concurrently expand their business models by exploring prospects aligned with their fundamental services. Financial sector boundaries will become increasingly indistinct as companies from various sectors begin to integrate financial services into their operations (KPMG, 2019).



By 2030, the financial services sector will transcend conventional borders and banks will enable their customers to choose services customized to their requirements from diverse providers, resulting in enhanced efficiency of digital interactions (KPMG, 2019).

## **Regulation**

Due to the substantial changes resulting from digital banking transformation, governments and regulatory organizations have to develop new strategies for risk identification and management, regulate activities conducted by a broader array of participants, and assess them based on the outcomes delivered to customers. Future customers, possessing more knowledge, will evaluate financial services organizations based on their outcomes (KPMG, 2019).

By 2030, financial regulators will establish new frameworks to monitor the organizations they supervise and assess the safety of the financial systems. Blockchain will serve as the fundamental basis of "trust," safeguarding transaction history data and facilitating further complex risk assessment models (KPMG, 2019).

## **Technology**

Technology serves as both the catalyst and facilitator of change. Technologies will significantly impact on the financial services sector in the next ten to fifteen years. The subsequent technologies are transforming the nature of services and their delivery and utilization. Such digital technologies are: artificial intelligence, blockchain, biometrics, 5G, cloud computing, the internet of things, and augmented reality/virtual reality (KPMG, 2019).

Emerging participants, such as neo-banks, will shape the competitive landscape and customer experience benchmarks for the future. Certain banks or emerging IT companies might choose to remain discreet and focus on providing the industry's backend infrastructure. Global IT corporations will leverage their capacity to interact with customers to provide new supplementary services, such as banking (KPMG, 2019).

Technology will facilitate more personalized banking across all platforms and

applications. They will modify the channels, services, and roles of banks in everyday life, rendering certain aspects of banking entirely distinct from the current experiences (KPMG, 2019).

KPMG's Emerging Technology Radar forecasts that the following technological breakthroughs and capabilities may significantly impact bank-customer relationships by 2030.

- The Bank of the Future will thrive by customizing its services to individual needs and preferences, while also considering their customer experiences. In the business-customer relationship, personalization often constitutes the most valuable aspect of an experience; even seemingly trivial details, such as recalling a customer's name, can exert a substantial impact (KPMG, 2019).
- Banks must adjust their business strategies to enhance the perception of the value of their services as they become increasingly integrated into their customer's daily lives. The Bank of the Future will achieve a considerable competitive advantage by ensuring that the use of their products and services is as straightforward and frictionless as possible for customers (KPMG, 2019).
- The ability of banks to act on the customer data they collect increases as their comprehension of it advances. Technologies such as artificial intelligence (AI), blockchain, and the internet of things (IoT) enable the delivery of relevant services and advice to customers that address their immediate needs and align with their best interests (KPMG, 2019).

### **2.1.1 Strategic steps that lead to a successful Digital Banking Transformation**

Not all financial services organizations, that aim for digital transformation, attain the expected outcomes. Several organizations confront difficulties investing in technologies that can significantly enhance operational efficiency and facilitate strategic expansion.

Inadequate execution of technology and insufficient strategic planning are two key factors contributing to the potential shortcomings of digital transformation (PwC, 2023).

Change management is essential for navigating these challenges. Banks have to train their employees in new systems and technologies, as well as enhance employees' skills to ensure they can effectively use, manage, and safeguard data. In the context of swift innovation, employees must comprehend the fundamentals of control and governance to ensure that modifications are monitored and authorized in accordance with a standardized methodology (PwC, 2023).

A vital component of effective digital transformation is robust cybersecurity measures. As the risk landscape changes, banks make additional security investments. According to PwC's Q4 2022 Financial Services Survey, over half of financial services organizations (53%) anticipated increasing their investments in cybersecurity during 2023. Several banks are engaging specialists to safeguard their private data, utilizing the security features inherent in cloud-based systems. These platforms provide security updates at scale, enabling them to mitigate emerging cyber threats as they are detected (PwC, 2023).

Banks should embrace digital transformation while investing in the necessary infrastructure to enhance experience for customers as well as employees. Collaborating with a technological leader can benefit financial services organizations, accelerate transformation and expedite the delivery of experiences to market more swiftly than their competitors (PwC, 2023).

Essential for the success of digital transformation is the alignment with a network of enterprises capable of using banking-specific applications, digital transformation methodologies, and cloud-migration tools to expedite banks' transition to the cloud and rapidly create value. In collaborating within a business ecosystem, banks may utilize among the best methods to provide necessary skills through established solutions. Furthermore, within an ecosystem, banks can utilize a broader community to collaborate, adjust to evolving market demands, and accelerate innovation (PwC, 2023).

Successful banks of the future are certainly constructing innovative and multifaceted ecosystems at present. These ecosystems can facilitate enhanced connection, more complex interactions, and superior products and services (PwC, 2023).

As digital transformation advances rapidly across the sector, banks will certainly necessitate more complex digital competencies to remain competitive. Collaborating with technology and non-financial services companies enables banks to innovate at the pace required by the market. To maintain competitiveness, banks require a contemporary and scalable technological infrastructure that permeates the enterprise (PwC, 2023).

A comprehensive strategy for digital transformation enables banks to optimize their data use. Analytics is likely to be the primary objective, as banking executives seek chances to integrate information from throughout the organization and identify intersections among customer and employee behavior, and financial performance. This consolidated perspective enables banks to extract greater value from their existing data. Furthermore, by collaborating with a network of technology and solution providers, banks can obtain real-time performance data, enhance automated controls, optimize cash flow, and enhance customer experience (PwC, 2023).

## **2.2 Opportunities and Challenges in Digital Transformation**

Digital transformation in banking sector involves not just the adoption of new technologies but also the creation of a culture that welcomes change. From a customer experience perspective, digitalization allows banks to satisfy extremely demanding customers by providing fast services, personalization, and multi-channel accessibility (Gualandri & Pizzeti, 2020).

The primary concerns confronting the banking business include outdated infrastructure, cybersecurity threats, and issues of trust among customers. Banks must embrace a "technology-first" approach to maintain relevance while simultaneously ensuring innovation is balanced with resilient, secure, and visible customer interactions. Success in digital transformation depends on matching technology with customer needs and

guaranteeing effortless user experience across all interfaces (McKinsey & Company, 2020).

### **2.2.1 Opportunities**

Blockchain technology serves as an effective tool across multiple economic sectors, including financial management and banking services. The digital economy, characterized by innovation, utilizes digital technologies and digital communication to facilitate economic and business activities. The implementation of digital technology and digital communication in different sectors has resulted in a notable shift to internet-based interactions, expedited processing, and digitalization, hence enhancing user experiences and facilitating access to services and products. The digital economy is the primary catalyst for economic growth and development in many countries because of the significant relevance of digital technologies and their influence on economic and corporate activities (Xia, Baghaie & Sajadi, 2024).

The digital era has introduced many advantages and trends in the financial sector, transforming traditional approaches and improving overall financial performance and customer experience. With the expansion of digital banking platforms and the integration of digital technologies like artificial intelligence and machine learning, banks have to adapt to digital transformation in order to foster sustainable growth and enhance competitiveness in the digital era (Rodrigues, Ferreira, Teixeira & Zopounidis, 2022).

Digital transformation enhances customer experience in banking sector through the use of data and automation. The increasing significance of hyper-personalization pushes banks to collect and analyze extensive data in order to customize services for specific customers. Artificial intelligence and machine learning help banks in forecasting customer behavior and in providing proactive solutions, such as financial advice or alerts regarding potential financial threats (Accenture, 2021).

Big data, Internet of Things (IoT), and Open Banking will provide banks and other financial institutions with deep knowledge into their costumers' lives. Utilizing Artificial

Intelligence (AI) tools to analyze information from thousands or millions of customers would enable banks to precisely anticipate customer demands and proactively provide support for customer needs. By aligning demands with varying situations, Banks of the Future could use this information to proactively address the changing lifestyles of their customers, sometimes even before the customers are aware themselves. As it concerns any errors, AI will promptly identify any issues, notify the customer, and offer a range of alternatives tailored to the individual's specific cases. In instances of suspicious transactions, AI will proactively mitigate the impact of fraud on customers (KPMG, 2019).

Key developments include the growth of mobile banking, the emergence of robo-advisors, and the increasing use of AI for individualized financial guidance. Customer-centric digital services provide more than fundamental banking operations, enabling customers to manage their financial resources in previously unattainable ways (McKinsey & Company, 2020).

Customers experience design is crucial to digital transformation. Innovations like fast payments, voice-activated banking, and intelligent chatbots are designed to improve easy use and cultivate loyalty (Harvard, 2019).

Banking sector is seen as a highly competitive market characterized by the provision of many financial products and services to customers. To sustain competitiveness in this sector, banks must foster and uphold customer loyalty, as it is essential for retaining a substantial customer base and generating revenues. Banks have to differentiate themselves by offering exceptional services and fulfilling experiences to their customers on order to enhance customer loyalty and facilitate retention. Banks have acknowledged the vital role of customer loyalty in fostering corporate growth and sustainability. Therefore, examining all aspects that influence customer loyalty is a fundamental objective for each bank. Customer loyalty is a crucial asset for successful banking organizations, as it significantly influences customer behavior, such as ongoing purchases or repurchases of services from the same organization. Customer loyalty is a critical component that banks must prioritize and actively cultivate to ensure corporate success and survival (Kim, Jindabot and Yeo, 2024).

Customers are increasingly sensitive to the significance of their personal data and the necessity of safeguarding it. Historically, banks have served as the most secure repository for customer money. Similarly, they have to become the most secure place for customers' data. By 2030, banks will have the potential to evolve into trusted personal data banks for customers in order to handle customer data in a manner similar to the management of their financial assets (KPMG, 2019).

Social media has an impact on the business models of certain digitally oriented banks. Social media possesses the capacity to fundamentally transform customer-bank relations and enhance future communication. Banks must shift from dependence on a singular, vertically integrated business model to adopting several non-linear models and places throughout the value chain. Information technology tools have been used in banking to accelerate a strategic transformation objective. The relationship between banks and their customers has changed dramatically in recent decades due to advancements in modern information technology. The main levels and design components of enterprise architecture are strategic, organizational, integration, software, and IT infrastructure. Information technology facilitates the creation of complex products, improves market infrastructure, implements effective risk management strategies, and allows financial intermediaries to access varied and widely separated markets (Osei, Cherkasova & Oware, 2023).

### **2.2.2 Challenges**

Digital transformation in banking sector, with the integration of modern technologies like cloud computing, big data analytics, artificial intelligence, and blockchain, has transformed financial services. This swift in digitalization includes considerable data privacy and cybersecurity problems. Banks primarily confront issues such as integrating old systems, adapting compliance management, controlling vendors risks, sustaining customer trust, and reducing developing risks. Financial institutions regard strong data privacy and cybersecurity as essential for competitive edge, regulatory adherence, and customer confidence. Strategies encompass stringent access restrictions, ongoing threat surveillance, employees training, compliance to laws and regulations frameworks, and data encryption (Wang, Asif, Shahzad & Ashfaq, 2024).

Banks confront several challenges, including difficult data management and storage demands that consume substantial resources, inadequate cybersecurity that jeopardizes the security of critical customer information, and intense competition from global technology companies that provide attractive customer experiences. Cloud computing provides unparalleled agility and security, while enhancing data processing capability. Financial institutions have adopted cloud computing not only for cost-effective solutions but also for business transformation. The rapid advancement of cloud computing applications in banking is anticipated to profoundly impact banks' operational efficiency and control, particularly in system security and fraud detection (Cheng, Qu, Jiang & Zhao, 2022).

Although AI and automation provide considerable advantages, they also present significant challenges. Policymakers, organizations, and individuals must confront these issues to leverage the benefits of AI and automation while mitigating possible adverse effects. An analytical approach is needed, given the complex and dynamic characteristics of AI and automation and their impacts on society. The objective is to employ these technologies to optimize their capacity to enhance lives while minimizing potential harm (Pattnaik, Ray & Raman 2023).

Collection, storage, and use of data will enhance organizational efficiency. Nonetheless, the advantages of digital transformation have also introduced numerous issues that must be addressed adequately. The success of digital transformation programs is contingent upon organizations implementing suitable steps to address information security issues. There are pivotal information security challenges confronting organizations engaged in digital transformation such as insufficient expertise, evolving security management requirements, financial concerns, potential security breaches, limited access and control, and decreased productivity. Methods to address information security concerns must be devised and implemented in accordance with the internal and external organizations environments (Gebremeskel, Jonathan & Demesie, 2023).

Trust in the finance business has recently been undermined, but additional factors are also impacting on the financial services sector. To remain competitive, Banks of the Future must diligently recover trust among customers by prioritizing the security of customer data



and upholding their privacy. Upon identifying issues, the foremost Banks of the Future will promptly implement measures to safeguard their reputation across every aspect of customer experience. This must be considered a non-negotiable component and will serve as the principal distinguishing factor for a customer to choose a bank versus a firm from another sector that has integrated financial services (KPMG, 2019).

Innovative "regtech" instruments, driven by AI, will provide far more efficient and effective oversight. Regulators will utilize these technologies to exchange information among one another, transcending national and international borders, so contributing to the struggle against financial crime. Data also plays a key role in this change and blockchain will serve as the foundation of 'trust', securing data from historical transactions and enhancing advanced risk assessment models. Regulations like the EU's GDPR will become widespread, with the international community expected to implement a comparable worldwide regulation (KPMG, 2019).

According to Shanti, Avianto and Wibowo (2022) the challenges are: insufficient infrastructure for enabling technology adoption and support, the risk to unauthorized access, and cyber-attacks concerning data privacy and security and the necessity for supplementary legal frameworks for technology particularly for novel product types and delivery methods. These issues necessitate a review of current regulations and permissions. Digital and technological innovation for banks is increasingly an opportunity for incremental returns through enhanced productivity but also poses a risk of obsolescence and irrelevance. The reduction of margins, loss of market share, and the loss of substantial revenue streams are significant issues. Digital transformation thrives in influencing both internal and external environments as a result of the emergence of new business models.

Although the indisputable advantages of digital transformation, banks encounter significant challenges on their journey toward digitalization. Legacy systems, marked by antiquated infrastructure and heterogeneous data architectures, present a substantial barrier to advancement, impeding agility and interoperability (Dudin, Shkodinskii and Usmanov, 2021). Challenges with IT infrastructure constitute the major constraints to banking

operations so, banks have to consider IT systems as a vital component requiring enhancement to effectively facilitate digital transformation initiatives in the context of rising rivalry. Digital transformation requires an accurate plan of action to guarantee reliable and sustained progress. When information regarding IT systems is resilient, digital transformation initiatives are stable and progressively advancing, indicating enhanced profitability for the bank. The absence of technology infrastructure changes in discussions about digital transformation is regarded as a detrimental indicator for profitability growth (Nguyen, Nguyen & Nguyen, 2023).

The employees in the banking sector must confront two significant problems because the initial challenge is internal. Banks often possess an organizational framework characterized by tight standard operating and risk management procedures. The presence of information and communication technology provides greater flexibility in the execution of financial tasks but digital economy continues to provide challenges, particularly with security concerns. The second external challenge originates from the customer perspective because customers generally favor companies who deliver efficiency and convenience. The delivery of digital banking services seeks to enhance and promote public access to financial services. Users of financial services typically favor providers that deliver efficiency and simplicity. Banks must educate customers through innovative social engagement and ongoing communication or reminders. The objective is to enhance customer understanding of the need to safeguard its assets and personal information when using digital banking services (Haryono, Ghafur & Somantri, 2023).

## **2.3 Enhancing Customer Experience through Digital Technologies**

Customer experience is an essential component that affects the willingness of consumers to repeat the experience or to recommend it to their peers. Significant experiences are more likely to influence an individual's future behavior. Customer experience is directly positively correlated with customer loyalty. This indicates that when customers consider the services they receive as excellent, they are likely to remain with the organization for a longer time. The influence of customer experience management on loyalty has driven

several organizations to invest in digital technologies for exceeding customer experience at every interaction (Makudza, 2021).

Windasari, Kusumawati, Larasati, and Amelia (2022) claim that developing a pleasant easy to use digital banking interface is essential for facilitating a user-friendly experience for customers. To guarantee beneficial customer experiences, more components must be implemented, including rewards, distinctive features, and referrals from satisfied customers.

Effective technology management and strong relationships with employees are essential components for ensuring a successful digital transformation strategy. Banks may retain customers by providing a variety of attractive and innovative services, lowering expenses, and improving the options and experiences they offer, so using these attributes to sustain their competitive advantage. They have to determine the optimal approach to address the threat of digital disruption by identifying the essential factors necessary for cultivating effective team cooperation, which is crucial for innovation and success. An evaluation is necessary for identifying the degree of intervention required to enhance IT cooperation and performance, hence facilitating successful digital transformation (Rodrigues, Oliveira & Rodrigues, 2023).

The increasing digital transformation of the economy, with the rise of new institutions like fintech, has significantly altered the operations of the banking sector. These changes have been in progress from the pandemic period and are expected to intensify in the post-pandemic age, due to their wide impact across all business sectors. The digital experience in financial services is defined by the combination of services and channels. The efficiency and superior quality of these services strive to deliver a satisfactory experience to all customers, while simultaneously offering personalized and tailored solutions (Rodrigues, Oliveira & Rodrigues, 2023).

Digital economy indicates the application of digital technologies and digital interactions in economic activities. These technologies involve the Internet, cloud computing, blockchain, artificial intelligence, the Internet of Things, and big data. The integration of these technologies can enhance economic processes, increase efficiency and production, and improve information accessibility. Digital economy embraces the application of digital technologies and digital interactions in economic activities, enhancing performance and service quality across many different sectors (Xia, Baghaie & Sajadi, 2024).

Strong digital transformation capability emphasizes the capacity to modify operational processes, products and services, customer experiences, and organizational culture while maintaining competitiveness. Technological capabilities can aid banks in enhancing their innovation capacity for the development of new products and services, like mobile applications or digital platforms, to improve customer experience and stimulate revenue growth. Modern technologies boost customer experience, improve operations, generate new business models, and facilitate the development of new products and services (Abdurrahman, Gustomo & Prasetyo, 2024).

Despite the significant influence of digitalization on the banking sector, the effectiveness of intermediaries' digital banking strategies depends on customer willingness and ability in using novel products, services, and technologies. The absence of digital skills within society may impede the efficacy of the banking digitization approach. External factors, like the Covid-19, have highlighted the necessity of enhancing knowledge and ability in using digital banking platforms, applications and tools. To enhance customer experience, many worldwide institutions have worked for and executed several financial education programs (Ferilli, Palmieri, Miami & Stefanelli, 2024).

Customer experience is affected by functional indicators (functional quality, trust, and convenience), mechanical indicators (website features, design, and perceived usability), and human indicators (management of customer complaints). Banking service providers should potentially evaluate their financial outcomes depending on the influence of digital banking on customers (Chautan, Akhtar & Gupta, 2022).

Monitoring customer experience is an essential task for organizations, especially in the financial industry. Organizations globally realize that a positive customer experience not only boosts growth but also fosters repeat business and generates favorable word-of-mouth referrals from dedicated customers. A little change in the ratio of loyal customers can greatly affect an organization's profitability. In the banking sector, customer loyalty depends on what they think of service quality and overall experience, as the products and services provided by many banks are mostly similar. The significance of customer satisfaction in shaping the whole customer experience is clear, as the majority of researches focus in this domain. The main factors that lead to a success digital transformation are the adoption of digital banking, maintained use of internet banking, efficient management of multichannel banking, analysis of diverse customer profiles for improved experience management, and strategic preservation of brand image to guarantee sustained customer satisfaction. It is recognized that digital channels have a major impact on customer satisfaction levels, due to the shifting technological landscape (Sangwan & Yadav, 2024).

Key criteria for enhancing customer experience are trust, perceived value, service quality, and service information. There are several crucial touchpoints that influence the customer experience. Banking institutions must continuously monitor their customers' experiences and focus on the interactions that customers consider significant, rather than those the institution regards as the most important or profitable. Emphasizing the customer's viewpoint above that of the organization is essential. Recognizing relevant digital points of contact enables banks to enhance customer service and cooperatively establish a safe platform. Furthermore, a multichannel approach must be supplemented with a comprehensive strategy for efficient management. Banks have to create high-quality services to foster customer loyalty. Financial institutions have to oversee both digital and physical customer interactions to enhance brand perception among customers. This can be accomplished through the seamless integration of offline and online channels, ensuring seamless synchronization for an improved customer experience (Sangwan & Yadav, 2024).

Competitive forces have compelled banks to adopt digital banking channels, such as internet and mobile banking, to provide services to customers. These channels have gained significance in financial services and are challenging traditional financial practices. Digital banking profoundly influences banks' marketing strategies by enhancing interactive services, since it affects the customer interfaces. It has allowed banks to provide multi-channel services, transforming their interactions with customers (Manser Payne, Peltier & Barger, 2017).

The transition to digital banking presents a challenge for banks regarding attracting, retaining, and profitability, which are no longer exclusively reliant on branches. Despite the remarkable advancement and adoption of Digital Banking among major banking organizations, it is essential to comprehend its effects on customer experience and the financial performance of banks, particularly from the perspective of managers responsible for its implementation (Tam & Oliveira, 2017).

Digital banking has empowered banks to provide customers with immediate services via various distribution methods. Bank employees who regularly engage with customers are the crucial connection in service delivery, fostering trust and shaping customer behavior. Since managers are tasked with executing digital banking services, it is essential to evaluate their perspectives through their responses and interactions with customers to comprehend the implications for customer experience and financial performance (Mbama, Ezepue, Alboul & Beer, 2018).

The perception of service quality and experience significantly influence customer loyalty, particularly in a sector where products and services are largely comparable among several institutions. Issues include the adoption of digital banking, sustained access to internet banking, management of multichannel banking, analysis of diverse bank customer groups, and strategic brand image management. The growing value of digital interactions in influencing customer satisfaction is a factor that has a great impact on customer satisfaction. As technology progresses, researchers and professionals are increasingly concentrating on the determinants affecting the adoption of digital banking, especially

mobile banking. Initial trust, perceived utility, service quality, and service information are key factors for achieving customer satisfaction (Sangwan & Yadav, 2024).

### **Enhance the customer experience from multi-channel to optichannel**

Banks, as financial institutions directly interacting with individuals, necessitate a profound comprehension of customers to enhance their market share and optimize banking resources in delivering services customized to customer needs. The development of digital channels has increased this necessity, as various components influence the use of these novel financial platforms. Expectancy-value theory argues that customer value and expectations influence purchasing behavior, requiring consideration by banking managers in creating strategies. A detailed understanding of these features would enable banks to deliver required services to customers, hence ensuring their continued loyalty (Hosseini, Abdolvand & Harandi, 2022).

Merely providing customers with a diverse array of contact channels and a well-structured yet isolated trip inside them, will be insufficient for success in the digital world.

Customers favor transitioning between channels and desire to resume from their previous point in the last channel. Many customers initially research a product online, subsequently ask with an advisor, and ultimately choose to complete the transaction in person in a branch. Consequently, banks must thoroughly comprehend the journeys their consumers need and identify their preferred touchpoints to facilitate seamless movement across all available channels. By concentrating on the channels and interactions significant to each customer, banks may reduce marketing costs, streamline communication, and ultimately provide an exceptional customer experience through pivotal moments. This exemplifies a successful Opti channel experience (Deloitte, 2021).

Opti channel, the most recent advancement in marketing development, emphasizes that organizations should prioritize being "at the right place at the right moment" rather than merely increasing and integrating several channels. An omnichannel strategy, recognized as the current best practice, enables customers to interact with an organization through their preferred channel at every stage of their journey. An Opti channel strategy defines the most suitable channel for each customer at every touchpoint, informed on their objectives and historical customer data (Deloitte, 2021).

## **Internet of Things (IoT)**

Internet of Things is a component of intelligent infrastructure, and banking represents a significant domain that can benefit on the vast opportunities presented by IoT technology. These digital edge technologies in banking facilitate personalized interactions with customers and their needs, hence creating chances for data gathering, processing, analytics, and decision-making based on that data. Smart banking edge systems are essential to meet the increasing demands of financial services, and IoT is a crucial component of the digital banking infrastructure that will fulfill these expectations. Banking sector is fundamental to the economic development of many countries, and information technology facilitates service management and streamlines operations for banking institutions to expand. The banking industry is driven by expertise and information management. Products are developed, promoted, and distributed utilizing IT systems and applications. Information Technology boosts banking for all economic activities, hence an efficient banking system accelerates the flow of capital, resulting in enhanced growth and improved balance sheets, ultimately fostering economic development. The banking sector has embraced technology for rapid expansion, with modern technological implementations including Service-Oriented Architecture, Master Data Management, Customer Relationship Management, Business Process Management, Web Content Management Systems, and Document Management Systems (Ramalingam & Venkatesan, 2019).

## **Artificial Intelligence (AI)**

In banking, artificial intelligence is progressively employed in identifying and managing fraud, cybersecurity, chatbots, algorithmic trading, robo-advisory, credit scoring, asset and wealth management, relationship management, and regulatory compliance. Digital platform tactics can gain advantages from a bank's AI focus. Initially, banks' AI perspective fosters innovation within digital platform ecosystems. The flexible information processing infrastructure that banks must establish for the implementation of AI technologies can be integrated into the digital platform, facilitating third-party developers in incorporating AI into their applications that interact with customers. Secondly, AI can enhance platform procedures, such as advice, thereby augmenting the quality of services for customers. Third, customers evaluate a platform as possessing



greater value when it incorporates AI capabilities, specifically through the provision of AI-enabled applications and services. These effects will enhance the network effects inside the digital platform ecosystem. In conclusion, investors would view a bank's digital platform strategy more favorably if the bank can utilize the data gathered on the platform with AI and provide third-party developers with tools to integrate AI into their applications and services (Schrieck, Huang, Kupfer & Krcmar, 2024).

Artificial intelligence is a key tool for fraud detection and risk reduction. The lack of regulatory requirements, data privacy and security measures, and insufficient skills and IT infrastructure are major obstacles to AI adoption. Financial technology (FinTech) is considered a crucial factor in strategic planning within the banking sector. Although AI presents numerous transformative prospects in the FinTech sector regarding data collecting, analysis, security, and process optimization, it simultaneously introduces significant risks to established banks (Rahman, Ming, Baigh & Sarker, 2021).

Innovative technologies, such as artificial intelligence, are becoming crucial in the banking sector to meet customer needs and enhance satisfaction. Artificial intelligence penetrates the digital banking sector, visible in applications such as facial recognition, chat bots, voice recognition, machine learning for fraud detection, and cybersecurity measures. Despite the efficiency in analyzing data and the ability to address customer concerns and complicated issues provided by artificial intelligence in banking, the adoption of AI-enabled digital banking remains in its early phase (Alhaser, Rahi, Alghizaawi & Ngah, 2023).

Through the application of artificial intelligence and machine learning, banks will effectively manage vast information volumes from customers, transactions, and additional sources with unparalleled accuracy, enabling the delivery of highly tailored financial services. Moreover, artificial intelligence and machine learning-based tools and algorithms would reduce operational costs while augmenting safeguards against fraudulent activities and other risks. These technologies are expected to improve compliance and operational performance (Polireddi, 2024).

### **Dialogue-based Chatbots**

Chatbots can enhance customer experience in the banking sector; nevertheless, their design, implementation, and integration with existing customer service channels require cautious consideration. The adoption of chatbots in banking sector must be conducted with careful consideration and strategy to optimize their capacity for enhancing customer experience while minimizing potential drawbacks (Salem, 2024).

Overall customer satisfaction refers to the evaluation of a company's products, services, and overall customer experience in relation to customer expectations, whereas customer experience includes an in-depth image and perception of a brand derived from interactions throughout the entirety of their usage journey. Enhancing customer satisfaction and fostering repeat transactions is crucial. Chatbots can provide many advantages in enhancing the customer experience throughout digital marketing. Chatbots increase customer engagement by providing quick support and minimizing response times, thereby avoiding the necessity for customers to wait for an employee's reply. It can help customers in selecting the products or services that most effectively meet their needs through personalized recommendations, hence improving customer satisfaction (Abdelkader, 2023).

ChatGPT can enhance chatbots in various manners. It can be leveraged to provide more authentic and captivating dialogue, deliver more precise and useful responses to requests, and develop more tailored marketing communications. As chatbots advance, ChatGPT is expected to have a progressively significant role in enhancing customer experience within digital marketing. Familiarity and comfort with technology significantly influence the customer experience with ChatGPT and overall satisfaction in digital marketing. Increased familiarity and comfort with technology enhanced the impact of ChatGPT on the customer experience (Abdelkader, 2023).

## **Natural Language Generation (NLG)**

Natural-language generation (NLG) engines facilitate dynamic interactions between humans and technology by adhering to rules that convert information gathering into words (Deloitte, 2017).

NLG technology enables the automatic generation of internal and external management reports by integrating structured performance information into a natural-language engine. Natural Language Generation (NLG) has been used by leading financial institutions to automate portfolio feedback, investment performance reports, and regulatory reporting (Deloitte, 2017).

## **Virtual Reality**

Virtual reality is significantly integrated into the actual world, providing several tangible uses. Financial institutions are also showing interest in virtual reality (Deloitte, 2017).

Initially, it will transform customer relations by providing an innovative approach to "enhanced" communications. Through online banking, users can communicate with bankers via email, live chat, phone calls, and additional methods. Tomorrow, customers will engage with their avatar within a virtual branch, allowing the banker to make offers and advise, as well as demonstrate simulations through altered, real-time images based on various criteria (Deloitte, 2017).

The "virtual meeting" is simpler and more interesting than a phone discussion or video call, while being equally successful as an in-person meeting without the necessity of travel. Augmented reality will be integrated into smartphone applications that may monitor the locations of customers and direct them to a branch by "visualizing" their journey (Deloitte, 2017).

### **2.3.1 Data sources that are used by the banks in order to measure customer experience in digital services**

**Banking Customer Relationship Management System (CRM):** The adoption of CRM involves the integration of all the operations that enhance organizational effectiveness and efficiency in delivering exceptional customer value. CRM constitutes a critical strategic goal for managing customer relationships by acquiring essential data and leveraging it for effective decision-making. With the appropriate application and software of CRM, banks will be equipped to address emerging difficulties, enhance its capacity to maintain customer databases, leverage this information for evaluating and predicting customer behaviors, and integrate it into the development of future marketing strategies. The ability to succeed can be evaluated by the skills, abilities, and expertise of bank employees in establishing, sustaining, and enhancing relationships with various customers, hence providing superior service compared to competitors (Hanaysha & Mehmood, 2022).

CRM is an important method for collecting vital information into customers and generating added value for them through the formulation of appropriate business strategies. Through CRM, banks obtain detailed information on their customer base and subsequently leverage this knowledge to modify their products and services to meet diverse customer needs and expectations. By implementing an effective organizational structure, the firm can implement CRM solutions across all the business units to proactively integrate resources towards achieving its long-term objectives (Hanaysha & Mehmood, 2022).

**Core Banking System:** The development of big data and the emergence of advanced analytical tools help banks use their vast databases to uncover customer information that would otherwise remain invisible. Business Analytics in the core system data is essential for improving the management of significant data and information relevant to the bank success. This process includes the classification, processing, along with interpretation of data into valuable intelligence information. By using business analytics in core system, banks gain a crucial tool to enhance their operational knowledge, recognize emerging trends and patterns, and ultimately make strategic decisions to foster business growth and success (Horani, Khatibi, AL-Sud & Tham, 2023).

**Digital Banking Platforms:** Digital platforms have become vital in the banking sector, allowing institutions to gather and analyze data to improve customer experience.

Digital platforms integrate digital technologies to enable interactions among customers who would otherwise find it difficult to connect. Digital platforms require a mechanism of control to facilitate interactions, guarantee suitable conduct among users, and foster the emergence of creative relationships (Ens, Hukal, & Jensen, 2023).

**Call Center & Chatbot Analytics:** The integration of call centers, chatbots, and virtual assistants can significantly enhance customer service and experience in banking sector. Banks collect data from the customer interactions and with the use of AI, particularly chatbots and virtual assistants, presents significant opportunities to measure and enhance service quality and customer experience. By effectively employing these technologies, banks can satisfy the changing needs of customers in the digital age (Pförsch & Sulaj, 2023).

### **2.3.2 AI & Analytics tools that are used by the banks in order to track and analyze customer experience in the digital services**

**Business Intelligence (BI) Dashboards:** Business Intelligence dashboards, like Power BI, Tableau, and Looker, have been used to demonstrate trends in customer experience and data insights. These tools allow banks to track key performance indicators (KPIs) and customer satisfaction metrics, which fosters decisions based on data. Improving customer experience via deep learning models for banking customer journey analysis underscores the significance of data visualization in analyzing customer interactions and enhancing service delivery (El-Gohary, Tayasselan, Babatunde & El-Gohary, 2021).

**AI Chatbots:** AI chatbots have been used to monitor customer demands, analyze self-service efficacy, and check response quality. These chatbots gather data on interactions with customers, delivering information about several issues, response durations, and customer satisfaction metrics. AI chatbots can improve the customer experience by providing promptly tailored responses, therefore enhancing service quality (Pförsch & Sulaj, 2023).

**Customer Data Platforms:** Customer Data Platforms collect and evaluate customer data resulting in information on user behavior and customer segmentation. By integrating data from several interaction points, Customer Data Platforms enable banks to better understand customer needs, customize services, and identify opportunities for enhancement. Customer Data Platforms can enhance tailored customer experiences and boost satisfaction levels (El-Gohary, Tayasselan, Babatunde & El-Gohary, 2021).

## **2.4 Customer Satisfaction and Loyalty in a Digital Age**

Digital technology is transforming the banking industry, emphasizing customer satisfaction and loyalty. Banks have to move from traditional banking methods to more agile, digital methodologies. This shift necessitates that banks reevaluate their relationship with customers, emphasizing personalization, ease of use, and reliability (Glyptis, 2020).

Customer satisfaction remains important however barriers such as technical difficulties, connectivity issues, reduced functionality, security issues, obstacles to interaction, and ambiguous user interfaces continue to exist. Confronting these obstacles is essential for banks to improve the entire customer experience. Although the overall security level in digital banking is mainly beneficial, ongoing initiatives are essential to enhance security measures and sustain customer trust. Digital transformation has positively influenced the banking sector by enhancing convenience, time efficiency, and accessibility, hence greatly improving the overall banking experience. Moreover, opportunities for additional enhancement are present, especially in resolving technological challenges, increasing functionality, and delivering more precise data. Banking sector is encouraged to prioritize investments in information technology, privacy, and customer experience. By resolving customer issues, providing seamless digital services, and promoting continuous innovation, banks may optimize the benefits of digital transformation, guaranteeing a favorable and gratifying banking experience for their customers (Sathwika, Hameed, Sharma, Babu, Chinnaiyan & Sungheetha, 2024).

Open Banking Applications are transforming the financial sector by integrating modern technology with traditional financial services. Customer satisfaction is essential for any

application, so by improving customer satisfaction, these applications generate deep understanding into customer needs, which may influence future advancements and improvements in their functionality. Customer services, application usability, and service quality are the main areas of discussion in open banking applications, reflecting the primary interests of customers (Desiraju, Mishra & Sengupta, 2024).

Due to increased rivalry in the global banking sector, there is a crucial need for banks to strengthen customer loyalty. Customer experience is an initial step to customer loyalty. The customer experience influences both the mental and emotional well-being of customers, fostering a preference for the product or organization that minimizes the potential of behavior shifts. Customer loyalty is cultivated by the experiences derived from service providers at multiple channels. An increasing number of organizations are prioritizing the development of enhanced customer interaction and meaningful experiences for their customers (Makudza, 2021). Banking sector is fundamental to the economy of any country and an alive economy requires inclusiveness. The complicated framework facilitates transactions only for certain users while posing accessibility challenges for others. Although technology need to be universally available, it must also be designed for simple use, enabling individuals with minimal technological knowledge to use it effectively (Kumar, Tiwari, Kumari & Patel, 2023).

There are several digital communication channels, like social media, that influence customer loyalty within the financial services sector. As many customers increasingly interact with their banks via social media, banks have to take advantage of these platforms to establish better, more loyal relationships. Social media serves not only as an advertising tool but also as a platform for community engagement, responding to customer needs, and addressing concerns in real-time. In the field of digital banking, customer loyalty extends mere transactional connections as it focuses on cultivating trust and engagement via digital interactions. Banks have to offer tailored financial guidance through social media, addressing customer input openly, and fostering a feeling of community in order to enhance loyalty (Smith & Green, 2022).

The factors that affect customer satisfaction and loyalty in digital age as it concerns digital banking are user experience, reliability, service quality, perceived value, convenience and accessibility, personalization and trust and security (Bapar, Bapar, Hussain & Shah, 2023).

### **User experience**

Customer satisfaction is significantly enhanced by user experience, defined by user-friendly interfaces and efficient transaction processes. Customers require assurance and trustworthiness in their digital financial transactions thus, reliability and security are paramount. Customer satisfaction is affected by the speed and accuracy of the services rendered. Easy access, characterized by its round-the-clock availability and mobile accessibility, is an essential component in ensuring customer satisfaction (Bapar, Bapar, Hussain & Shah, 2023).

Customer satisfaction now extends beyond competitive pricing and innovative products to encompass the creation of a smooth, effortless experience across all digital interfaces. Financial institutions must consider the significance of data analytics, artificial intelligence, and mobile banking in cultivating customer loyalty through personalized services and improved user experience (Glyptis, 2020).

### **Reliability**

Reliability indicates the online banking system's ability to function continuously and accurately, guaranteeing that customers' transactions are executed correctly and punctually. The dependability of digital banking services significantly affects customer satisfaction. Customers who consider digital banking platforms as trustworthy, exhibiting less system problems, interruptions, and transaction failures, tend to have greater levels of satisfaction with the service (Egala, Boateng & Mensah 2021).

### **Service Quality**

Service quality greatly affects customer loyalty in banking. The quality requires precise information and superior execution of the services because service quality is perceived as essential for customer consumption. From the perspective of customers, superior service quality reduces dissatisfaction and stress, so by fostering greater trust ultimately enhances



the customer desire to make future purchases. So, service quality directly enhances customer loyalty, as customers demonstrate an intense desire to continue supporting and purchasing services from the same organization (Kim, Jindabot & Yeo, 2024).

The digital models define the interconnections between service quality, employee satisfaction, customer satisfaction and loyalty, and profitability. Customer experience arises from the interactions between a customer and an organization, resulting in positive value. Customer experience is defined as the customer's cognitive and emotional evaluation of all direct and indirect interactions with the organization (Mbama, Ezepeue, Alboul & Beer, 2018).

### **Perceived Value**

Customer experience is impacted by customer behavior. It is advisable to explore additional dimensions of customer experience to optimize the distribution of marketing resources towards enhancing financial performance drivers, such as loyalty, satisfaction, and share of wallet. In digital banking, customer interaction with interfaces and service quality are critical study domains. Managers must merge various digital banking features to efficiently engage customers and cultivate a unique experience (Mbama, Ezepeue, Alboul & Beer, 2018).

### **Convenience and Accessibility**

Digital banking effectively enhances customer experience and fulfills service expectations. Customers appreciate internet banking due to its convenience and the expedited access to products compared to traditional branches. Digital banking offers convenience, time efficiency, and its functional quality influences user engagement. The general view is that digital banking provides customers with pleasing experience. Banks must enhance their digital model by modernizing the design, adopting more value-added services, and enhancing security and service personalization to enhance customer experience and retention. Strategically, digital banking is crucial for financial institutions, nevertheless, customers require an expanded range of digital banking services and enhancements to further enhance their experience (Mbama, Ezepeue, Alboul & Beer, 2018).

## **Personalization**

Customized experiences have to be adapted to individual needs. By implementing integrated strategies, banks may enhance customer loyalty, trust, and satisfaction inside the digital banking environment. In the digital world, comprehending and addressing these essential variables is crucial for financial institutions seeking to prosper and maintain their customer base (Bapar, Bapar, Hussain & Shah, 2023).

## **Trust and Security**

Banks must develop strategies to execute digital-first solutions that meet customer needs while keeping strict cybersecurity measures to ensure security and trust inside the digital banking ecosystem (Glyptis, 2020).

Security is the main issue while accessing a digital banking service. Security is the primary consideration for a customer during an online transaction. Online banking is a common and essential service but users may hesitate to complete online transactions if the application or website lacks security. Customers are reluctant to finalize transactions on a non-secure platform so security is paramount. Banks have to protect customer data and funds, ensuring customer satisfaction and trust in digital banking services (Bapar, Bapar, Hussain & Shah, 2023).

Trust strongly affects customer loyalty in banking sector. Trust reflects a favorable relationship between banks and customers. In certain significant circumstances, customers may choose to accept risks and invest when they have a sense of trust, while perceiving some level of risk. From the customer's viewpoint, any service that fosters customer trust creates a crucial basis for establishing the relationship between customers and organizations. Some customers feel confident in further investing their time and money with the same organizations if they already have trust in the services provided. Consequently, enhancing trust among customers may foster more customer loyalty within the banking sector (Kim, Jindabot & Yeo, 2024).

## 2.5 Factors affecting Digital Transformation

Numerous benefits, including customer satisfaction, operational efficiency, and profitability, can be reached if banks implement appropriate digital transformation methods. Four components must be considered in a digital transformation strategy (Shanti, Avianto & Wibowo, 2022):

**Technology:** characterized as a combined set of skills, experiences, knowledge, organizational and administrative tools, and resources accessible to employees and customers for use in order to fulfill both financial and ethical standards. Organizations, such as banks, have to establish an integrated information infrastructure that allows information management to interact with and analyze data to promote growth.

**Value Creation:** is a linked process that involves the transformation of raw resources into finished products, ending in their delivery to customers. The implementation of new technology improves products and services and generates new value. These developments affect the value chain, moving from traditional to digital business, and necessitate technologies related to products and services.

**Structural adjustments:** are necessary to establish a robust foundation for the new business model, notably with the integration of digital operations within the organizational structure.

**The financial aspect:** should be prioritized in the bank's digital transformation strategy, preceding the aforementioned three factors. Financial factors can either restrict or accelerate the digital transformation process because these factors drive the execution of digital transformation.

Digital transformation must not be executed randomly, banks ought to establish their digital transformation strategies on a personalized basis in order to reach a high-level performance. More powerful banks can establish their own digital teams while banks with uncertain bases may opt to collaborate with third-party fintech firms or external research

platforms to accomplish digital transformation objectives while minimizing investment costs. Banks must enhance the adaptability of digital technology and financial operations, and develop unique digital financial products. Moreover, banks have to initiate the establishment of digital transformation expertise and enhance their comprehension of digitalization from the management level to the operational level. Banks have to concentrate on the innovation of specialized financial products because standardized digital financial products will result in inadequate investment and increase competition within the sector. Consequently, banks ought to create specialized products and concentrate their technology and capital in this domain for sustained investments (Zhang, Wang & Zhang, 2024).

According to Sangwan and Yadav (2023), initially traditional financial institutions must allocate resources towards digital infrastructure and modify their operational procedures to satisfy the expectations of today's customers for a cohesive omni-channel experience. The data-centric approach of digital banking prioritizes the effective gathering, analyzing, and use of customer data. Traditional financial institutions can implement analogous strategies to adjust to evolving customers preferences and improve overall customer experiences. Achieving an optimal equilibrium between maintaining physical branches and enhancing digital services is essential for traditional banks. It is very important to maintain and increase trust in digital platforms, traditional financial institutions must prioritize strong cybersecurity measures and uphold transparent communication. These components are crucial for fostering customer trust in digital banking settings. Traditional banks have to spend in extensive training for employees to guarantee that in-person interactions with customers are remarkable and valuable. Nowadays, certain banks are implementing hybrid models that combine comprehensive digital services with branches as it is crucial to integrate the advantageous features of both traditional and digital banking models. Emphasizing technology and data analytics, while maintaining security and fostering customer trust in the digital domain, must be central to banking operations. This strategy allows banks to efficiently satisfy the different requirements and expectations of its customers.

Commercial banks should enhance digital transformation throughout strategy, organization, technology, product, and service. Moreover, banks must guarantee that the channels via which digital transformation influences efficiency remain unimpeded to optimize its beneficial effects. Due to the varying effects of digital transformation across different types of banks, each institution should customize its digital transformation approach to its unique environment. Governments have to support and assist the digital transformation of commercial banks by formulating suitable policies for various bank types and carefully supervising the transformation process in order to reduce potential risks and guarantee a robust transition (Shen, Wu, Li & Chen, 2024).

The implementation of modern digital technologies, including the Internet of Things (IoT) and Big Data Analytics (BDA), will enhance production, increase efficiency, and generate new opportunities for companies across all sectors, which are essential for economic recovery. Analyzing extensive datasets via Artificial Intelligence techniques, like machine learning to enhance corporate processes is an effective method for transforming data into value. Many organizations find it challenging to attain consistency in their recurring procedures. Both IoT and Big Data are breakthroughs that have profoundly disrupted the business landscape, significantly impacting the strategies and business models of organizations so, the change in organizational structure is crucial (Moumtzidis, Kamariotou & Kitsios, 2022).

In the era of technological innovation, the rise of artificial intelligence has radically enhanced banking processes. The implementation of artificial intelligence is no longer optional for financial institutions because it has become an essential tool for fulfilling customer expectations. Despite the speed, efficiency, and effectiveness of artificial intelligence in digital banking, user acceptance of this technology remains in its initial steps. Policymakers should focus on enhancing user expectation confirmation, perceived performance, visual appeal, customer service, and brand image, which will subsequently improve satisfaction and increase digital banking users' confidence in adopting artificial intelligence in digital banking (Alnaser, Rahi, Alghizzawi & Ngah, 2023).

The strategic use of Artificial Intelligence leads in enhancing business strategy through predictive analytics by visualizing key performance indicators and applying image recognition to identify how customers behave. Banks have to select the optimal option for IT infrastructure planning while considering future organizational variables and their impact on the necessity for IT transformations, to effectively develop decision-support tools that strategically enhance the decision-making process, to foster new organizational opportunities and innovation capacity, to address specific challenges related to product attributes and machine functionalities, and to elevate product quality while enhancing business performance (Kitsios & Kamariotou, 2021).

Digital banking development is crucial for delivering added value and ensuring that both banks and customers gain from interactive enhancements to services. This indicates that banks can generate value by enhancing services and profitability through digital banking, emphasizing the relationship between innovation and value marketing. The influence of innovation has to be evaluated via management in order to understand its potential and generate value for customers and financial institutions. E-banking leads in attracting customers, whereas mobile banking is preferable for customer loyalty, enabling banks to provide diverse services to various groups of customers through appropriate marketing channels. Customers are familiar with digital banking channels that giving them appropriate and interactive services. These channels enable banks to deliver value-added services (Mbama, Ezepue, Alboul & Beer, 2018).

Functional Quality drives the success of digital banking, hence financial institutions have to prioritize interaction and accessibility in their operations. Digital banking marketing priority is to deliver value to customers in order to ensure their satisfaction and loyalty. Service Convenience enhances digital banking attractiveness; hence banks must provide customers with access from anywhere. Digital banking Innovation addresses customer needs and enhances customer experience, so financial institutions need technology to maintain competitiveness. By applying innovation, banks can develop value-added services, differentiate themselves, address diverse customer needs, and enhance value for both customers and the bank itself. The effectiveness of banks in implementing digital

banking within their marketing strategies is depending on the availability of digital architecture (Mbama, Ezepue, Alboul & Beer, 2018).

Banks must consistently meet customer needs by delivering enhanced service assistance and prompt resolutions to requests or challenges about service functionalities and financial information. In addition, banks must establish a high level of service credibility with customers by reducing service risk (errors in digital banking applications) to instill confidence and encourage continued use of their services. Banks must enhance service quality by delivering precise financial information and superior professional services to their customers. Moreover, banks have to maintain their good reputation by welcoming complaints and addressing them effectively, ensuring that customers recognize and recall the attentive care they receive while using services. Banks must guarantee exceptional service reliability by promptly addressing all customer service issues in accordance with their commitments, so preventing customers from feeling that their time, effort, and confidence are wasted. Banks should enhance perceived value for customers by providing superior service value, including prompt access, fast transactions, and exceptional service performance (Kim, Jindabot, & Yeo, 2024).

Additionally, banks must establish ethical service standards by enhancing the expertise and readiness of their employees, especially front-line staff, to deliver precise services to customers, in accordance with banking industry regulations, thereby preventing any unethical issues post-service settlements. Banks must provide a satisfactory service experience by training employees to demonstrate a strong commitment to customer services, facilitate seamless transactions, and offer ongoing assistance both online and in-person (Kim, Jindabot, & Yeo, 2024).

### **2.5.1 Factors that lead to a successful Digital Transformation**

**Digital Strategies:** The integration of IT into organizations has rendered the alignment of IT with wider organizational strategies a critical subject of discussion. IT alignment pertains to the proper implementation of IT solutions in compliance with the overall

organizational objectives, infrastructure, and information security requirements. In the era of digital transformation, the alignment of strategies has evolved into a digital strategy that integrates the digital transformation plan, employee skill sets, current processes, and expected innovations. Consequently, an effective digital strategy will be crucial in establishing a framework for an acceptable information security standard (Gebremeskel, Jonathan & Demesie, 2023).

**Organizational Structure and Organizational Culture:** As the information security landscape evolves, it is imperative for organizations to establish a suitable organizational structure that effectively manages information security. An effective organizational structure is crucial for expediting the decision-making process regarding information security. Besides formal procedures and technical solutions, executives must cultivate an organizational culture that encourages risk-taking and recognizes the importance of information security. Moreover, leaders must assume the primary duty for staying informed on advancements in information security (Gebremeskel, Jonathan & Demesie, 2023).

**Human Resource Practices and Information Policies:** As digital transformation becomes increasingly complicated due to heightened interconnection, information security concerns will also escalate. This necessitates continuous upgrades to individuals' skills and awareness of the information security requirements of organizations. To provide employees with essential skills and assistance, information security policies must be consistently introduced and updated. It is advantageous for organizations to involve their employees in the policy creation process, as no information security strategy can be effective without comprehensive employee support. So, organizations must teach, incentivize, and empower their workforce (Gebremeskel, Jonathan & Demesie, 2023).

To adopt and pursue new digital strategies, managers are not just observing trends; they are developing detailed practical methods that will facilitate and fundamentally enable future digital implementation. Nonetheless, this process necessitates the provision of suitable resources, as execution is ultimately contingent upon their availability. A significant disparity exists among small, medium, and large banking organizations,



allowing for the more focused advancement of main difficulties associated with potential holistic digitalization. It is essential for banks, irrespective of their size, to systematically confront future digital challenges now, enabling them to possess the requisite expertise to solve these concerns proactively at the proper moment. Modern bank management assigns a significant role model to employees as they strategically adopt digitalization inside the organization and enhance customer engagement. It is imperative that employees are educated about technology applications and understand how to use them correctly and safely. Banks are introducing targeted educational programs and events for customers and employees to promote the adoption of digital methodologies and, ultimately, bank digitalization, while also improving the acceptance and integration of both employees and customers (Diener & Špaček, 2021).

## **2.6 Researches on the Digital Transformation in Greek and International banking Sector**

### **2.6.1 Greek Banking Sector**

According to the research of Mylonakis, Orfanos and Evripiotis (2024), it is evident that while the majority of individuals believe they use digital banking services frequently or consistently, just a few engage with it on a regular basis. The majority use the service once or twice every three days so, this indicates that while customers in Greece are familiar with the idea of digital banking, it is not their preferred option. In summary, the customers' feedback regarding the variables influencing the desire to use e-banking indicated a favorable perception of the service's utility, as their responses reflected positive levels, demonstrating that customers recognize the advantages they can obtain from its use. At the same time, they find online banking user-friendly.

The overall opinion of customers regarding the possible risks associated with online banking is particularly significant, as majority hold a negative attitude, yet a substantial percentage remains uncertain about the provided security. Nearly all respondents believe that digital banking is relevant with their daily lives and lifestyles, indicating that the

service may be embraced by a diverse array of customers (Mylonakis, Orfanos & Evripiotis, 2024).

It is crucial that the main factor influencing customer's intention to adopt digital banking is its compatibility with their lifestyle. This fact aligns with the rapid tempo of modern society and increasing needs that necessitate, particularly in large cities, the reduction of distances and the minimization of transaction processing time. Simultaneously, electronic devices like mobile phones, tablets and computers are essential components of the majority of individuals' lives, rendering their usage increasingly instinctive. An individual with sufficient free time or limited technological knowledge will likely favor services from a physical branch (Mylonakis, Orfanos & Evripiotis, 2024).

It is noteworthy that while the potential risks adversely impact Greek users' decisions regarding digital banking, they exert the least influence among all the criteria analyzed. This indicates that Greek users have distanced themselves from stereotypes and biases concerning risks associated with online transactions and place their trust in the financial institution they have selected. Their self-assessment of abilities and sense of satisfaction further motivate them to familiarize themselves with and embrace the service. This fact, along with the impact of perceived usefulness and comparative advantage, indicates that the customers comprehend the offer and value of digital banking and are inclined to reject the service with minimal issues (Mylonakis, Orfanos & Evripiotis, 2024).

In conclusion, digital banking in Greece is thriving and continuously surpasses the average of online banking users in the European Union. In light of recent developments regarding capital controls and the Covid-19 pandemic, many individuals have switched to digital banking for enhanced accessibility and account management. Moreover, financial institutions are continually introducing new digital services, and users are becoming progressively more open to these offerings. The advancement of technology and the growing interaction users have with it provide a conducive environment for overcoming anxieties and resistances. The objective of financial institutions should be to educate customers and address the challenges encountered by current users through the modernization and enhancement of their digital applications and platforms. Ultimately, customers should relinquish any prejudices that define them and adopt a more open-minded approach to change (Mylonakis, Orfanos & Evripiotis, 2024).

Greek bank employees agree that digital banking enables them to perform a greater volume of work more efficiently and fast. Bank employees believe that familiarity with new technology does not necessitate specialized expertise or abilities in terms of perceived ease of usage. As anticipated, younger employees having a greater level of education finally agree on the simplicity of utilizing modern technology. Older employees with limited educational backgrounds report significant challenges in using these modern tools. Employees have prior experience with identical applications and receiving minimal supervision exhibit elevated perceived self-efficacy. The majority of employees have a positive attitude towards the intention to use, as the integration of these novel tools into their everyday routines has made their use nearly mandatory. All Greek banks are undergoing a shift to digital banking to reduce operational costs and implement a more adaptable customer service model. While some individuals link job digitalization to job losses, survey results indicate that employees in Greek banks do not resist the digital transformation of their roles. Research indicates employees embrace the new data within the digital economy. The paramount requirement in research is training on the application of new technologies via training programs. Employees in Greek banks are not threatened by digital banking; however, they require instruction and training on the implementation of these emerging technologies. E-learning programs are currently being used in the banking sector to facilitate a seamless transition to the new digital era (Kitsios, Giatsidis & Kamariotou, 2021).

According to the research of Boufounou, Eriotis, Gekas and Kounadeas (2024), the development of digital transformation in the banking sector is a logical progress, in accordance with advances in technology. Banks, traditionally leaders in adopting novel technologies, experienced a substantial shift towards digital banking in Greece. Two significant factors drove this transformation: the implementation of capital controls in 2015, which limited traditional transfer of money and withdrawals, and the Covid-19 pandemic, which necessitated an increase in online transactions because of extensive physical branch closures. Digital transformation, a vital component of the contemporary economy, necessitated the Greek banking industry to conform to the path established by other European countries. The need for such shift entails a strong infrastructure and

equipment to enable seamless digital banking. The pandemic accelerated the modernization of the financial industry and the wider Greek state.

Bank customers express considerable satisfaction and familiarity with digital transactions and desire to enhance their access to them. They evaluate the availability of 24/7 service as an important criterion for selecting digital banking, with quick transactions and cyber security being the key components for increasing their use. Bank employees view digital transformation favorably and claim that its success necessitates supplementary and continuous training to enhance their digital skills, which will also facilitate cultural change and adaption to the digital age. Moreover, the age and educational background of bank customers significantly influence the increasing acceptance and growth of the banking sector's digital transformation (Boufounou, Mavroudi, Toudas & Georgakopoulos, 2022).

According to the research of Valsamidis, Tsourgiannis, Pappas and Mosxou (2020), The digitization of financial transactions, resulting from the broader digitalization of the economy, is now a reality that, although not fully transforming the economy, has still generated substantial changes. The paramount evidence of the digitization of banking transactions is the extensive utilization of digital banking transactions. The majority of the customers considers digital banking services as accessible and user-friendly, while also finding them more convenient and reliable than traditional banking. Moreover, it is noteworthy that the customers generally exhibit confidence in digital banking and does not perceive it as significantly more costly than traditional banking services.

Nonetheless, it is essential to underscore the significance that customers give to the security and integrity of digital transactions. Significant benefits of digital banking services include round-the-clock support, enhanced time efficiency, and streamlined processes. Conversely, the majority of customers believe their personal interactions with banking personnel essential, beneficial, and effective. Policy makers in financial institutions should examine the customers' concerns and expectations regarding digital banking services. Customers' greater worries regarding transactions security, should be a priority for those tasked with effectively demonstrating the security of transactions via technology to enhance customer confidence in digital services. Furthermore, the perception among many customers those interpersonal relationships with bank employees

are generally beneficial should serve as a fundamental factor for those responsible for identifying an optimal integration between digital and traditional banking, thereby mitigating the disconnect between the evolving banking landscape and the real demands of customers (Valsamidis, Tsourgiannis, Pappas & Mosxou, 2020).

It is essential to highlight the identifying components that appear to affect customers' perceptions on digital banking. Age and education significantly influence customers' perspectives compared to other demographic factors. Specifically, both younger and more educated customers hold a more positive attitude towards digital banking. It is noteworthy that older and less educated customers show characteristics of a person who is opposed to technology, lacks comprehension of it, and has distrust towards it. This serves as a crucial reminder for developers in the banking sector concerning the necessity of adopting varied techniques for distinct user communities. Recognizing key groups of customers allows banks to improve customer experiences. In conclusion, the digitization of banking transactions has become a reality. The banking industry must persuade customers that this move serves their best interests (Valsamidis, Tsourgiannis, Pappas & Mosxou, 2020).

### **2.6.2 International Banking Sector**

Bank employees perceive digital transformation as essential for enhancing business volume and optimizing the operational efficiency of banks. The conclusions declare the extensive scope of digital transformation, encompassing the three separate concepts examined (people, internal, and external factors of banking operations). Some variables are more pivotal than others, and specific configurations of these variables tend to enhance the effects of digital transformation in banks, resulting in enhanced organizational efficiency and increased business size. The age and educational level of bank employees are more related to the expected implications of digital transformation than gender or job experience. Furthermore, it may be inferred that specific variable configurations enable banks to navigate potential challenges associated with digital transformation, such as limited funds, inadequate communication, or a lack of comprehension of these processes (Porfirio, Felício & Carrilho, 2024).

Digital transformation often enhances the profitability of banks and their organizational efficiency. Achieving the anticipated outcomes is feasible through a suitable merger of technology and resources, based on the internal and external identified conditions. Flexibility and managerial skills are essential for leveraging the opportunities of digital transformation and overcoming potential resource constraints as initial circumstances. The digital user experience is crucial for addressing potential challenges associated with digital transformation arising from banking regulations and compliance. The adverse impacts of those obstacles to digital transformation are inversely associated to the educational background of bank employees (Porfirio, Felício & Carrilho, 2024).

Winasis, Wildan, and Sutawidjaya (2020) claim that implementing an innovative digital customer experience requires both systemic changes and a simultaneous adjustment of employees' behaviors. Developing a plan for necessary training and support for assisting employees adapt to the new technology environment is crucial for the successful adoption of the digital business model. The negative impact of work-related stress on employee engagement highlights the necessity for proactive organizational measures to help bank employees throughout periods of technological change.

Technological, organizational, and social factors are pivotal in influencing banks' adoption and use of Business Intelligence and Analytics (BIA) in their operations and strategic planning. Identifying the various benefits of BIA systems and addressing problems related to handling data are essential for successful adoption. Organizational factors significantly influence the adoption and utilization of BIA, with key variables including talent leadership, management support, and readiness for implementation, along with external factors such as market power and regulatory compliance. Additionally, it is crucial to examine the reducing effect of employee experience on the relationship between technological and organizational parameters and BIA utilization. This research emphasizes the significance of training bank employees to optimize the advantages gained from the adoption and application of BIAs (Mohammed, Okaily, Oasim & Al-Majali, 2024).

The implementation of artificial intelligence technology significantly influences banks' return on assets, underscoring its significance in improving their financial outcomes. The

relationship between artificial intelligence innovation and economic growth highlights their simultaneous positive effect on business performance. This research underscores the critical importance of innovation in artificial intelligence technology in banking sector, underlining the necessity of integrating economic and technological components in order to optimize its advantages in improving financial performance. The suggested policies encompass fostering an artificial intelligence innovation ecosystem, modifying regulatory frameworks, and investing in IT infrastructure to leverage the advantages of artificial intelligence innovation while mitigating related challenges (Baffour Gyau, Appiah, Gyamfi, Achie, & Naeem, 2024).

A rising tendency appears in the emergence of digital-only banks, which are entirely virtual institutions without physical branches, conducting all banking operations exclusively via mobile applications. Purely virtual operations alter the manner in which customers engage with the service, hence influencing their use and financial decisions. The development of digital banking has transformed the financial sector in developing countries. Forecasts indicate that potential in this area are expanding annually, enhancing their appeal to customers. Although customers are getting used to internet and mobile banking in their daily routines, entirely digital-only banking remains novel for many of them. The absence of physical branches in digital-only banks, combined with the provision of all services via digital platforms, leads to differentiated customer experiences (Windasari, Kusumawati, Larasati & Amelia, 2022).

Consequently, psychological aspects affecting customers' adoption of this technology have become crucial. The introduction of digital-only banking aligns with an increase in the number of young adult banking customers. When digital banks aim at younger customers, social influence plays a more crucial role in shaping customer behavior. Generation Y and Generation Z demonstrate heightened connectivity with peers, possess a robust social belief, and regard the perspectives of friends and other customers as a more credible basis for making adoption choices. Establishing trust among customers as a developing brand is challenging, particularly for banks lacking physical branches. Customers are inclined to take advantage of the digital bank due to the guarantees provided by trustworthy



traditional banks. Consequently, customers frequently use the financial products offered by these institutions (Windasari, Kusumawati, Larasati & Amelia, 2022).

Economic value is an essential indicator of the intention to use digital banking. The economic value and resulting advantages are crucial factors that determine the intention to use various technology-enabled service applications. Bank customers require products and services that provide money-related advantages to enhance their financial assets. Digital-only banking products must offer added value for specific financial criteria. The ability for customers to withdraw funds from several traditional bank ATMs is advantageous for Generation Y and Generation Z, as they are mobile and dynamic groups frequently relocating. The results indicate that the perceived simplicity of using digital-only banking applications favorably influences customer desire to engage with a digital-only bank. If digital banking is straightforward, accessible, and user-friendly, customers are more likely to familiarize themselves with it and embrace its use. Due to the little physical presence of digital-only banks, external verification is required to establish the service's trustworthiness. Potential customers may have very little knowledge of the digital-only bank; hence, evaluations from influential individuals might boost customer trust and confidence in using such a bank. The reputation of an organization greatly impacts the decision of using its services. Reliability is more critical for exclusively online service providers, such as digital banking, than for multichannel service providers. Multi-channel customers establish service expectations derived from their physical channel experiences (Windasari, Kusumawati, Larasati & Amelia, 2022).

According to the research of Peña García, Losada-Otálora, Juliao and Rodríguez-Orejuela (2021), banks and financial institutions can design their relationship models with targeted customer groups via online platforms. This would enable banks to provide unique benefits in the market, allowing customers to fulfill their needs while leveraging the bank's experience in the financial sector, thereby achieving product personalization for different types of customers. The initial step in establishing a co-creation of value process is to foster an enhanced B2C connection through information, benefits, and challenges, among other factors. Upon accomplishing the initial step, the next step is to facilitate user-generated products, establish a B2C connection, introduce new competencies into the



process, and tailor products to meet consumer demands rather than forcing people to adapt to the products. As a result, integrating these models into product development might be regarded as a competitive advantage. In the final step, financial information must be provided to the customer, enabling interaction across various online channels and activities, including rate verification, credit simulations, and individualized debt levels for each user. Implementing the co-creation of value model in banking can facilitate value co-creation, enabling customers to use online banking with all its associated benefits.

On the other hand, for the bank, the implementation of this system signifies a reduction in costs, as it diminishes personnel interaction while producing and supplying essential information to customers. This strategy can enhance customer loyalty and brand positioning by creating additional and distinctive value for customers across multiple channels within the banking sector. Researching customer experience in the banking sector revealed that customers engaged in value co-creation enjoy a favorable interaction with the company. The aim of mutual advantages between an organization and a customer necessitates excellent interactions, and the co-creation of a value model facilitates this process. It is claimed that connectivity, creativity, and knowledge are essential components for the advancement of co-creation of value models, since the absence of any of these three variables would make interactions between customers and organizations unachievable (Peña García, Losada-Otálora, Juliao & Rodríguez-Orejuela, 2021).

According to Hewarathna and Hettige's research (2023), components such as efficacy, system accessibility, connectivity, response, and website design substantially enhance customer satisfaction with online banking. Customers' satisfaction increases when they perceive the internet banking system as efficient, accessible, responsive to their demands, easy to contact and receptive to their concerns. However, customer satisfaction with online banking may not be directly influenced by privacy issues. This can be attributed to the customers' overall trust in the privacy controls implemented by the institutions. It is essential to evaluate factors such as efficacy, system accessibility, satisfaction, connectivity, timeliness, and website design to ensure increased levels of customer satisfaction. These components are essential in shaping customer perceptions and

interactions with banks, underscoring the need of providing a seamless and user-friendly online banking experience.

According to the research of Tulcanaza-Prieto, Cortez-Ordoñez and Lee (2023), the ease of use, personalization, trust, customer loyalty, and satisfaction are both intangible and tangible components that shape the perception of customers, whereas AI-enhanced customer experience includes AI-interactions and AI-recognition service. Each component enhanced the AI services offered by financial institutions. Banks provide homogeneous products and services; therefore, customer perception components serve as the unique qualities among institutions, creating a significant competitive advantage that also positively impacts the advancement of digital banking products and services. It is really important to integrate AI into the creation of financial products and services, utilizing customer data regarding purchasing behavior and preferences among customers and have an essential input.

According to the research of Winata, Thoyib, Rohman and Yuniarinto (2024), the perceived risk does not directly influence the loyalty intentions of users of mobile banking applications. Despite increased perceptions of risk, users continue to demonstrate commitment to the application. This highlights the necessity for organizations to emphasize the advantages and favorable experiences offered by their applications to sustain consumer loyalty, irrespective of perceived threats. Perceived risk affects loyalty intention via customer satisfaction. Customer satisfaction serves as a mediator between perceived risk and loyalty, suggesting that when users are content with their experience, they are more inclined to maintain loyalty to the program, despite early concerns regarding risk. As customer risk acceptability rises, consumer loyalty may diminish due to reduced satisfaction. This underscores the essential importance of customer satisfaction in decreasing or overcoming perceived risks and cultivating loyalty. Organizations must prioritize enhancing customer satisfaction in order to foster loyalty, despite the fact that great experiences do not necessarily result in loyalty. Concentrating on enhancing customer experience and successfully addressing perceived risks can help organizations in cultivating stronger relationships with customers and fostering loyalty within the competitive mobile banking sector.

According to the Kanvya and Rakesh's research (2022), a large number of customers express great satisfaction with digital banking, assuming that it offers ease and facilitates transactions. The preference for Mobile Banking among customers is attributed to several factors, including the accessibility of mobile devices, which allow for 24/7/365 access. The financial services sector must prioritize security concerns and deliver individualized offers to enhance customer comfort and confidence in utilizing digital banking in the modern era. Customers perceive that these benefits are not the only factors influencing their adoption of digital banking; there are more challenges that restrict customers from using digital banking, such as technical issues, security concerns, connectivity problems, and transaction speed. Consequently, a bank that offers distinctive services and products fulfills customer satisfaction.

### **3. Research Methodology**

#### **3.1 Aim and Research Questions**

The aim of this research is to examine and analyse how Digital Transformation in banking sector enhances customer experience. In order to collect the required data for achieve this research objective, the three research sub-questions were examined and analyzed:

- Opportunities and challenges in Digital Banking
- The most important factors that affect customer satisfaction and loyalty
- Digital technologies that banks use to enhance customer experience

Based on the currently available literature and in order to examine how the bank employees' position role and department differentiate employees' perceptions the following hypotheses are suggested:

**Hypothesis H1:** Bank employees' perceptions regarding the factors that affect customer satisfaction and customer loyalty in Digital Banking differ accross the bank employee's position/role (aligning with the research of Diener & Špaček, 2021).

**Hypothesis H2:** Bank employees' perceptions regarding the factors that affect customer satisfaction and customer loyalty in Digital Banking are correlated with the bank employees' familiarity with digital technologies (aligning with the research of Boufounou, Mavroudi, Toudas & Georgakopoulos, 2022).

**Hypothesis H3:** Bank employees' perceptions regarding the digital technologies that enhance customer experience in Digital Banking differ across the bank employee's position/role (aligning with the research of Diener & Špaček, 2021).

**Hypothesis H4:** Bank employees' perceptions regarding the digital technologies that enhance customer experience in Digital Banking differ across the department that the bank employees work for (aligning with the research of Rodrigues, Oliveira & Rodrigues, 2023).

**Hypothesis H5:** Bank employees' perceptions regarding the opportunities in Digital Banking differ across the bank employee's position/role (aligning with the research of Porfírio, Felício & Carrilho, 2024).

**Hypothesis H6:** Bank employees' perceptions regarding the challenges in Digital Banking differ across the department that the bank employees work for (aligning with the research of Kitsios, Giatsidis & Kamariotou, 2021)

**Hypothesis H7:** There are significant correlations between Customer satisfaction and customer loyalty in Digital Banking, Digital technologies that enhance customer experience in Digital Banking, Opportunities in Digital Banking and Challenges in Digital Banking (aligning with the research of Diener & Špaček, 2021).

### **3.2 Research Population**

The population of the research are individuals who work in the Greek private banking sector and more specifically in the four systemic banks (Alpha Bank, Eurobank, National Bank of Greece and Piraeus Bank). According to the Hellenic Bank Association, in 2023 the population of the bank employees in the four systemic banks were 25.675 individuals.

### **3.3 Questionnaire**

The questionnaire was written in English (see Appendix), implemented in Google Forms, distributed via mail and the collection of the answers was done online. More specifically, a highly structured questionnaire incorporating 5-point Likert scales and multiple-choice questions were employed to measure bank employees' perceptions regarding customer experience in the banking sector. The questionnaire consists of 27 items (multiple choice and 5-point Likert type scale) which are divided into 5 sections and answered by 187 bank employees. The sections of the questionnaire were:

1. Factors affecting customer satisfaction and customer loyalty in Digital Banking
2. Digital technologies that enhance customer experience in Digital Banking
3. Opportunities in Digital Banking
4. Challenges in Digital Banking
5. General Questions of the demographic characteristics of the participants/bank employees.

### **3.4 Sample and Collection of Data**

According to the Hellenic Bank Association, in 2023 the population of the bank employees in the four systemic banks were 25.675 individuals. Simple random sampling was utilized and 187 usable responses were collected. In this sampling method, each member of the population has an exactly equal chance of being selected. This method minimizes selection bias and enhances the representativeness of the sample, making it more likely that the findings can be generalized to the entire population. Reliable statistical inferences can also

be facilitated from simple random sampling. In spite of that, while random sampling reduces bias, there is still a chance that the sample may not perfectly represent the population due to random variation. The questionnaire was sent to 233 recipients (bank employees) and 187 of them responded. The response rate was 80.26%. The questionnaire was sent to 233 bank employees who work in the following business units/departments:

- Human Resources
- IT/Information Security
- Cybersecurity Operations
- Customer Service/Retail Credit
- Marketing
- PMO (Project Management Office)/Business Analysis
- Strategy
- Business Models
- Legal/Compliance

The specific business units/departments were chosen because their employees participate on the projects as it concerns the business and the functional requirements for the implementation of the banking digital transformation. Moreover these departments analyse the opportunities, challenges and impacts on customer digital experience. The survey was conducted from 8 February to 12 February 2025.

### **3.5 Ethics**

Researchers using questionnaires rely, in general, on truthful responses from participants to explore meaningful conclusions. Privacy and confidentiality of the participants were secured and data were only be gathered to further the research and will not be used for any other purpose. No e-mail addresses were collected and only the researcher had access to the data.

### **3.6 Statistical Analysis**

IBM SPSS v.26 was used for descriptive statistics and conduction of statistical tests. Additionally, Microsoft Excel 2016 was utilized for data entry, preliminary data cleaning, and creation of frequency tables.

Descriptive statistics includes graphs, frequency tables and demographic characteristics of the respondents. Spearman's rank correlation coefficient was used due to the presence of non-normal distribution data in the questionnaire. Nonparametric statistical tests were conducted to examine any statistically significant differences between more than two groups of an independent variable on an ordinal dependent variable. The Kruskal–Wallis H test was utilized for more than two groups in this purpose.

### **3.7 Validity and reliability**

Cronbach's alpha was used to assess the reliability of the Likert scales in producing consistent results across repeated measurements. Coefficients over 0.7 are considered acceptable.

**Table 1: Reliability of the Likert scale**

Question	Cronbach's Alpha	N of Items
Factors affecting customer satisfaction and customer loyalty in Digital Banking	0.884	6
Digital technologies that enhance customer experience in Digital Banking	0.801	4
For how many years has the bank, you work for, been using the technologies listed above?	0.914	12
Does the bank, you work for, plan to invest in one or more of the below technologies in the next years?	0.949	12
Opportunities in Digital Banking	0.80	3
To what extent do you believe that the below statements describe the	0.932	9

Question	Cronbach's Alpha	N of Items
opportunities the bank, you work for, gains when implementing Digital Banking?		
Challenges in Digital Banking	0.935	11

A reliability analysis was carried out on the perceived task values scale. Cronbach's alpha showed the questionnaires to reach acceptable reliability (Cronbach's alpha values above 0.70).

## 4. Results of the research

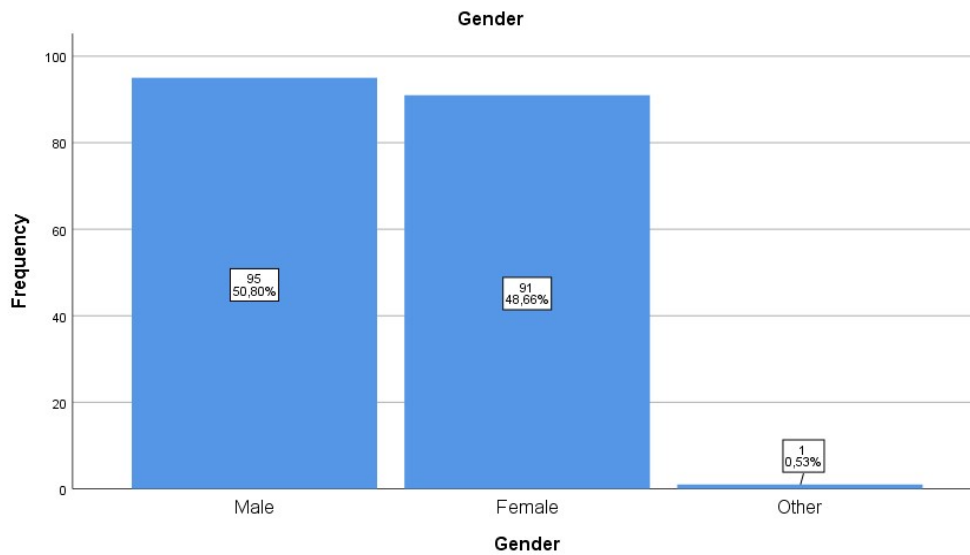
### 4.1 Demographics and main variables

In the present research, the majority of the participants were men (50.80%) and the most mentioned age group of the participants was that of 35-44 years of age (48.66%). In addition, the majority of the participants are Master's degree holders (54.01%) and their position/role in the bank is mostly Manager or Assistant Manager (28.88%).

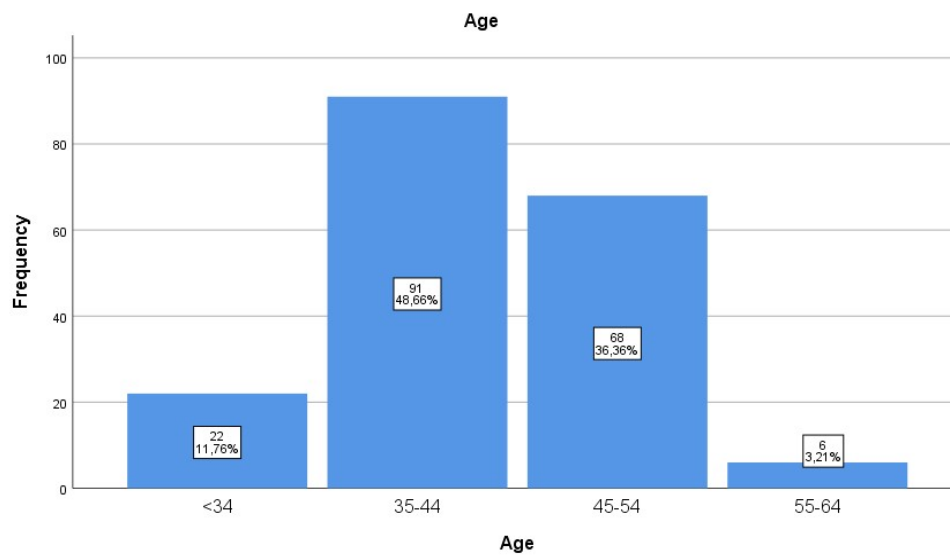
Furthermore, the majority of the participants work in PMO/Business Analysis (19.25%) followed by Customer service/Retail Credit (18.18%) and IT/Information security (17.11%). Moreover, 36.90% of the participants are quite familiar with digital technologies and according to the participant's the bank invested in digital transformation for more than 10 years (31.55%). All the above-mentioned characteristics of the participants to the present research are presented in the graphs below.



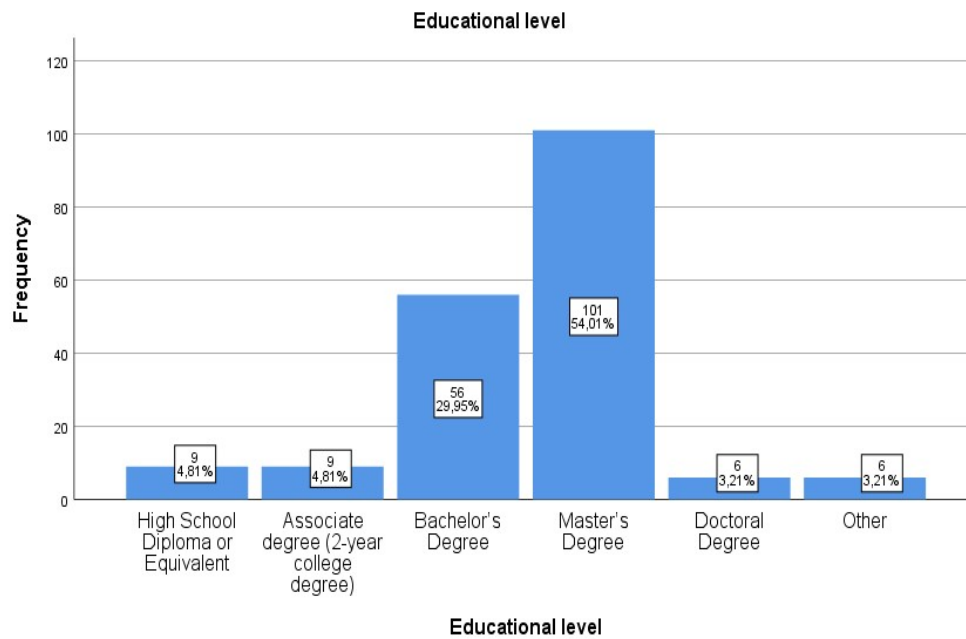
**Figure 1: Gender**



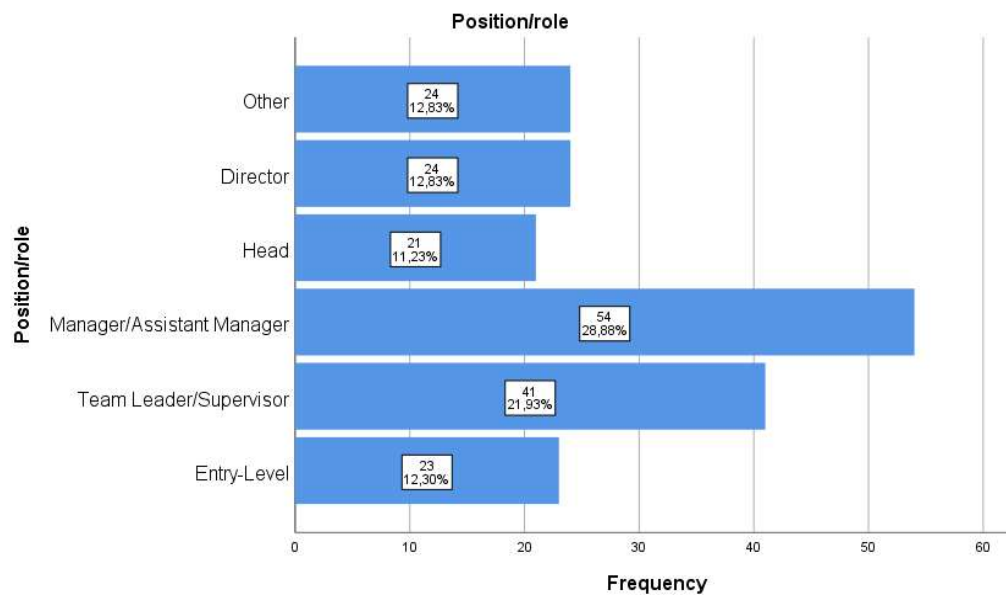
**Figure 2: Age**



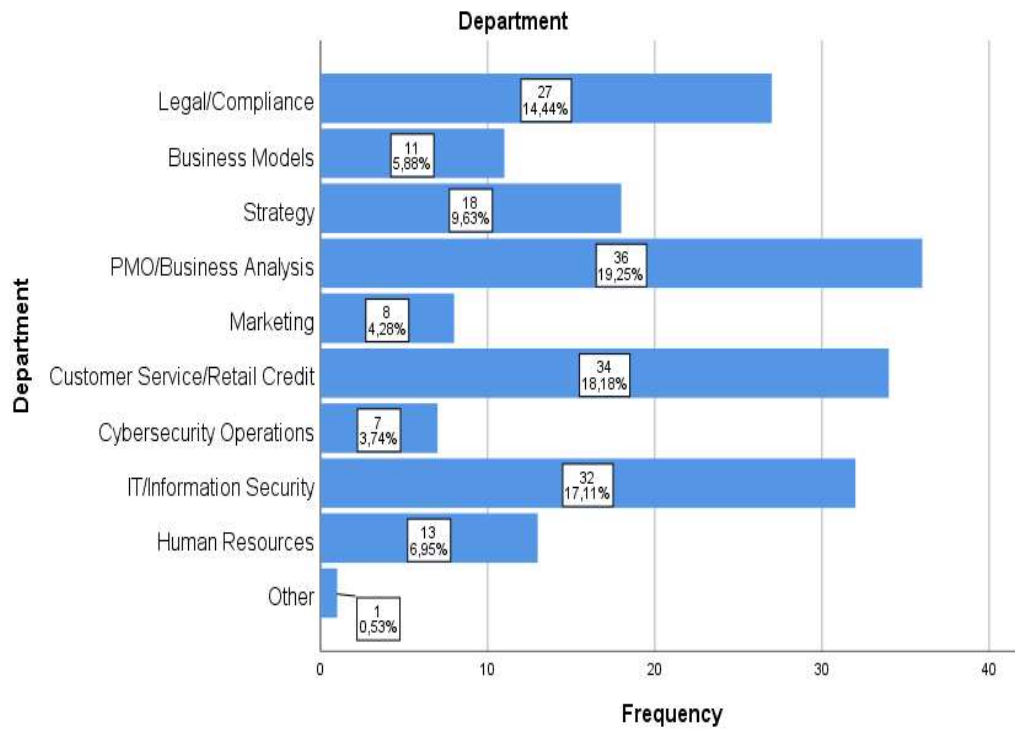
**Figure 3: Educational level**



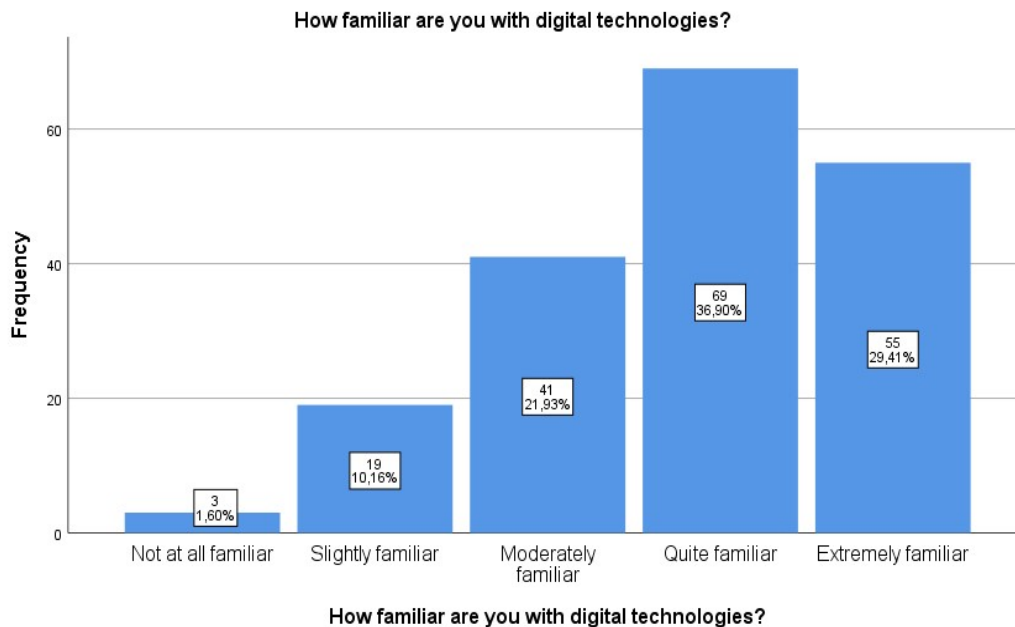
**Figure 4: Position/role**



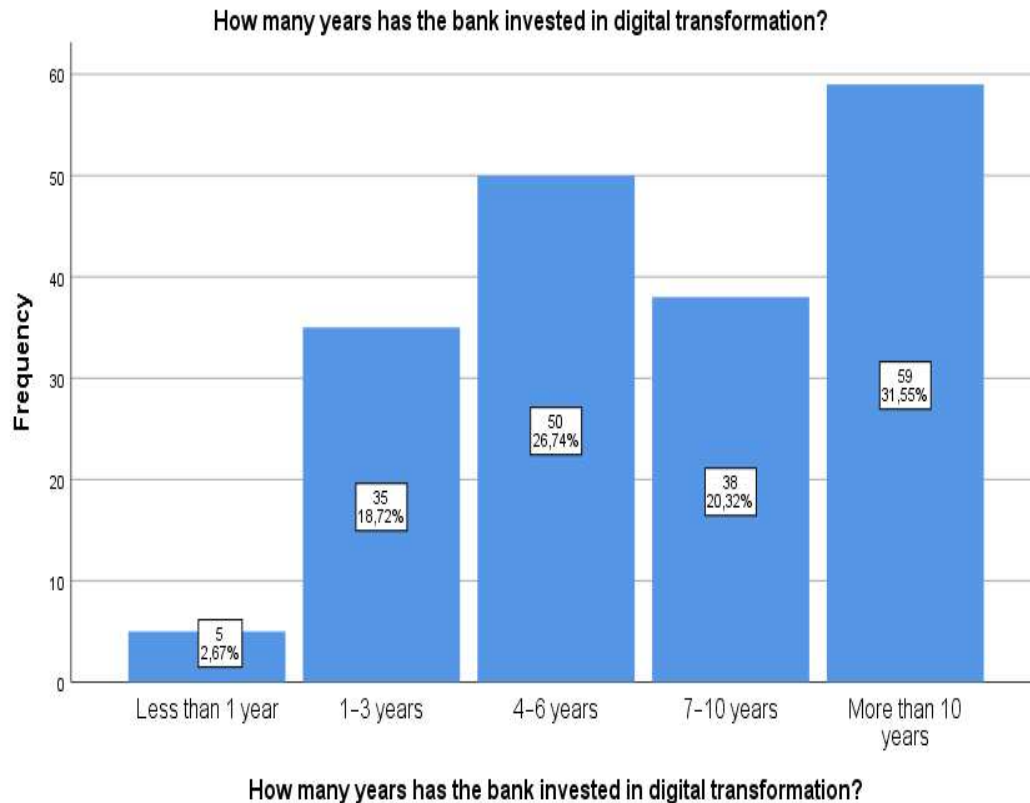
**Figure 5: Department**



**Figure 6: Familiarity with digital technologies**



**Figure 7: Years that the bank invested in digital transformation**



## 4.2 Descriptive analysis

Descriptive statistics is a fundamental area of statistics that focuses on summarizing and organizing data to provide insights into its characteristics. Descriptive statistics typically includes measures of central tendency, measures of variability, and graphical representations of data (Dong, 2023).

#### **4.2.1 Factors affecting customer satisfaction and customer loyalty in Digital Banking**

***Table 2: Factors affecting customer satisfaction and customer loyalty in Digital Banking***

	Mean	Median	Std. Deviation	Minimum	Maximum
To what extent do you believe that user experience, in digital banking, affects customer satisfaction and loyalty?	4.17	4.00	0.823	2	5
To what extent do you believe that reliability, in digital banking, affects customer satisfaction and loyalty?	4.26	4.00	0.810	2	5
To what extent do you believe that perceived value, in digital banking, affects customer satisfaction and loyalty?	3.86	4.00	0.818	2	5
To what extent do you believe that convenience and accessibility, in digital banking, affect customer satisfaction and loyalty?	4.27	4.00	0.771	2	5
To what extent do you believe that personalization, in digital banking, affects customer satisfaction and loyalty?	3.86	4.00	0.946	1	5
To what extent do you believe that trust and security, in digital banking, affect customer satisfaction and loyalty?	4.44	5.00	0.862	2	5

Most bank employees believe that trust and security is the most critical factor for customer satisfaction and loyalty ( $M=4.44$ ,  $SD=0.862$ ). Furthermore, convenience and accessibility ( $M=4.27$ ,  $SD=0.771$ ) and reliability ( $M=4.26$ ,  $SD=0.81$ ) are strong drivers of customer satisfaction and loyalty. User experience comes next ( $M=4.17$ ,  $SD=0.823$ ) as a moderate factor that affects customer satisfaction and loyalty. Personalization ( $M = 3.86$ ,  $SD=0.946$ ) and perceived value ( $M=3.86$ ,  $SD=0.818$ ) are the least important factors that influence customer satisfaction and loyalty.

#### 4.2.2. Digital technologies that enhance customer experience in Digital Banking

**Table 3: Digital technologies that enhance customer experience in Digital Banking**

	Mean	Median	Std. Deviation	Minimum	Maximum
To what extent do you believe that the development of digital channels enhances customer experience in digital banking?	3.96	4.00	0.832	2	5
To what extent do you believe that the Internet of Things (IoT) technologies enhance customer experience in digital banking?	3.73	4.00	0.888	1	5
To what extent do you believe that Artificial Intelligence (AI) enhances customer experience in digital banking?	3.65	4.00	1.079	1	5
To what extent do you believe that Dialogue-based Chatbots enhance customer experience in digital banking?	3.37	3.00	1.149	1	5

Bank employees believe that customer experience in Digital Banking is primarily enhances by the advancement of digital channels (M=3.96, SD=0.832) and Internet of Things (IoT) technology (M=3.73, SD=0.888). According to bank employees' perceptions, Artificial Intelligence (AI) (M=3.65, SD=1.079) ranks lower, followed by Dialogue-based Chatbots (M=3.37, SD=1.149).

**Table 4: Digital technologies that banks use**

Which digital technologies does the bank, you work for, currently use?	Frequency	Percent
Artificial Intelligence (AI)	123	63.1%
Blockchain	55	28.2%
Cloud Computing	113	57.9%
Mobile Banking Applications	152	77.9%
Cybersecurity Technologies	121	62.1%
Internet of Things (IoT)	73	37.4%
Big Data Analytics	130	66.7%
Multi-channel and Opti channel	81	41.5%
Dialogue-based chatbots	78	40.0%
Natural Language Generation (NLG)	41	21.0%
Virtual Reality	17	8.7%

Which digital technologies does the bank, you work for, currently use?	Frequency	Percent
E-sign	1	0.5%
Special online platforms for applications that automatically producing the documents	1	0.5%

Most banks (77.9 %) use mobile banking applications and Big Data Analytics (66.7 %) for their digital transformation. Artificial Intelligence (AI) is also widely used (63.1 %) followed by Cybersecurity Technologies (62.1 %).

**Table 5: Number of years that banks use digital technologies**

<i>Artificial Intelligence (AI)</i>		
	Frequency	Percent
Less than 5 years	2	100.0
<i>Blockchain</i>		
Less than 5 years	2	100.0
<i>Cloud Computing</i>		
Less than 5 years	2	100.0
<i>Mobile Banking Applications</i>		
5–10 years	1	50.0
11–15 years	1	50.0
Total	2	100.0
<i>Cybersecurity Technologies</i>		
Less than 5 years	1	50.0
11–15 years	1	50.0
Total	2	100.0
<i>Internet of Things (IoT)</i>		
Less than 5 years	1	50.0
5–10 years	1	50.0
Total	2	100.0
<i>Big Data Analytics</i>		
5–10 years	1	50.0
11–15 years	1	50.0
Total	2	100.0
<i>Multi-channel and Opti channel</i>		
5–10 years	1	50.0
11–15 years	1	50.0
Total	2	100.0
<i>Dialogue-based chatbots</i>		

Less than 5 years	1	50.0
5–10 years	1	50.0
Total	2	100.0
<b><i>Natural Language Generation (NLG)</i></b>		
Less than 5 years	1	50.0
5–10 years	1	50.0
Total	2	100.0
<b><i>Virtual Reality</i></b>		
Less than 5 years	1	50.0
11–15 years	1	50.0
Total	2	100.0
<b><i>Other</i></b>		
Less than 5 years	2	100.0

According to the bank employees' perceptions, technologies such as AI, Blockchain and Cloud Computing have been used for less than 5 years, suggesting that these innovations are still in early adoption phases within the banking sector. Mobile Banking Applications, Big Data Analytics and Multi-channel/Omni-channel Strategies have a more balanced distribution with half of the bank employees using them for 5–10 years and the other half for 11–15 years. This indicates that these technologies have been in the banking industry for a longer period. Cybersecurity Technologies and IoT also show variations in usage duration with some banks having implemented them for less than 5 years and others for more than a decade. Emerging Limited Use of Dialogue-Based Chatbots and Natural Language Generation (NLG) show mixed adoption trends, with usage ranging from less than 5 years to 5–10 years. Virtual Reality (VR) was used by one bank for less than 5 years and another for 11–15 years. The "Other" category is exclusively composed of technologies that have been in use for less than 5 years.

***Table 6: Number of years that banks plan to invest in the future***

<b><i>Artificial Intelligence (AI)</i></b>		
	Frequency	Percent
Next year	1	50.0
Next 2 years	1	50.0
Total	2	100.0



<b><i>Blockchain</i></b>		
Next year	2	100.0
<b><i>Cloud Computing</i></b>		
Next year	1	50.0
Next 3 years	1	50.0
Total	2	100.0
<b><i>Mobile Banking Applications</i></b>		
Next year	2	100.0
<b><i>Cybersecurity Technologies</i></b>		
Next year	1	50.0
Next 3 years	1	50.0
Total	2	100.0
<b><i>Internet of Things (IoT)</i></b>		
Next year	1	50.0
Next 3 years	1	50.0
Total	2	100.0
<b><i>Big Data Analytics</i></b>		
Next year	1	50.0
Next 2 years	1	50.0
Total	2	100.0
<b><i>Multi-channel and Opti channel</i></b>		
Next year	1	50.0
Next 3 years	1	50.0
Total	2	100.0
<b><i>Dialogue-based chatbots</i></b>		
Next year	2	100.0
<b><i>Natural Language Generation (NLG)</i></b>		
Next year	1	50.0
Next 3 years	1	50.0
Total	2	100.0
<b><i>Virtual Reality</i></b>		
Next year	1	50.0
Next 2 years	1	50.0
Total	2	100.0
<b><i>Other</i></b>		
Next year	2	100.0

The results in Table 6 indicate that banks are prioritizing short-term investments in digital technologies within the next year. Blockchain, mobile banking applications and chatbots are

receiving immediate attention while AI, Big Data and Virtual Reality have slightly longer investment horizons (up to two years). Technologies like cloud computing, cybersecurity, IoT and NLG are extending up to three years.

***Table 7: Data sources that banks use to measure customer experience***

<b>Which of the following data sources does the bank, you work for, use to measure customer experience in the bank's digital services?</b>	<b>Frequency</b>	<b>Percent</b>
Banking CRM (Customer Relationship Management System) (Tracks customer interactions, complaints, and resolutions)	146	74.90 %
Core Banking System (CBS) (Stores transaction data, digital service usage, and error logs)	112	57.40 %
Digital Banking Platform (Mobile & Web Apps) (Captures user logins, feature adoption, and transaction times)	155	79.50 %
Call Center & Chatbot Analytics (Measures response times, issue resolution rates, and customer sentiment)	148	75.90 %

The results indicate that the most commonly used data source is the Digital Banking Platform (Mobile and Web Apps) (79.5%). Call Center and Chatbot Analytics (75.9%), and Banking CRM (Customer Relationship Management System) (74.9%), follow next.

***Table 8: AI & Analytics tools that used to analyze customer experience***

<b>Which of the following AI &amp; Analytics tools do you use to track and analyze customer experience in the bank's digital services?</b>	<b>Frequency</b>	<b>Percent</b>
Business Intelligence (BI) Dashboards (e.g., Power BI, Tableau, Looker) (Visualizes customer experience trends and data insights)	157	80.50 %
AI Chatbots (e.g., IBM Watson, Google Dialogflow) (Monitors customer queries, self-service efficiency, and response quality)	83	42.60 %
Customer Data Platform (CDP) (e.g., Salesforce, Adobe Experience Platform) (Provides insights on user behavior and customer segmentation)	114	58.50 %

The most commonly used tool for analyzing customer experience is Business Intelligence (BI) Dashboards (80.5%). This indicates a strong preference for data visualization and reporting tools to track customer interactions. Customer Data Platform (CDP) is the second most used tool (58.5%) and this platform helps banks integrate and analyze customer data

from multiple sources. AI Chatbots was the least selected tool (42.6%) stating that automated responses provide low reliability for measuring customer experience.

### 4.2.3 Opportunities in Digital Banking

*Table 9: Questions related to opportunities in Digital Banking*

	Mean	Median	Std. Deviation	Minimum	Maximum
To what extent do you believe that the bank, you work for, fosters sustainable growth and enhances its competitiveness in the digital era through digital transformation?	3.69	4.00	0.945	1	5
To what extent do you believe that big data, IoT, and AI tools help the bank, you work for, in forecasting customer behavior and providing proactive solutions, such as financial advice or alerts regarding potential financial threats?	3.67	4.00	0.936	1	5
To what extent do you believe that the bank, you work for, differentiates itself by offering exceptional services and fulfilling experiences to its customers, in order to enhance customer loyalty through digital transformation?	3.52	4.00	0.912	1	5

There is a moderate belief extent:

- In banks that foster sustainable growth and enhance their competitiveness in the digital era through digital transformation (M=3.69, SD=0.945)
- In banks that differentiate themselves by offering exceptional services and fulfilling experiences to its customers (M=3.52, SD=0.912)

Big data, IoT, and AI tools help banks in forecasting customer behavior and providing proactive solutions, such as financial advice or alerts regarding potential financial threats (M=3.67, SD=0.936).

**Table 10: Opportunities banks gain when implementing Digital Banking**

	Mean	Median	Std. Deviation	Minimum	Maximum
Business processes transformation	3.76	4.00	0.841	2	5
Customer experience enhancement	3.91	4.00	0.857	2	5
Employee experience improvement	3.60	4.00	0.930	1	5
Create innovative products and services	3.61	4.00	0.911	2	5
Create personalized products and services	3.60	4.00	0.942	1	5
Create new business models	3.66	4.00	0.961	2	5
Business decisions improvement	3.63	4.00	0.983	1	5
Create efficiencies	3.75	4.00	0.942	2	5
Cost reduction	3.77	4.00	0.998	1	5

The enhancement of customer experience received the highest score (M=3.91, SD=0.857), indicating that digital transformation is the key driver for banks for maintaining and expanding their customer base. Cost reduction is, in addition, another key benefit for banks in order to improve their financial performance (M = 3.77, SD=0.998).

On the other side, employee experience improvement impact is lower (M=3.60, SD=0.93), suggesting that employees need more engagement strategies or training in digital technologies.

#### 4.2.4. Challenges in Digital Banking

**Table 11: Challenges banks face when implementing Digital Banking**

	Mean	Median	Std. Deviation	Minimum	Maximum
Lack of clear strategy	2.76	3.00	1.140	1	5
Systems integration	3.24	3.00	1.037	1	5
Budget constraints	3.29	3.00	1.080	1	5
Skills gap	3.19	3.00	1.033	1	5
Organisational culture	3.19	3.00	1.085	1	5
Resistance to change	3.21	3.00	1.115	1	5
Agility and speed of implementation	3.24	3.00	1.016	1	5
Changing customer needs	2.99	3.00	0.992	1	5
Limited access and control barriers	2.97	3.00	0.992	1	5
Cybersecurity and data privacy concerns	3.10	3.00	1.043	1	5
Ethical concerns	2.80	3.00	1.058	1	5

The primary challenge mentioned by the bank employees regarding the implementation of Digital Banking are Budget constraints ( $M=3.29$ ,  $SD=1.080$ ). Systems Integration ( $M=3.24$ ,  $SD=1.037$ ) and Agility and speed of implementation ( $M=3.24$ ,  $SD=1.016$ ) are also major challenges while the two most unimportant challenges are lack of clear strategy ( $M=2.76$ ,  $SD=1.14$ ) and ethical concerns ( $M=2.80$ ,  $SD=1.058$ ).

### 4.3 Statistical analysis for the hypothesis

Inferential statistics cover those methods, which help in drawing inferences on the characteristics of the population, based on a sample (Sancheti and Kapoor, 2007). It is an applied field of statistics to help in generalization of facts representing the population. A significance level of 5 % was used for testing the hypotheses.

#### 4.3.1 Testing hypothesis H1: Bank employees' perceptions regarding the factors that affect customer satisfaction and customer loyalty in Digital Banking differ across the bank employee's position/role

*Table 12: Ranks of Kruskal Wallis test for testing H1*

Position/role	N	Mean Rank
Entry-Level	23	88.39
Team Leader/Supervisor	41	85.50
Manager/Assistant Manager	54	106.51
Head	21	104.36
Director	24	107.88
Other	24	62.81
Total	187	

**Table 13: Test Statistics for H1**

	<b>Factors that affect customer satisfaction and customer loyalty in Digital Banking</b>
<b>Kruskal-Wallis H</b>	14.612
<b>df</b>	5
<b>Asymp. Sig.</b>	0.012

a. Kruskal Wallis Test

b. Grouping Variable: Position/role

The Kruskal-Wallis test (Kruskal & Wallis 1952) is the nonparametric equivalent of a one-way ANOVA and is used to test the relationship between a nominal independent variable and an ordinal (or numeric) dependent variable with more than three groups.

There was a statistically significant difference in the bank employees who, depending on their position/role in the company, believe that user experience, reliability, perceived value, convenience and accessibility, personalization, and trust and security affect customer satisfaction and loyalty in digital banking, (Kruskal-Wallis test,  $\chi^2(5) = 14.612$ ,  $p = 0.012$ ), with a mean rank score of 88.39 for Entry-Level bank employees, 85.50 for Team Leader/Supervisor bank employees, 106.51 for Manager/Assistant Manager bank employees, 104.36 for Head bank employees, 107.88 for Director bank employees and 62.81 for bank employees with other position/role in their company. These findings indicate that Directors believe in more extent that all the previous factors affect customer satisfaction and loyalty in digital banking.

#### **4.3.2 Testing hypothesis H2: Bank employees' perceptions regarding the factors that affect customer satisfaction and customer loyalty in Digital Banking are correlated with the bank employees' familiarity with digital technologies**

The Spearman rank correlation is a non-parametric correlation coefficient, which is computed using the ranks of the raw data. This is appropriate when the population data are

believed to be non-normal. This coefficient also tests the association between two sets of ranked data.

**Table 14: Correlations for H2**

*Correlations*

			Factors affecting customer satisfaction and customer loyalty in Digital Banking	How familiar are you with digital technologies?
Spearman's rho	Factors affecting customer satisfaction and customer loyalty in Digital Banking	Correlation Coefficient	1,000	0,299**
		Sig. (2-tailed)	.	0,000
		N	187	187
	How familiar are you with digital technologies?	Correlation Coefficient	0,299**	1,000
		Sig. (2-tailed)	0,000	.
		N	187	187

\*\* . Correlation is significant at the 0.01 level (2-tailed).

There is an increasing monotonic trend of 29.9% (Spearman Coefficient,  $r_s=0.299$ ,  $p<.001$ ) between the factors that affect customer satisfaction and customer loyalty in Digital Banking and the bank employees perceptions based on their familiarity with digital technologies. Bank employees who are more familiar with digital technologies believe in more factors that affect customer satisfaction and customer loyalty in Digital Banking.

#### 4.3.3 Testing hypothesis H3: Bank employees' perceptions regarding the digital technologies that enhance customer experience in Digital Banking differ across the bank employee's position/role

**Table 15: Ranks of Kruskal Wallis test for testing H3**

Position/role	N	Mean Rank
Entry-Level	23	74.57
Team Leader/Supervisor	41	82.98

Manager/Assistant Manager	54	110.75
Head	21	103.86
Director	24	109.56
Other	24	69.58
Total	187	

**Table 16: Test Statistics for H3**

	<b>Digital technologies that enhance customer experience in Digital Banking</b>
<b>Kruskal-Wallis H</b>	17.579
<b>df</b>	5
<b>Asymp. Sig.</b>	0.004

a. Kruskal Wallis Test

b. Grouping Variable: Position/role

There was a statistically significant difference in the bank employees who, depending on their position/role in the company, believe that development of digital channels, Internet of Things (IoT), Artificial Intelligence (AI) and Dialogue-based Chatbots enhance customer experience in digital banking, (Kruskal-Wallis test,  $\chi^2(5) = 17.579$ ,  $p=0.004$ ), with a mean rank score of 74.57 for Entry-Level bank employees, 82.98 for Team Leader/Supervisor bank employees, 110.75 for Manager/Assistant Manager bank employees, 103.86 for Head bank employees, 109.56 for Director bank employees and 69.58 for bank employees with other position/role in their company. These findings indicate that managers and assistant managers believe in more extent that all the previous digital technologies enhance customer experience in digital banking.



#### 4.3.4 Testing hypothesis H4: Bank employees' perceptions regarding the digital technologies that enhance customer experience in Digital Banking differ across the department that the bank employees work for.

**Table 17: Ranks of Kruskal Wallis test for testing H4**

Department	N	Mean Rank
Human Resources	13	85.81
IT/Information Security	32	71.06
Cybersecurity	7	82.93
Operations		
Customer	34	97.57
Service/Retail Credit		
Marketing	8	142.00
PMO/Business	36	101.75
Analysis		
Strategy	18	98.06
Business Models	11	103.14
Legal/Compliance	27	94.80
Other	1	32.50
Total	187	

**Table 18: Test Statistics for H4**

	Digital technologies that enhance customer experience in Digital Banking
<b>Kruskal-Wallis H</b>	15.390
<b>df</b>	9
<b>Asymp. Sig.</b>	0.049

a. Kruskal Wallis Test

b. Grouping Variable: Department

There was a statistically significant difference in the bank employees who, depending on the department they work for in the bank, believe that development of digital channels, Internet of Things (IoT), Artificial Intelligence (AI) and Dialogue-based Chatbots enhance customer experience in digital banking, (Kruskal Wallis test,  $\chi^2(9)=15.390$ ,  $p=0.049$ ), with

a mean rank score of 85.81 for Human Resources department, 71.06 for IT/Information Security department, 82.93 for Cybersecurity Operations department, 97.57 for Customer Service/Retail Credit department, 142 for Marketing department, 101.75 for PMO/Business Analysis department, 98.06 for Strategy department, 103.14 for Business Models department, 94.80 for Legal/Compliance department and 32.50 for other department. These findings indicate that bank employees who work in the Marketing department believe in more extent that all the previous digital technologies enhance customer experience in digital banking.

#### 4.3.5 Testing hypothesis H5: Bank employees' perceptions regarding the opportunities in Digital Banking differ accross the bank employee's position/role

*Table 19: Ranks of Kruskal Wallis test for testing H5*

Position/role	N	Mean Rank
Entry-Level	23	73.93
Team Leader/Supervisor	41	84.72
Manager/Assistant Manager	54	108.44
Head	21	109.29
Director	24	106.52
Other	24	70.71
Total	187	

*Table 20: Test Statistics for H5*

Opportunities in Digital Banking	
Kruskal-Wallis H	15.867
df	5
Asymp. Sig.	0.007

a. Kruskal Wallis Test

b. Grouping Variable: Position/role

A statistically significant difference was detected in the bank employees who, depending on their position/role in the company, believe that the Opportunities in Digital Banking

enhance customer experience, (Kruskal Wallis test,  $\chi^2(5)=15.867$ ,  $p=0.007$ ), with a mean rank score of 73.93 for Entry-Level bank employees, 84.72 for Team Leader/Supervisor bank employees, 108.44 for Manager/Assistant Manager bank employees, 109.29 for Head bank employees, 106.52 for Director bank employees and 70.71 for bank employees with other position/role in the bank. These findings indicate that Heads believe in more extent that opportunities in digital banking enhance customer experiences.

#### 4.3.6 Testing hypothesis H6: Bank employees' perceptions regarding the challenges in Digital Banking differ across the department that the bank employees work for

*Table 21: Ranks of Kruskal Wallis test for testing H6*

Department	N	Mean Rank
Human Resources	13	69.62
IT/Information Security	32	88.20
Cybersecurity Operations	7	69.64
Customer Service/Retail Credit	34	116.44
Marketing	8	53.44
PMO/Business Analysis	36	102.76
Strategy	18	82.06
Business Models	11	117.59
Legal/Compliance	27	86.78
Other	1	163.50
Total	187	

*Table 22: Test Statistics for H6*

	Challenges in Digital Banking
<b>Kruskal-Wallis H</b>	20.892
<b>df</b>	9
<b>Asymp. Sig.</b>	0.013

a. Kruskal Wallis Test

b. Grouping Variable: Department

There was a statistically significant difference in the bank employees who, depending on the department that they work for in the bank, believe that there are challenges in digital banking, ( $\chi^2(9) = 20.892$ ,  $p = 0.013$ ), with a mean rank score of 69.62 for Human Resources department, 88.2 for IT/Information Security department, 69.64 for Cybersecurity Operations department, 116.44 for Customer Service/Retail Credit department, 53.44 for Marketing department, 102.76 for PMO/Business Analysis department, 82.06 for Strategy department, 117.59 for Business Models department 86.78 for Legal/Compliance department and 163.50 for other department. These findings indicate that the bank employees who work in the Business Models department believe in more extent that there are challenges in digital banking.

#### **4.3.7 Testing hypothesis H7: There are significant correlations between Customer satisfaction and customer loyalty in Digital Banking, Digital technologies that enhance customer experience in Digital Banking, Opportunities in Digital Banking and Challenges in Digital Banking**

***Table 23: Correlations between Customer satisfaction and customer loyalty in Digital Banking, Digital technologies that enhance customer experience in Digital Banking, Opportunities in Digital Banking and Challenges in Digital Banking***

		Digital technologies			
		Customer satisfaction and customer loyalty in Digital Banking	that enhance customer experience in Digital Banking	Opportunities in Digital Banking	Challenges in Digital Banking
Customer satisfaction and customer loyalty in Digital Banking	Correlation	1.000			
	Coefficient				
	Sig. (2- tailed)				
	N	187			
Digital technologies that enhance customer experience in Digital Banking	Correlation	0.542**	1.000		
	Coefficient				
	Sig. (2- tailed)	0.000			
	N	187	187		

<b>Opportunities in Digital Banking</b>	<b>Correlation</b>	0.409**	0.397**	1.000	
	<b>Coefficient</b>				
	<b>Sig. (2- tailed)</b>	0.000	0.000	.	
	<b>N</b>	187	187	187	
<b>Challenges in Digital Banking</b>	<b>Correlation</b>	0.031	-0.056	0.021	1.000
	<b>Coefficient</b>				
	<b>Sig. (2- tailed)</b>	0.675	0.447	0.777	.
	<b>N</b>	187	187	187	187

\*\*. Correlation is significant at the 0.01 level (2-tailed).

A moderate positive correlation exists between digital technologies enhancing customer experience and customer satisfaction/loyalty. The relationship is statistically significant at the 0.01 level (Spearman Coefficient,  $r_s=0.542$ ,  $p<0.001$ ), indicating that improvements in digital banking are associated with higher customer satisfaction and loyalty in digital banking.

Opportunities in digital banking are positively significantly correlated with both customer satisfaction (Spearman Coefficient,  $r_s=0.409$ ,  $p<0.001$ ) and digital technologies (Spearman Coefficient,  $r_s=0.397$ ,  $p<0.001$ ), suggesting that opportunities and improved digital technologies contribute to enhance customer experiences and satisfaction.

## 5. Discussion

The findings of this research prove that digital transformation presents significant opportunities for banks to improve customer experience and competitiveness. Bank employees strongly believe that digital transformation has positive impact for sustainable growth and enhanced competitiveness. These findings are aligned to those of the academic research of Rodrigues, Ferreira, Teixeira and Zopounidis (2022).

More over the findings are aligned to those of the business research of KPMG (2019) and highlight the important role of data-driven technologies (Big Data, Internet of things, and AI) in predicting customer behavior and offering financial solutions and customized services and products.

Bank employees' perceptions show that digital transformation is a way to differentiate services and enhance customer loyalty. These findings are aligned with those of the academic research of Kim, Jindabot and Yeo (2024).

Despite the opportunities, several challenges follow the implementation of digital banking. The lack of a clear strategy and organizational culture are key challenges. These findings are aligned with those of the business research of PwC (2023) and the academic research of Nguyen, Nguyen and Nguyen (2023).

Additionally, bank employees believe that system integration and budget constraints affect the ideal implementation of digital banking. These findings are aligned with those of the academic researches of Dudin, Shkodinskii and Usmanov (2021) and Shanti, Avianto and Wibowo (2022).

According to the findings of this research, resistance to change and agility in implementation are also obstacles in implementing digital transformation in banking sector. These findings are aligned with those of the business research of PwC (2023).

Cybersecurity and data privacy concerns are the most important challenges in digital banking transformation, while ethical concerns were not believed as key challenges by the bank employees. These findings are aligned with those of the academic research of Cheng, Qu, Jiang and Zhao (2022).

Several factors influence customer satisfaction and loyalty in digital banking. The most critical factors, according to the bank employees' perceptions, are trust, security and reliability in order to lead to reliable digital banking experiences. Convenience and accessibility are also crucial for customer retention. In addition, bank employees believe that service reliability significantly affects customer satisfaction and loyalty. User experience is also an important factor as it concerns customer retention. Lastly, according to the findings, personalization and tailored banking services contribute to customer loyalty. These findings are aligned to those of the academic research of Bapar, Bapar, Hussain and Shah (2023).

Banks utilize various digital technologies to improve customer experience. The most widely adopted technology are mobile banking applications. Big Data Analytics are also used for customer insights and decision-making. Artificial Intelligence (AI) is used by banks to enhance customer interactions while banks also use Cybersecurity Technologies are in order to ensure safe transactions. These findings are aligned with those of the business research of KPMG (2019).

Referring to the impact of digital banking technologies on customer experience, bank employees believe that Digital Channels Development enhance customer experience and insure their continued loyalty. These findings are aligned with those of the academic research of Hosseini, Abdolvand and Harandi (2022).

According to the bank employees's perceptions, IoT Technologies and digital channels development are the key digital technologies that enhance customer experience in digital banking. These findings are aligned with those of the academic research of Ramalingam and Venkatesan (2019).

Artificial Intelligence (AI) and dialogue-based chatbots contribute to personalized banking experiences. These findings are aligned with those of the academic researches of Schrieck, Huang, Kupfer and Krcmar (2024) and Salem (2024).

As for future investments, half of bank employees claim that the bank, they work for, plans to invest in Artificial Intelligence in less than 5 years and the other half of the bank employees claim that the bank, they work for, plan to enhance mobile banking applications in 5 to 15 years. The findings show that banks also prioritize investments in blockchain and cloud computing within in less than 5 years. These findings are aligned with those of the academic researches of Sathwika, Hameed, Sharma, Babu, Chinnaiyan & Sungheetha (2024), Zhang, Wang & Zhang (2024) and Baffour Gyau, Appiah, Gyamfi, Achie, & Naeem (2024).

According to the findings bank employees in top-level management (Directors) and in middle-level management (Heads and Managers/Assistant Managers) have a stronger belief that user experience, reliability, perceived value, convenience and accessibility, personalization, and trust and security affect customer satisfaction and loyalty in digital

banking than the bank employees in lower-level management. These findings are aligned with those of the academic research of Diener & Špaček (2021).

Moreover, bank employees who are more familiar with digital technologies recognize more factors that affect customer satisfaction and loyalty. These findings are aligned with those of the academic research of Boufounou, Mavroudi, Toudas & Georgakopoulos, (2022).

Managers and assistant managers are most convinced that AI, Internet of Things (IoT), Dialogue-based chatbots, and digital channels enhance digital banking customer experiences. These findings are aligned with those of the academic research of Diener & Špaček (2021).

Moreover according to the bank department that the bank employees work for, the finding show that bank employees who work in the Marketing department believe in more extent that AI, Internet of Things (IoT), Dialogue-based chatbots, and digital channels enhance digital banking customer experiences. These findings are aligned with those of the academic research of Rodrigues, Oliveira & Rodrigues (2023).

The perception of opportunities in digital banking varied significantly across the different bank roles/positions, so Heads of the departments had the strongest belief that digital banking opportunities enhance customer experiences in digital banking. These findings are aligned with those of the academic research of Porfirio, Felício & Carrilho (2024).

The perception of challenges in digital banking varied significantly across the department that the bank employees work for. Business models department employees reported the highest concern regarding digital banking challenges. These findings are aligned with those of the academic research of Kitsios, Giatsidis & Kamariotou (2021).

The findings show that improved digital banking services are associated with higher customer satisfaction and loyalty in digital banking. Opportunities in digital banking are significantly correlated with both customer satisfaction and digital technologies, suggesting



that advancements in digital banking drive customer engagement. These findings are aligned with those of the academic research of Diener & Špaček (2021).

## **6. Conclusions**

The findings of this research underscore the crucial role of digital transformation in enhancing customer experience within the banking sector. The results demonstrate that factors such as trust and security, convenience and accessibility, reliability and technological advancements significantly affect customer satisfaction and loyalty.

Digital transformation has enabled banks to implement Artificial Intelligence (AI), Big Data Analytics, Mobile Banking applications and Cloud Computing, in order to improve service quality, operational efficiency, and customer engagement.

The research confirms, according to the bank employees' perceptions, that security and trust are the most critical factors for customer satisfaction in digital banking. Additionally, bank employees claim that convenience and reliability have also a very important role in enhancing customer loyalty. These findings suggest that banks should prioritize security measures and enhance reliability.

This research also underlines the importance of technological advancements in forming and enhancing customer experiences. According to the bank employees' perceptions, Mobile banking applications and Big Data Analytics are the most adopted technologies. AI and cybersecurity technologies have also become well-known. These results support the fact that banks investing in digital technologies can gain a competitive advantage and improve customer satisfaction. However, Dialogue-based Chatbots scored relatively low in effectiveness, suggesting that AI-driven services still need improvements in personalization and accuracy.

While digital transformation offers many opportunities when implementing digital

banking, including enhanced customer experience and cost reduction, it also presents challenges. Budget constraints, system integration issues, and resistance to change were identified by the bank employees as major barriers. These findings highlight the need for banks to develop strategic financial planning and change management initiatives to tackle these barriers.

## **6.1 Research Limitations**

Despite the contribution of this research to understand the importance of the role of digital transformation in enhancing customer experience in the banking sector, this research possesses limitations that should be mentioned. The research is depended on a Quantitative approach, questionnaire, to collect data from 187 bank employees and the findings are generalized. Moreover, this research does not examine bank customers' perceptions.

The study was conducted in Greece, which is a country with specific economy, culture, and technology. The level of banking digital transformation and its level of implementation in other countries may differ.

## **6.2 Further Research**

The findings of this research emphasize bank employees perceptions on how digital transformation enhances customer experience in the banking sector. Despite the current limitations, the present research constitutes a valid basis for further research within Greek Banking Sector.

Moreover, the research could be enhanced by examining various types of financial institutions in Greece and in other countries, as the implementation level of digital transformation may differ globally.

Future research could enhance the findings of this research by using samples from bank employees and bank customers to improve the validity of the results.

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## **Appendix: Questionnaire**

### **The Role of Digital Transformation in Enhancing Customer Experience in the Banking Sector: Opportunities and Challenges**

This questionnaire is part of the research for my thesis titled "The Role of Digital Transformation in Enhancing Customer Experience in the Banking Sector: Opportunities and Challenges", for the "Master in Business Administration (MBA)" program of the Hellenic Open University (HOU).

Your participation is anonymous, and it will take approximately **10 minutes** to complete the questionnaire.

The collected data will be used for the research needs of this diploma thesis.

**All information is confidential and their use in the diploma thesis will be anonymous.**

Thank you in advance for your time and participation!

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<b>1. Factors affecting customer satisfaction and customer loyalty in Digital Banking</b>					
<b>Questions</b>	<b>Not at all</b>	<b>To a slight extent</b>	<b>To a moderate extent</b>	<b>To a considerable extent</b>	<b>To a very great extent</b>
1. To what extent do you believe that user experience, in digital banking, affects customer satisfaction and loyalty?					
2. To what extent do you believe that reliability, in digital banking, affects customer satisfaction and loyalty?					
3. To what extent do you believe that perceived value, in digital banking, affects customer satisfaction and loyalty?					
4. To what extent do you believe that convenience and accessibility, in digital banking, affect customer satisfaction and loyalty?					
5. To what extent do you believe that personalization, in digital banking, affects customer satisfaction and loyalty?					
6. To what extent do you believe that trust and security, in digital banking, affect customer satisfaction and loyalty?					

<b>2. Digital technologies that enhance customer experience in Digital Banking</b>					
<b>Questions</b>	<b>Not at all</b>	<b>To a slight extent</b>	<b>To a moderate extent</b>	<b>To a considerable extent</b>	<b>To a very great extent</b>
7. To what extent do you believe that the development of digital channels enhances customer experience in digital banking?					
8. To what extent do you believe that the Internet of Things (IoT) technologies enhance customer experience in digital banking?					
9. To what extent do you believe that Artificial Intelligence (AI) enhances customer experience in digital banking?					
10. To what extent do you believe that Dialogue-based Chatbots enhance customer experience in digital banking?					

**11. Which digital technologies does the bank, you work for, currently use? (Check all that apply):**

- ☐ Artificial Intelligence (AI)
- ☐ Blockchain
- ☐ Cloud Computing
- ☐ Mobile Banking Applications
- ☐ Cybersecurity Technologies
- ☐ Internet of Things (IoT)
- ☐ Big Data Analytics
- ☐ Multi-channel and Opti channel
- ☐ Dialogue-based chatbots
- ☐ Natural Language Generation (NLG)
- ☐ Virtual Reality
- ☐ Other, please clarify: .....

**12. For how many years has the bank, you work for, been using the technologies listed above? (Please indicate for each technology):**

Technology	Less than 5 years	5–10 years	11–15 years	16–20 years	More than 20 years
Artificial Intelligence (AI)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Blockchain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cloud Computing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mobile Banking Applications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cybersecurity Technologies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internet of Things (IoT)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Big Data Analytics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Multi-channel and Opti channel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dialogue-based chatbots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Natural Language Generation (NLG)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Virtual Reality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**13. Does the bank, you work for, plan to invest in one or more of the below technologies in the next years? (Please indicate for each technology)**

Technology	Next year	Next 2 years	Next 3 years	Next 4 years	Next 5 years
Artificial Intelligence (AI)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Blockchain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cloud Computing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mobile Banking Applications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cybersecurity Technologies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internet of Things (IoT)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Big Data Analytics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Technology	Next year	Next 2 years	Next 3 years	Next 4 years	Next 5 years
Multi-channel and Opti channel	[]	[]	[]	[]	[]
Dialogue-based chatbots	[]	[]	[]	[]	[]
Natural Language Generation (NLG)	[]	[]	[]	[]	[]
Virtual Reality	[]	[]	[]	[]	[]
Other	[]	[]	[]	[]	[]

**14. Which of the following data sources does the bank, you work for, use to measure customer experience in the bank's digital services? ( (Select all that apply)**

- ☐ **Banking CRM (Customer Relationship Management System)**  
(Tracks customer interactions, complaints, and resolutions)
- ☐ **Core Banking System (CBS)**  
(Stores transaction data, digital service usage, and error logs)
- ☐ **Digital Banking Platform (Mobile & Web Apps)**  
(Captures user logins, feature adoption, and transaction times)
- ☐ **Call Center & Chatbot Analytics**  
(Measures response times, issue resolution rates, and customer sentiment)

**15. Which of the following AI & Analytics tools do you use to track and analyze customer experience in the bank's digital services? (Select all that apply)**

- ☐ **Business Intelligence (BI) Dashboards** (e.g., Power BI, Tableau, Looker)  
(Visualizes customer experience trends and data insights)
- ☐ **AI Chatbots** (e.g., IBM Watson, Google Dialogflow)  
(Monitors customer queries, self-service efficiency, and response quality)
- ☐ **Customer Data Platform (CDP)** (e.g., Salesforce, Adobe Experience Platform)  
(Provides insights on user behavior and customer segmentation)



<b>3. Opportunities in Digital Banking</b>					
<b>Questions</b>	<b>Not at all</b>	<b>To a slight extent</b>	<b>To a moderate extent</b>	<b>To a considerable extent</b>	<b>To a very great extent</b>
16. To what extent do you believe that the bank, you work for, fosters sustainable growth and enhances its competitiveness in the digital era through digital transformation?					
17. To what extent do you believe that big data, IoT, and AI tools help the bank, you work for, in forecasting customer behavior and providing proactive solutions, such as financial advice or alerts regarding potential financial threats?					
18. To what extent do you believe that the bank, you work for, differentiates itself by offering exceptional services and fulfilling experiences to its customers, in order to enhance customer loyalty through digital transformation?					

**19. To what extent do you believe that the below statements describe the opportunities the bank, you work for, gains when implementing Digital Banking?**

		<b>Not at all</b>	<b>To a slight extent</b>	<b>To a moderate extent</b>	<b>To a considerable extent</b>	<b>To a very great extent</b>
Business transformation	processes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Customer enhancement	experience	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Employee improvement	experience	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Create innovative products and services		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Create personalised products and services		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Create new business models		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Business decisions improvement		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Create efficiencies		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cost reduction		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## 4. Challenges in Digital Banking

**20. To what extent do you believe that the below statements describe the challenges the bank, you work for, faces when implementing Digital Banking?**

	Not at all	To a slight extent	To a moderate extent	To a considerable extent	To a very great extent
Lack of clear strategy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Systems integration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Budget constraints	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Skills gap	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Organisational culture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Resistance to change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Agility and speed of implementation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Changing customer needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Limited access and control barriers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cybersecurity and data privacy concerns	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ethical concerns	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### General Questions (21-27)

#### 21. Gender

<input type="checkbox"/>	Male
<input type="checkbox"/>	Female
<input type="checkbox"/>	Other

#### 22. Age

<input type="checkbox"/>	<34
<input type="checkbox"/>	35-44
<input type="checkbox"/>	45-54
<input type="checkbox"/>	55-64

### 23. Educational level

<input type="checkbox"/>	High School Diploma or Equivalent
<input type="checkbox"/>	Associate degree (2-year college degree)
<input type="checkbox"/>	Bachelor's Degree
<input type="checkbox"/>	Master's Degree
<input type="checkbox"/>	Doctoral Degree
<input type="checkbox"/>	Other

### 24. Position/role

<input type="checkbox"/>	Entry-Level
<input type="checkbox"/>	Team Leader/Supervisor
<input type="checkbox"/>	Manager/Assistant Manager
<input type="checkbox"/>	Head
<input type="checkbox"/>	Director
<input type="checkbox"/>	Other

### 25. Department

<input type="checkbox"/>	Human Resources
<input type="checkbox"/>	IT/Information Security
<input type="checkbox"/>	Cybersecurity Operations
<input type="checkbox"/>	Customer Service/Retail Credit
<input type="checkbox"/>	Marketing
<input type="checkbox"/>	PMO/Business Analysis
<input type="checkbox"/>	Strategy
<input type="checkbox"/>	Business Models
<input type="checkbox"/>	Legal/Compliance
<input type="checkbox"/>	Other, please clarify:.....

Question	Not at all familiar	Slightly familiar	Moderately familiar	Quite familiar	Extremely familiar
26. How familiar are you with digital technologies?					

Question	Less than 1 year	1–3 years	4–6 years	7–10 years	More than 10 years
27. How many years has the bank invested in digital transformation?					

**Author's Statement:**

I hereby expressly declare that, according to the article 8 of Law 1559/1986, this dissertation is solely the product of my personal work, does not infringe any intellectual property, personality and personal data rights of third parties, does not contain works/contributions from third parties for which the permission of the authors/beneficiaries is required, is not the product of partial or total plagiarism, and that the sources used are limited to the literature references alone and meet the rules of scientific citations.