



A Framework for Digital Transformation in the Banking Industry of Iran

Zahra Shamshirband, Neda Abdolvand, Saeedeh Rajaei Harandi
and Ali Abdollahi

EasyChair preprints are intended for rapid
dissemination of research results and are
integrated with the rest of EasyChair.

September 30, 2023

A FRAMEWORK FOR DIGITAL TRANSFORMATION IN THE BANKING INDUSTRY OF IRAN

Research full-length paper

Zahra Shamshirband, Department of Management, Faculty of Social Sciences and Economics, Alzahra University, Tehran, Iran. zahrashirmj123@gmail.com

Neda Abdolvand, Department of Management, Faculty of Social Sciences and Economics, Alzahra University, Tehran, Iran. nabdolvand@alzaha.ac.ir

Saeedeh Rajaei Harandi, Department of Management, Faculty of Social Sciences and Economics, Alzahra University, Tehran, Iran. Sa.rajaeeharandi@gmail.com

Ali Abdollahi, Faculty of Management and Accounting, Shahid Beheshti University, Tehran, Iran. Ali_abdollahi@sbuu.ac.ir

Abstract

Digital transformation is driving structural change in all sectors of the global economy especially in the banking industry. The digital transformation of the banking industry is an ongoing process that impacts the working environment through the redesign of processes and methods. Therefore, this study aims to provide a framework for digital transformation in Iran's banking industry using an enterprise architecture framework. For this purpose, qualitative and quantitative approaches were used. In the qualitative part, systematic review was done to identify key factors. The extracted factors were then coded and classified with the approval of the experts. For the quantitative part, Friedman's test was used to prioritize the categories and components. Ultimately, 10 categories and 28 components were identified. Among them, security and customer management were the highest priority categories.

Keywords: digital transformation, digital transformation framework, banking industry, digital banking, enterprise architecture framework.

Introduction

Digital transformation is now an important trend permeating many industries and sectors of society (Gray and Rumpe, 2017). It is a process aimed at enhancing entities by combining information, computing, communication and connectivity technologies to significantly change their characteristics (Giatsidis et al., 2019). Its main objective is to reap the benefits of digitization, such as having a clear strategy to achieve these goals is very important (Hess et al., 2016). One of the most important areas where digital transformation is currently of great importance is the financial sector, particularly the banking industry (Hanna, 2016). In the financial sector, digital technology is creating new types of services, such as bigtech online loans, digital payments, robo-advisor, etc. These initiatives have motivated banks to improve their customer services and competitiveness through digital transformation (Xie and Wangr, 2023). The banking industry professionals invest three times more in information technology than any other industry (Kitsios et al., 2021; Giatsidis et al., 2019). Digital transformation in the banking industry involves has led to a profound transformation of banking systems and offers new opportunities such as creating loyalty, attractiveness and thus increasing profitability for banks (Omarini, 2017; Cuesta et al., 2015).

Although the digital transformation in the banking industry can be seen as a great opportunity, it brings many challenges. For example, mobile banking and internet banking are simple approaches to carry out multiple financial transactions. While customers benefit from such services, the threat and potential of cyber-attacks poses significant challenges for these digital services as well (Johri and Kumar, 2023). Gimpel et al. (2018) argue that the relevance of the action fields strongly depends on industry and company specific characteristics. Some countries are currently pioneers in this field, while others, such as Iran, are less advanced due to specific environmental conditions and legal restrictions. Of course, Iranian banks have started their electronic journey. Some services have gone digital, but the lack of coordination and integration in this area is very noticeable (Majdalawieh and Khan, 2022; Bumann and Peter, 2019; Pourebrahimi et al., 2018).

Despite the relative success of Iranian banks in creating digital access channels for their customers, not paying attention to three key factors has made it impossible to consider them a modern and digital bank: a unified customer experience across all bank access channels (omnichannel), attention to digital banking as a tool and not as a new business model, focusing solely on digital payment tools instead of addressing all aspects of banking in the digital space. However, the response of Iranian banks to the above developments has been to offer relatively similar banking products and services in the form of internet banking services and mobile banking services, which in practice have become the equivalent of electronic products and services in the Iranian banking sector. In short, although some of the services provided by Iranian banks are digital, the lack of coordination and integration in this area is clearly felt (Pourebrahimi et al., 2018). The most important reason for this can be the absence of a fee-based business model in Iran's banking sector on the one hand and the lack of a comprehensive framework that help them to success in digital transformation.

To succeed in digital transformation, it is necessary to have clear goals along with a strategic plan and framework (Hess et al., 2016). The existence of a specific framework will help organizations design a digital roadmap, achieve their ultimate goals and provide opportunities to thrive and move forward in the current situation, regardless of their size (Zapata et al., 2020; Gimpel et al., 2018).

Despite the general direction of digital banking and due to the difference in goals and business models in different banks, the digital transformation roadmap for the establishment of digital banking systems in different banks will be different. Therefore, there are several methodologies and frameworks to achieve the goals of digital transformation. These frameworks differ in their origins, industry limitations (if any), scientific or practical backgrounds and purposes. Moreover, relatively heterogeneous frameworks vary greatly in the amount of information disclosed (Bumann and Peter, 2019). Due to the lack of a digital transformation framework for the banking, an effort should be made to provide a suitable digital transformation framework in Iran's banking industry. Considering the complexity of the digital transformation and the fact that the digital transformation of the banking industry is an ongoing

process (Kitsios et al., 2021), this question arises, what factors affect the success of Iranian banks in moving towards digital transformation? To answer this question, this study uses the The Federal Enterprise Architecture Framework (FEAF) to identify and prioritize the effective factors on digital transformation of the Iranian banking industry and provide a localized framework for the success of the banking industry in digitalization. The reason for using this framework is that the Iranian banks' strategic models are based in part on FEAF and banking executives want to ensure that their organizations' strategic and digital transformation models are aligned. FEAF is a business-based analytical framework for the government-wide improvement that enables agencies to use standardized methods to map relationships between strategic objectives, business functions, and supporting technologies. The purpose of this framework is to allow a set of predefined models to be coordinated and used in business activities to support IT systems (Cavallare, 2020; Dumitriu and Popescu, 2020; Urbaczewski and Mrdalj, 2006). The framework developed in this study can give the Iranian banking industry direction for developing organizational skills throughout the digital transformation process. The rest of the study is organized as follows. After reviewing the relevant literature, research methods and results are presented. Discussion, conclusion and suggestions for future research are then presented.

2. Literature review

Digital transformation is a profound change in the way companies delivers value to their customers. It is an overarching concept that includes organizational and strategic change through a combination of information, communication and connectivity technologies (such as artificial intelligence (AI), cloud computing, and Internet of Things (IoT)) (Cheng et al., 2023; Xie and Wang, 2023; Jafari-Sadeghi et al., 2023; Diener and Špaček, 2021; Kitsios et al., 2021). The digital transformation in the banking industry refers to operational and cultural changes in banking organizations towards integrating digital technologies into all banking areas, streamlining operations and delivering value to customers (Bumann and Peter, 2019; Vial, 2019). It includes the production, distribution and sale of financial products and services through digital channels, banking automation, the use of advanced technology to communicate with customers, and predicting the customers' needs (Omarini, 2017).

The digital transformation in the banking industry increases bank profitability by creating a competitive advantage and reducing costs (Mahmoodi et al., 2023; Valero et al., 2020). However, stronger competitors and pressure to reduce margins and operational risks could lead to lower profitability. Therefore, to succeed in digital transformation, banks need to be realistic and develop strategies (Mahmoodi et al., 2023) to better plan and perform digital transformation (Bumann and Peter, 2019). A transformation strategy also known as the digital transformation framework, is the main plan for the digital transformation and development of the organization during the digitalization (Chiguvi, 2023; Johnson and Zondervan, 2018). The digital transformation framework bridges the gap between current and desired conditions by providing the transition planning, and helps organizations of all sizes thrive in current market conditions (Johnson and Zondervan, 2018).

There are several frameworks for IT management and governance such as COBIT (Control Objectives for Business and Related Technologies), ITIL (Information Technology Infrastructure Library), CMMI (Integration Capability Maturity Model), etc. (Korachi and Bounabat, 2019). COBIT is a comprehensive IT governance framework that provides IT administrators with guidelines for managing and controlling enterprise IT (Mangalaraj et al., 2014). ITIL is a framework of best practices compiled by public and private organizations around the world. IT covers all IT parts of an organization (Ahmad and Shamsudin, 2013). CMMI consists of a gradual or continuous representation of software maturity, covers several different process areas or disciplines, and provides a way to integrate these process areas. However, the representation of process areas within CMMI is intentionally platform-agnostic and does not provide operational details in order to remain useful to the widest possible range of organizations (Alfaraj and Qin, 2011). Using these frameworks alone prevents organizations from realizing the full benefits of IT governance. This is because each practice has its own limitations when applied to a

particular IT domain, and all these practices overlap (Korachi and Bounabat, 2019). Few studies have tried to close this gap by proposing well-founded, cross-industry frameworks of action fields for digital transformation (such as Gimpel et al. 2018; Peter, 2017; Valdez-De-Leon, 2016).

Many consulting companies such as Accenture, McKinsey, MIT, Gartner, PWC, and KPMG, have also developed frameworks for digital transformation that can be used to assess an organization's ability to undertake digital projects (Стоянова et al., 2020). Regarding the business to business (B2B) market, consultants, such as Accenture pointed out that the objective of digital transformation is return on investment (Majdalawieh and Khan, 2022). Accenture sought to connect the circular economy with digitalization (El Hilali and El Manouar, 2019) and concluded that a successful transformation program requires strong and consistent leadership skills at all levels of an organization (Sainger, 2018). The McKinsey framework identifies risk elimination, diversification, design, decision-making, and data as effective elements in preparing an enterprise for digital transformation (Flavin and Heller, 2019). The MIT Framework recognizes the importance of component operational processes, customer insight, understanding digital platforms, organizing the organization and its digital parts, and developing external platforms (ROSS et al., 2019). The Gartner framework includes building the right mindset and common understanding, choosing the right leadership, building a digital organization, developing a digital strategy, acquiring and developing digital business skills and roles, and creating new digital business skills (Stamford, 2014). In the Framework proposed by PWC, factors such as digitalization of products and services, digital business models, digitalization and integration of horizontal and vertical value chains, and customer accessibility were identified as effective factors for an organization's success in digital transformation (PWC, 2016). The KPMG framework assesses the ability to leverage new (digital) business by considering digital strategy, flexible infrastructure models, talent, and managing and digitizing business processes (KPMG, 2016).

Common characteristics of these frameworks include: digitized business models, collaborative leadership, customer-centric products and services, internal talent development, and a culture of innovation. Some consulting firms believe that traditional thinking creates a false sense of digital competency and could be dangerous if companies need to rethink and digitize their businesses to remain competitive (Stockhinger and Teubner, 2018). Some consulting firms even believe that integrating the digital strategy into the overall business strategy is a prerequisite for a successful strategy development in the digital world (Stockhinger and Teubner, 2018; Sebastian et al., 2017). This is consistent with observations of large digital companies that are coping with the digitization of their industries by significantly changing their corporate strategies, closely linking both strategies (Stockhinger and Teubner, 2018; Bughin et al. 2017). The digitization of companies and the existence of value creation networks change the competitive environment in which companies operate, which affects business and industry performance (Stockhinger and Teubner, 2018).

Although different frameworks have been developed for digital transformation many leaders still face difficulties in setting and implementing the digital agenda due to their unfamiliarity with the topics, processes and structures (Bumann and Peter, 2019). With regard to the complexity of digitalization of the banking industry, different studies have been conducted in this area from different points of view. For example, Xie and Wang (2023) tried to create a system that measures the digital transformation of banks and indicated that digital transformation improves bank performance, reduces the negative impact of new technologies, and facilitates withdrawal from offline channels. In another study, Mahmoodi et al. (2023) studied the effective drivers of the digital innovation process in Iran's social banking and indicated that digital transformation infrastructure, law and policy, innovative approaches, banking industry structure, security and social factors are the most important factors that affect digital innovations in banking. At the same study, Diener and Špaček (2021) explored the main barriers to digital transformation in banking sector. They found that strategy, technology, regulation, customers and employees play important roles in digital transformation.

The review of studies indicates that until now, studies on digital transformation of banking industry have been focused on the strategic level, the customer's point of view or the internal perspective. In addition, very little research has focused on digital transformation strategies and frameworks, which

most of them focused on prerequisites and drivers of digital banking. Therefore, this study tries to identify the factors affecting digital transformation in the Iranian banking industry and provide a localized framework for the banking industry to fill this gap in academics and identify the pathways to success in the banking digitalization.

3. Method

This study aims to provide a framework for digital transformation in Iran's banking industry. To this end, first, the systematic literature review was used to extract the main critical factors of banking digital transformation. A systematic literature review is a type of review that searches, selects, and synthesizes all available evidence using repeatable methods (Romanelli et al., 2021). A systematic review begins with specific questions that are well defined and scientifically answerable in terms of topic, intervention, and outcome (Pullin and Stewart, 2006). In this study the question is, what factors affect the success of Iranian banks in moving towards digital transformation? To answer the question, it is important to conduct sufficiently detailed and broad searches to identify all studies of interest. Therefore, all available sources, including scientific papers, journals, and databases were first reviewed. This includes "Springer", "Taylor and Francis", "EMERALD", "IEEE Explore", and "ELSEVIER". A search strategy is constructed from search terms extracted from the question subject, intervention, and outcome elements (Pullin and Stewart, 2006). The search terms were "Digital Transformation", "Digital Transformation Framework", and "Digital Transformation in the Banking Industry." First, 308 papers were selected. The papers were then limited to the title and content, and a total of 150 papers were found at the end of the search process that was more related to the objective of the study. The selected papers were then reviewed and the digital transformation frameworks presented therein were extracted. Subsequently, all frameworks of digital transformation were checked, and their common factors were extracted, coded and categorized. The expert panel was then used to validate the codes and categories. At this stage, 17 experts in the fields of information technology, digital transformation, and banking were asked to validate the components and their categories using a questionnaire based on 5-point Likert scale (ranging from very high to very low). Experts were selected by using a snowball approach, with each expert nominated by the other participants. Snowball sampling is a method used when population surveys are difficult to access (Leick et al., 2022). Most of the experts were familiar with or were worked in the banking industry (58.6%). And about 70.5% of them were completely familiar with digital transformation especially in banking.

After confirmation of factors and categories, they were compared and matched with those of Federal Enterprise Architecture framework (FEAF) by experts' approval.

The final framework was then validated twice. The Cohen's Kappa coefficient was used to check the coding validity. This was 98%, indicating high validity of the codes. Lawshe's Content validity Ratio was also used to validate categories and quantify the validity of categories (Ayre and Scally, 2014). Finally, the Friedman test was used to determine the importance and priority of components and categories.

4. Results

First, all frameworks of digital transformation were reviewed and their common factors were extracted and coded. At this stage, similar concepts were grouped into similar categories. Then, expert panel was set up to validate the codes and their categories. As a results, 10 main categories (digital strategy and goals, digital operational processes, customer management, digital technologies, organizing, data, digital products and services, security, capital and asset management, network and infrastructure, and technical and engineering management) and 32 distinct factors were extracted from existing digital transformation frameworks. Table 1 indicates the concepts extracted from the digital transformation frameworks.

Main Categories	Components	MIT	Capgemini	DXC	Mckinsey	Gartner	Cognizant	PWC	Accenture	KPMG	Iconology	Morze and Strutyńska, (2021)
Digital strategy and goals	Developing digital strategies			✓							✓	
	Implementation of digital strategies											✓
	Achieving the organization's digital goals	✓	✓				✓		✓	✓		✓
Digital operational processes	Designing the optimal situation compared to the current situation									✓	✓	✓
	Integration of processes using optimization and digitalization approaches									✓		
Customer management	Gain organizational knowledge about customer insights and needs	✓	✓	✓			✓					
	Responding to customer needs and suggestions			✓								
	Using customer experiences		✓				✓					
	Increasing digital channels and contact points with customers and receiving feedback from them		✓				✓	✓			✓	
Digital technologies	Development and integration of digital technologies and platforms	✓		✓					✓	✓	✓	✓
	Creating a platform for the development of digital technologies and platforms	✓									✓	
Organizing	Board selection and leadership with digital skills											
	Cooperation and coordination of digital departments of the organization	✓										
	Discovery, recruitment and training of digital skills and roles					✓						
	Integration of horizontal and vertical value chains							✓				
Data	Organization and customer data analysis				✓						✓	✓
	Creating a repository of organization and customer information				✓							
	Providing solutions related to the problems of the organization and customers										✓	✓
	Using existing data and retrieving required data											✓
	Big data storage											✓
Digital products and services	Designing prototypes of digital products and services				✓		✓	✓				
	Providing and marketing digital products and services				✓			✓				
	Performance evaluation of digital products and services											
Security	Establishing and developing security in processes, business models and digital programs of the organization								✓	✓		
	Organization and customer data security											✓
	The existence of cyber security infrastructure											✓
Capital and asset management	Management of digital assets of the organization	✓			✓							
	Gaining knowledge about the costs of the organization	✓						✓				
	Setting up an organization with digital capabilities and units for property, finance and investment affairs									✓		
Network and infrastructure	Developing a network to provide services in line with the organization's goals									✓		✓
Technical and engineering management	Engineering and design of modern capabilities and platforms				✓				✓			
	Technical guidance of products and services by technologies (such as robotics, artificial intelligence, blockchain, etc.)								✓			

Table 1. Concepts Extracted From Digital Transformation Frameworks.

The extracted factors were then compared and matched with those of FEAF (Table 2). According to the results, most of the factors are common with FEAF. But no significant relationship was found between the components of systems and applications, asset management/configuration management, project/program management from the FEAF and components of digital products and services, customer management, organization from the digital transformation frameworks. Since three components of digital transformation frameworks were very common among the existing frameworks, the systems and applications component replaced with digital products and services, the asset /configuration management component replaced with customer management and the project /program management component replaced with organization replaced with the approval of experts.

The Categories of FEAF	The Categories of the Digital Transformation Frameworks	The Categories of the Final Framework
Strategic plans	Digital strategy and goals	Digital strategy and goals
Business programs and processes	Digital operational processes	Digital processes and operational plans
Data and information	Data	Data
Infrastructure and network	Digital technologies - network and infrastructure	Network/infrastructure/digital technologies
Security/Privacy	security	security
Configuration management	Technical and engineering management	Configuration management
Capital planning/portfolio management	Capital and asset management	Capital planning and portfolio management
Systems and applications	-	-
Asset /configuration management	-	-
Project/program management	-	-
-	Digital products and services	Digital products and services
-	Customer management	Customer management
-	Organizing	Organizing

Table 2. Correspondence between the components of the digital transformation frameworks with those of the FEAF

After extracting components and matching them with those of FEAF with experts' approval, the Cohen's Kappa coefficient was used for examining the the validity of coding, which was 98% and shows high validity of the codes. The Lawshe's Content validity Ratio was also used to validate the categories and to quantify the validity of content (Ayre and Scally, 2014), which was approximately 0.47 for categories and component except for the three components marked in grey. These components were removed from the analytical process (Table 3). Finally, 10 categories and 28 components were identified to be effective in the success of Iranian banks in moving towards digital transformation. Finally, the Friedman test was used to prioritize categorises and components (Table 3). According to the results, the security and customer management components had the highest priority and the configuration management component had the lowest priority. Among the components, organization and customer data analysis had the highest priority.

Categories and Components	CVR	Average Ranks
Digital strategies and goals	1	5.74
Developing digital strategies	1	2.26
Implementation of digital strategies	0.88	1.91
Achieving the organization's digital goals	0.76	1.82
Digital processes and operational plans	1	5.79
Designing the optimal situation compared to the current situation	0.29	-
Integration of processes using optimization and digitalization approaches	0.64	1.62
Network, infrastructure and digital technologies	1	4.65
Development and integration of digital technologies and platforms	0.88	1.59
Creating a platform for the development of digital technologies and platforms	0.64	1.41
Developing a network to provide services in line with the organization's goals	0.36	-
Data	1	6.18

Categories and Components	CVR	Average Ranks
Organization and customer data analysis	1	4.09
Creating a repository of organization and customer information	1	2.74
Providing solutions related to the problems of the organization and customers	1	2.85
Using existing data and retrieving required data	0.88	2.68
Big data storage	0.88	2.65
Security	0.64	6.65
Establishing and developing security in processes, business models and digital programs of the organization	0.64	1.88
Organization and customer data security	0.64	2.15
The existence of cyber security infrastructure	0.64	1.97
Capital planning and portfolio management	1	4.62
Management of digital assets of the organization	1	1.50
Gaining knowledge about the costs of the organization	0.88	1.50
Setting up an organization with digital units and capabilities for property, finance and investment affairs	0.17	-
Configuration management	1	4.06
Engineering and design of modern capabilities and platforms	0.76	1.44
Technical guidance of products and services by technologies (such as robotics, artificial intelligence, blockchain, etc.)	1	1.56
Digital products and services	0.88	5.21
Designing prototypes of digital products and services	0.52	1.88
Providing and marketing digital products and services	0.52	2.06
Performance evaluation of digital products and services	0.76	2.06
Customer management	1	6.65
Obtain organizational knowledge about customer insights and needs	1	2.12
Using customer experiences	0.88	1.88
Responding to customer needs and suggestions	0.52	2
Increasing digital channels to contact customers and receive feedback from them	0.36	-
Organizing	1	5.47
Board selection and leadership with digital skills	0.76	2.82
Discovery, recruitment and training of digital skills and roles	0.76	2.50
Cooperation and coordination of digital departments of the organization	0.76	2.35
Integration of horizontal and vertical value chains	1	2.32
Note: Categories are in bold and grey areas were excluded from further analysis and Friedman's test due to low CVR.		

Table 3. The CVR and Friedman's Test Results

5. Discussion

After extracting the categories and components and coding and prioritizing them, the final framework was presented, consisting of 10 categories and 28 components. The results demonstrated that security and customer management had the highest priority and configuration management had the lowest priority among the major categories. In terms of components, organizational and customer data analysis was given top priority. According to the results, security is a top priority in the banking sector. Security must therefore be given special attention in all areas of banking.

Although Iran's banking industry has tried to achieve a favourable level of security in connection with a suitable user experience in these years, according to security experts, it still has a long way to go to converge on global security standards. The lack of a uniform structure for securities custody in the banking sector, the lack of dedicated professionals in this sector and the maintenance of expensive human capital, the need to raise public awareness of the general requirements for information security in international level, international sanctions in providing security equipment, lack of specific budget allocations for implementing security issues within organizations, numerous security regulators and incompleteness of announced security policies, technical flaws in local security products, lack of 24/7

online follow-up and response centers for security incidents; lack of clear, effective and efficient cybercrime and information disclosure laws; and lack of sufficient technical knowledge of the country's judicial system to handle cybercrime cases are the challenges of the current situation in the security of the country's banking industry. The most important areas of bank security include extensive internal networks, banking software including banking core and bank database. For this reason, the existence of specialized groups for software security, network security, operating system security, database security, as well as legal and forensic among the security experts of each bank is inevitable. In addition, creating a strong risk management system is very important for banks; otherwise, they will be condemned to huge losses. It is noticeable that security is not limited to technology and equipment, it also applies to policies, procedures, monitoring and assessment infrastructure. More importantly, professional personnel is essential to security establishment and maintenance.

Customer management is also critical in a successful digital banking implementation. Since most of a bank's capital comes from customer deposits, banks need to make customer orientation a pillar of their operations. Today, customer centricity in banks is considered one of the most important policies of banks, thus bankers should pay more attention to this category in banking system policies. In order to provide appropriate services, banks need to understand and analyze customer expectations and needs, and build a mechanism for that purpose. Analyzing customer data based on various parameters can help banks better target their customers and classify customer into specific categories. Based on these divisions, banks can modify and define their services and products.

The schematic model of the final research framework based on the logic of the organizational architecture framework is shown in Figure 2.

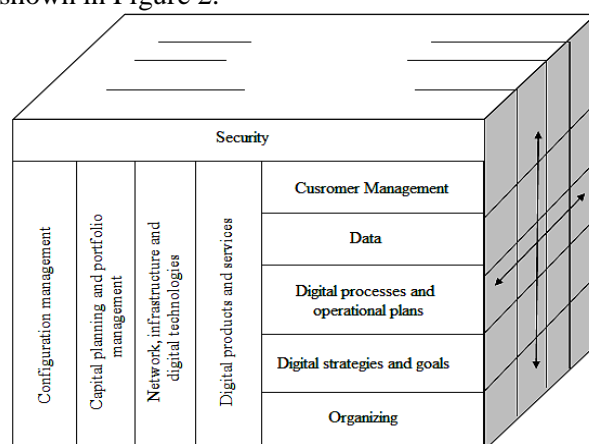


Figure 2. Schematic model of the proposed digital transformation framework

The components obtained in the final framework of the study are as follows:

- **Security**

Digital transformation is the cornerstone of modern organizations and the crucial driver of their operations, which for various reasons (lack of security knowledge, misperception of security risks, etc.) is at fundamental risk. Serious mistakes in digital transformation due to security issues can lead to business disruptions. Therefore, in the digital age, successful companies are those that identify and deal with security risks more efficiently (Shahim, 2021).

Internet-based networks store large amounts of financial, credit, and personal information. With many information paths and resources in the network, it is not clear where this information is going and who is exploiting it. Therefore, security of customer data is of paramount importance in digital transformation (Johri and Kumar, 2023; Varma et al., 2021). Safeguarding online and digital technologies in banking operations, setting up security centers to record events, monitoring and handling suspicious transactions in banks, educating bank customers about cyber risks in remote banking services and maintaining the confidentiality of processes and information are of the measures taken by banks to increase security (Johri and Kumar, 2023; Rashidovich, 2022).

- **Customer Management**

Digital transformation has led to changes in customer expectations, and due to the opportunities created by the use of modern technologies customers often evaluate organizations based on their digital experience (Stalmachova et al., 2022; Naimi-Sadigh et al., 2021). Therefore, the growth of organizations in the digital age requires responding to customer needs and requirements and improving customer satisfaction, which is the main objective of customer management (Gilgomez et al., 2020).

In the digital age, customer experience management has become a key strategy for e-banking, and customer experience has been clearly emphasized with the aim of achieving customer retention and long-term growth (Suvarchala and Rao, 2018). The digital transformation can help banks reach new customers with new business models. Understanding the customer experience is critical for banks in the digitalization era. This approach improves service quality and customer satisfaction (Indriasari et al., 2019). Customer experience in e-banking services is the sum of all interactions that customers make while fully communicating with staff through information technology components such as telephone banking, ATMs, kiosks, internet banking services, and mobile banking services. The main purpose of customer experience management in banking is to improve the efficiency of customer management and provide an interesting banking experience in customer transactions. Banks are therefore focused on investing in and improving the customer experience as they set themselves apart from other financial institutions in the business sector (Suvarchala and Rao, 2018). By increasing touch points with customers through different digital devices, after receiving, registering, and understanding customer needs, banks can anticipate customer needs over time (Stalmachova et al., 2022; Diener and Špaček, 2021). Therefore, customers will be interested in using digital banking services because banking services powered by information technology are more convenient and affordable. This mutual satisfaction means that the banking industry is finally achieving its goals of increasing profitability and productivity (Diener and Špaček, 2021; Litvishko et al., 2020; Omarini, 2017; Cuesta et al., 2015).

- **Data**

In the digital transformation phase, the ability to capture and analyze big data for decision making is essential, as all digital technology functions rely on digital data (Verhoef et al., 2021). Providing a customer database and analyzing customer data helps uncover valuable information to reach customer insights and evidence-based decisions (Verhoef et al., 2021; Maklan et al., 2017).

Creating value from big data for businesses and customers requires employees with strong digital and analytical skills (Verhoef et al., 2021). Banks need big data teams with analytics, data management, data visualization, and business skills. In addition, an ongoing training program should be in place to update skills as the technology becomes more sophisticated.

- **Digital processes and operational plans**

Digital transformation in organizational processes means changing business models, changing value chains, and creating new products and services, resulting in new and better ways to create value (Parida et al., 2019; Goerzig and Bauernhansl, 2018; Parviainen et al., 2017). The digitalization of processes improves the ability of organizations to control and monitor activities and employees (Kretschmer and Khashabi, 2020) as digitalization makes processes a huge data generator (Sestino et al., 2020). Through this generated data, it is possible to measure processes and know how close an organization is to meeting its goals and objectives and how well it aligns with strategic priorities (Wang et al., 2016).

Banks must be able to use digital technology judiciously in all processes and services to transform their business models into digital business models (Diener and Špaček, 2021; Litvishko et al., 2020; Omarini, 2017). Simplification and elimination of long and useless processes and the modernization and digitalization of the main processes helps the banks to achieve their goals. One of the most important aspects of a bank's digital transformation is the significant reduction in operating costs. Automated programs and processes eliminate unnecessary work and effort, reduce the chance of error, and deliver efficient results (Rashidovich, 2022).

- **Digital goals and strategies**

Digital goals and strategies are the foundation of every company and one of the important dimensions of digital transformation, the formulation and implementation of which has become a concern for many managers of organizations due to the transformative effect of digital technologies. Digital strategy helps to successfully allocate efforts and resources to achieve the best business goals (Chanias et al., 2019; Maynard, 2019).

A bank's digital transformation requires an approach to develop and apply a digital strategy. As digital transformation encompasses all aspects of financial activities, such as bank governance mechanisms the banking industry digital transformation must be aligned with other development strategies to create solutions that lead to the efficiency (Galazova and Magomaeva, 2019). By formulating and implementing digital strategies, banks support their digitalization and globalization and bring the organization closer to its digital goals. Adopting strategies towards digital models as well as customer-centric strategies, which is the main goal of the banking industry, can help achieve banking goals (Naimi-Sadigh et al., 2021).

- **Organizing**

Organizing in a digital organization means the existence of ownership and coordination between the organization's components and its digital parts. This includes coordinating all leadership and management functions, human resources, digital strategy and technology, and customer relations functions (Ross et al., 2019). By making the appropriate decisions, banks can align their various departments to achieve their goals.

Selecting leaders and managers familiar with digital transformation and well-equipped to lead the organization during this period, discovering required digital knowledge and skills, and hiring talent in this area and providing ongoing training to improve skills (Marks and Al-Ali, 2022; Stark, 2020) can help the banks to lead in digital era. Banks can integrate horizontal and vertical value chains through coordination. In horizontal value chain integration, banks grow and capture value by purchasing similar assets from competitors. By integrating vertical value chains, banks control and own parts of this industry and capture value for themselves.

- **Digital goods and services**

Digital goods and services means using digital transformation technology to transform traditional goods and services in innovative ways to make them more attractive to current and new consumers (Writer, 2021). The delivery of digital products and services requires the appropriate prototypes and models (Nunes et al., 2022; Westerman et al., 2014).

Automated Teller Machines (ATMs), Smart Cards, Electronic Funds Transfers (EFT), Telephone Banking, POS Systems, Computerized Credit Ratings are among the digital products use by banks (Ilo et al., 2014). By optimizing products and services, banks can create compelling value propositions for their customers. In banking, evaluation of provided digital products and services performance is an important step and help banking to provide appropriate service to customers.

- **Network, infrastructure and digital technologies**

Organisational networks connect computers and related devices across departments to coordinate disparate users together through digital means to meet shared needs. In a digital environment, companies must take a network-centric view and create value across a range of digitally connected businesses (Verhoef et al., 2021; Ayegba and Lin, 2020). Businesses need digital assets such as data storage, telecommunications infrastructure, and accompanying technologies to remain competitive in the digital age (Verhoef et al., 2021). In addition, without digital infrastructure, it is difficult to improve bank efficiency and performance (Rashidovic, 2022).

With the emergence of new social channels, new portals, and mobile banking applications, banks and financial institutions must digitize to embrace and capitalize on these opportunities (Niemand et al., 2021; Rizvi et al., 2018). The use of technologies such as cloud computing that people anywhere, just by having banking systems, can benefit from the organization's information technology-based services, in addition to saving time and reducing organizational costs, leads to Improving data security

and protection. Furthermore, the use of intelligent automation systems with artificial intelligence, which changed the work processes of employees, shortened the time of banking processes and increased the speed, has greatly increased the productivity of the banking industry (Diener and Špaček, 2021; Litvishko et al., 2020; Omarini, 2017; Cuesta et al., 2015).

- **Capital planning and portfolio management**

The digital transformation has made investment more affordable. Companies today are investing heavily in developing and acquiring digital technologies that enable machine learning, AI, robotics, and IoT (Verhoef et al., 2021). Before investing in digital transformation, digital organizations must determine their vision and properly assess the time, costs, and issues along the organizational path (Majbour, 2021). Enterprise architecture, capital planning, and IT portfolio management enable organizations to manage the delivery of IT solutions that effectively meet business needs (Hayes, 2021).

Digital transformation is the way the banking industry evolves from traditional to digital and modern. For this reason, investments in this direction, including investments in infrastructure and digital technologies, will help the industry reach its specific goals faster (Diener and Špaček, 2021; Litvishko et al., 2020; Omarini, 2017; Cuesta et al., 2015).

- **Configuration management**

Configuration management is part of the change management process. It enables application developers and project managers to identify problems, manage changes, and follow the progress of software projects (Hass, 2003). The configuration management team works with engineers and specialists to identify, record, and manage the physical and functional characteristics of assets, software, and related documentation, including connections between system components. Configuration management ensures that only compatible software versions are installed on systems (Wu et al., 2019).

In the digital era banks are trying to address configuration management challenges that arise in supporting a customer base with a wide variety of device types. Supporting a user base running services on different devices may require more frequent configuration changes to address issues caused by the different operating systems. A good service desk strategy can help banks' IT team meet these challenges.

6. CONCLUSION

Banks are taking action to realize and further develop their strategies and objectives by adopting digital strategies and benefiting from technology. However, there is no general framework that banks can use to successfully complete their digital transformation. The innovation of this study is therefore to fill this gap and provide the industry with a framework for digital transformation. This paper adds to the body of literature in the field of digital transformation of banking by developing a comprehensive framework to support banks' digital transformation efforts. The study can make several contributions. First, it provides a more nuanced and detailed view of the elements of banking required to manage the digital transformation process. Second, it provides Iranian banking sector managers and decision makers with clear guidance on how to prioritize the development of necessary organizational skills and promote organizational knowledge in a dynamic and competitive environment.

Among studied components, security and customer management have the highest priority. Therefore, banks' advanced digital services require the development of secure, reliable and more comprehensive technology solutions. Banks are expected to regularly maintain and update security measures such as virus control, password protection, intrusion detection, and technical system updates in accordance with federal regulations.

In addition, customer experience should always be verified, management should have sufficient knowledge of the impact of effective factors, and banks and service providers should ensure that customer experience using e-banking services should be monitored continuously. Improve the level of experience and use strategies to establish and enhance effective measures in service delivery, customer experience management.

It should be noted that digital banking is a technology-enabled approach to transforming the entire bank, and not just transforming banking products and services into digital ones. The necessity of banking digitalization, in addition to the transformation of products and services on the customer side, is to make changes in the bank's organizational architecture. However, banks are often hampered by strict security measures, laws and frameworks designed to protect customer data and privacy. At the same time, new native digital banking solutions and payment programs are outperforming traditional banks in terms of growth and customer acquisition. Adapting policies to meet changing consumer needs, adapting quickly to new technologies, and responding to market changes are key to the digital transformation of the banking industry. The framework presented in this study for digital transformation in the banking industry and designing a digital roadmap will help banks achieve their ultimate goals, and by fully identifying the current situation and designing a path to achieve the desired situation thrive in the current landscape and move forward regardless of size.

Providing a framework for digital transformation in the banking sector and designing a digital roadmap can help organizations, regardless of their size, achieve their ultimate goals and give them the opportunity to grow and progress in the current situation. The digital transformation framework proposed in this study will help banks assess their current state, identify areas for improvement and chart a path forward. It also allows you to be more efficient and better serve your customers.

Although different frameworks have been developed for digital transformation many leaders still face difficulties in setting and implementing the digital agenda due to their unfamiliarity with the topics, processes and structures (Bumann and Peter, 2019). The development of digital transformation in the banking sector requires the efforts of each bank and the support of the government. Based on this, banks need to focus on developing and training appropriate personnel in social media communication and information management, updating information technology systems, developing network security management plans, and classifying customers for better management.

The proper establishment of digital banking projects in the country requires coordination of the various institutions involved in this major development. Every organization has its own database and the authentication method as well as approaches and policies in different organizations are different from each other and each of these organizations acts based on its own procedure and approach; therefore, coordination and considering a The same procedure is important in this regard. Providing sufficient resources and budget is also necessary for the proper and timely establishment of digital banking in the banking system of Iran by the responsible institutions.

Considering the role of environmental changes around banks, such as changes in the state of competition, changes in technological innovations, changes in customer preferences, changes in the investment process, etc., which can affect the progress of the country's banking system and affect the business environment of banks, it is suggested that banking managers make appropriate decisions regarding these changes and provide the conditions for adapting to these changes. It is also necessary for banking managers to constantly consider the impact of environmental factors on the movement in the technological and digital space in the banking field and act accordingly. In addition, banks should think about the cultural and spiritual challenges employees may face and offer solutions in this area.

6.1 Limitations and Recommendations

The study used existing frameworks to identify the effective factors on the digital transformation of banking sector and providing a local framework for Iranian banks. However, the proposed framework was not implemented by banks. Therefore, it is suggested that future studies use an action research method to check the implementation of the proposed framework in the banking sector and to improve it according to the research experiences obtained from this method.

Additionally, the criteria for evaluating digital transformation in the banking industry were not explored in this study and a maturity model can better guide bank managers in the long road of digital transformation, which is a recommendation for future studies.

REFERENCES

- Ahmad, N., and Shamsudin, Z. M. (2013). "Systematic approach to successful implementation of ITIL." *Procedia computer science*, 17, 237-244.
- Alfaraj, H. M., and Qin, S. (2011). "Operationalising CMMI: integrating CMMI and COBIT perspective." *Journal of Engineering, Design and Technology*. 9 (3). 323-335.
- Ayegba, J. O., and Lin, Z. L. (2020). "An overview on enterprise networks and company performance." *International Entrepreneurship Review*, 6(2), 7-16.
- Ayre, C., and Scally, A. J. (2014). "Critical values for Lawshe's content validity ratio: revisiting the original methods of calculation." *Measurement and evaluation in counseling and development*, 47(1), 79-86.
- Bughin, J., Kretschmer, T., and van Zeebroeck, N. (2021). "Digital technology adoption drives strategic renewal for successful digital transformation." *IEEE Engineering Management Review*, 49(3), 103-108.
- Bumann, J., and Peter, M. (2019). "Action fields of digital transformation—a review and comparative analysis of digital transformation maturity models and frameworks." *Digitalisierung und andere Innovationsformen im Management*, 2, 13-40.
- Cavallare, M. R. (2020). *Information Systems Security Governance Evaluation in the Portuguese Local Public Administration* (Doctoral dissertation, Universidade do Minho (Portugal)).
- Cheng, S., Fan, Q., and Huang, M. (2023). "Strategic Orientation, Dynamic Capabilities, and Digital Transformation of Commercial Banks: A Fuzzy-Set QCA Approach." *Sustainability*, 15(3), 1915-1924.
- Chiguvi, D. (2023). "Analysis of the effectiveness of e-customer service platforms on customer satisfaction at ABSA, Botswana." *International Journal of Research in Business and Social Science* (2147-4478), 12(1), 57-71.
- Стоянова, О., Лёзина, Т., and Иванова, В. (2020). "The framework for assessing company's digital transformation readiness." *Вестник Санкт-Петербургского университета. Экономика*, 36(2), 243-265.
- Cuesta, C., Ruesta, M., Tuesta, D., and Urbiola, P. (2015). "The digital transformation of the banking industry." *BBVA research*, 1, 1-10.
- Diener, F., and Špaček, M. (2021). "Digital transformation in banking: A managerial perspective on barriers to change." *Sustainability*, 13(4), 2032-2058.
- Dumitriu, D., and Popescu, M. A. M. (2020). "Enterprise architecture framework design in IT management." *Procedia Manufacturing*, 46, 932-940.
- El Hilali, W., and El Manouar, A. (2019, March). "Towards a sustainable world through a SMART digital transformation." In *Proceedings of the 2nd International Conference on Networking, Information Systems and Security* (pp. 1-8).
- Flavin, S., and Heller, J. (2019). "A technology blueprint for personalization at scale." *McKinsey and Company*.
- Galazova, S. S., and Magomaeva, L. R. (2019). "The transformation of traditional banking activity in digital." *International Journal of Economics and Business Administration*. VII (2), 41-51.
- Giatsidis, I., Kitsios, F., and Kamariotou, M. (2019, May). "Digital transformation and user acceptance of information technology in the banking industry." In *Proceedings of the 8th International Symposium and 30th National Conference on Operational Research, Patras, Greece* (pp. 6-10).
- Gil-Gomez, H., Guerola-Navarro, V., Oltra-Badenes, R., and Lozano-Quilis, J. A. (2020). "Customer relationship management: digital transformation and sustainable business model innovation." *Economic research-Ekonomska istraživanja*, 33(1), 2733-2750.
- Gimpel, H., Hosseini, S., Huber, R., Probst, L., Röglinger, M., and Faisst, U. (2018). "Structuring digital transformation: a framework of action fields and its application at ZEISS." *Journal of Information Technology Theory and Application (JITTA)*, 19(1), 31-54.

- Goerzig, D., and Bauernhansl, T. (2018). "Enterprise architectures for the digital transformation in small and medium-sized enterprises." *Procedia Cirp*, 67, 540-545.
- Gray, J., and Rumpe, B. (2017). "Models for the digital transformation." *Software and Systems Modeling*, 16, 307-308.
- Hanna, N. K. (2016). "Mastering digital transformation." *Mastering Digital Transformation (Innovation, Technology, and Education for Growth)*. Bingley, UK: Emerald Publishing, pp. i-xxvi.
- Hass, A. M. J. (2003). "Configuration management principles and practice." Addison-Wesley Professional.
- Henriette, E. (2016). "Digital Transformation Challenges." *AIS Electronic Library*.
- Hess, T., Benlian, A., Matt, C., and Wiesböck, F. (2016). "How German media companies defined their digital transformation strategies." *MIS Quarterly Executive*, 15(2), 103-119.
- Ilo, J. V., Wilson, A., and Nnanyelugo, S. (2014, December). "Impact of technological innovation on delivery of banking services in Nigeria." In *14th international conference on economics, education and humanities, Indonesia* (pp. 162-168).
- Indriasari, E., Gaol, F. L., and Matsuo, T. (2019, July). "Digital banking transformation: Application of artificial intelligence and big data analytics for leveraging customer experience in the Indonesia banking sector." In *2019 8th International Congress on Advanced Applied Informatics (IIAI-AAI)* (pp. 863-868). IEEE.
- Jafari-Sadeghi, V., Mahdiraji, H. A., Alam, G. M., and Mazzoleni, A. (2023). "Entrepreneurs as strategic transformation managers: Exploring micro-foundations of digital transformation in small and medium internationalisers." *Journal of Business Research*, 154, 113287- 113292.
- Johnson, B., and Zondervan, W. (2018). *IT for Business (IT4B): From Genesis to Revolution, a business and IT approach to digital transformation*. IT Publishing Governance Ltd.
- Johri, A., and Kumar, S. (2023). "Exploring Customer Awareness towards Their Cyber Security in the Kingdom of Saudi Arabia: A Study in the Era of Banking Digital Transformation." *Human Behavior and Emerging Technologies*, 2023, 1-10.
- Kitsios, F., Giatsidis, I., and Kamariotou, M. (2021). "Digital transformation and strategy in the banking sector: Evaluating the acceptance rate of e-services." *Journal of Open Innovation: Technology, Market, and Complexity*, 7(3), 204-218.
- Korachi, Z., and Bounabat, B. (2019). "Integrated methodological framework for digital transformation strategy building (IMFDS)." *International Journal of Advanced Computer Science and Applications*, 10(12). 242-251.
- Koryzis, D., Dalas, A., Spiliotopoulos, D., and Fitsilis, F. (2021). "Paritech: Transformation framework for the digital parliament." *Big Data and Cognitive Computing*, 5(1), 15.
- KPMG (2016) Are you ready for digital transformation? Measuring your digital business aptitude. Retrieved on- 08/05/2023 from: <https://assets.kpmg.com/content/dam/kpmg/pdf/2016/04/measuring-digital-business-aptitude.pdf>.
- Kretschmer, T., and Khashabi, P. (2020). "Digital transformation and organization design: An integrated approach." *California Management Review*, 62(4), 86-104.
- Leick, B., Falk, M. T., Eklund, M. A., and Vinogradov, E. (2022). "Individual-contextual determinants of entrepreneurial service provision in the platform-based collaborative economy." *International Journal of Entrepreneurial Behavior and Research*. 28 (4), 853-877
- Liao, M. H., and Wang, C. T. (2021). "Using enterprise architecture to integrate lean manufacturing, digitalization, and sustainability: A lean enterprise case study in the chemical industry." *Sustainability*, 13(9), 4851-4874.
- Litvishko, O., Beketova, K., Akimova, B., Azhmukhamedova, A., and Islyam, G. (2020). "Impact of the digital economy on the banking sector." In *E3S Web of Conferences* (Vol. 159, p. 04033). EDP Sciences.
- Lomakina, O., Kookueva, V., and Makarenko, A. (2021). "Retracted: Redistribution of economic resources in the digital society." *Business and Society Review*, 126(1), 25-35.

- Mahmoodi, A., Khamseh, A., and Hosseini Shakib, M. (2023). "The Model of Innovative Social Banking Based on Digital Transformation in Iran's Banking Industry." *Transformation Management Journal*, 14(28), 121-149.
- Majdalawieh, M., and Khan, S. (2022). "Building an Integrated Digital Transformation System Framework: A Design Science Research, the Case of FedUni." *Sustainability*, 14(10), 6121-6141.
- Maklan, S., Antonetti, P., and Whitty, S. (2017). "A better way to manage customer experience: Lessons from the Royal Bank of Scotland." *California Management Review*, 59(2), 92-115.
- Malar, D. A., Arvidsson, V., and Holmstrom, J. (2019). "Digital transformation in banking: Exploring value co-creation in online banking services in India." *Journal of Global Information Technology Management*, 22(1), 7-24.
- Mangalaraj, G., Singh, A., and Taneja, A. (2014, August). "IT Governance Frameworks and COBIT-A Literature Review." In *AMCIS*.
- Marks, A., and Al-Ali, M. (2022). "Digital transformation in higher education: a framework for maturity assessment." In *COVID-19 Challenges to University Information Technology Governance* (pp. 61-81). Cham: Springer International Publishing.
- Morze, N. V., and Strutynska, O. V. (2021, June). "Digital transformation in society: key aspects for model development." In *Journal of physics: Conference series* (Vol. 1946, No. 1, p. 012021). IOP Publishing.
- Naimi-Sadigh, A., Asgari, T., and Rabiei, M. (2021). "Digital transformation in the value chain disruption of banking services." *Journal of the Knowledge Economy*, 1-31.
- Niemand, T., Rigtering, J. C., Kallmünzer, A., Kraus, S., and Maalaoui, A. (2021). "Digitalization in the financial industry: A contingency approach of entrepreneurial orientation and strategic vision on digitalization." *European Management Journal*, 39(3), 317-326.
- Nunes, M. L., Pereira, A. C., and Alves, A. C. (2017). "Smart products development approaches for Industry 4.0." *Procedia manufacturing*, 13, 1215-1222.
- Omarini, A. (2017). "The digital transformation in banking and the role of FinTechs in the new financial intermediation scenario." *Munich Personal RePEc Archive*. 85228. 1-12.
- Parida, V., Sjödin, D., and Reim, W. (2019). "Reviewing literature on digitalization, business model innovation, and sustainable industry: Past achievements and future promises." *Sustainability*, 11(2), 391.
- Parviainen, P., Tihinen, M., Kääriäinen, J., and Teppola, S. (2017). "Tackling the digitalization challenge: how to benefit from digitalization in practice." *International journal of information systems and project management*, 5(1), 63-77.
- Pourebrahimi, N., Kordnaeij, A., Hosseini, H. K., and Azar, A. (2018). "Developing a digital banking framework in the Iranian Banks: Prerequisites and facilitators." *International Journal of E-Business Research (IJEER)*, 14(4), 65-77.
- Pullin, A. S., and Stewart, G. B. (2006). "Guidelines for systematic review in conservation and environmental management." *Conservation biology*, 20(6), 1647-1656.
- Romanelli, J. P., Silva, L. G., Gonçalves, M. C. P., Naves, R. P., De Almeida, D. R. A., De Resende, A. F., and Rodrigues, R. R. (2021). "Repeatability of the searching process in reviews of restoration outcomes." *Restoration Ecology*, 29(8), e13496-e13509.
- Suvarchala, M. B., and Rao, V. N. (2018). "Customer experience management in banking sector-A brief review." *International Journal of Research-Granthaalayah*, 6(7), 164-178.
- Rashidovich, X. M. (2022). "Ways to Ensure Security In Commercial Banks." *Spectrum Journal of Innovation, Reforms and Development*, 8, 110-113.
- Rizvi, S. K. A., Naqvi, B., and Tanveer, F. (2018). "Is Pakistan ready to embrace Fintech innovation?." *The Lahore Journal of Economics*, 23(2), 151-182.
- Ross, J., Mocker, M., and Beath, C. (2018). "Five building blocks of digital transformation." *CISR research briefing*, 18(6), 1-4.
- Sainger, G. (2018). "Leadership in digital age: A study on the role of leader in this era of digital transformation." *International Journal on Leadership*, 6(1), 1-6.

- Sebastian, I., Ross, J., Beath, C., Mocker, M., Moloney, K., and Fonstad, N. (2017). "How big old companies navigate digital transformation." *MIS quarterly executive*, 16(3), 197-213.
- Sestino, A., Prete, M. I., Piper, L., and Guido, G. (2020). "Internet of Things and Big Data as enablers for business digitalization strategies." *Technovation*, 98, 102173.
- Shahim, A. (2021). "Security of the digital transformation." *Computers and Security*, 108, 102345-102359.
- Stalmachova, K., Chinoracky, R., and Strenitzerova, M. (2022). "Changes in business models caused by digital transformation and the COVID-19 pandemic and possibilities of their measurement—case study." *Sustainability*, 14(1), 127-166.
- Stark, J. (2020). "Digital transformation of industry." Springer International Publishing.
- Stoll, C. R., Izadi, S., Fowler, S., Green, P., Suls, J., and Colditz, G. A. (2019). "The value of a second reviewer for study selection in systematic reviews." *Research Synthesis Methods*, 10(4), 539-545.
- Tsindeliani, I. A., Proshunin, M. M., Sadovskaya, T. D., Popkova, Z. G., Davydova, M. A., and Babayan, O. A. (2022). "Digital transformation of the banking system in the context of sustainable development." *Journal of Money Laundering Control*, 25(1), 165-180.
- Urbaczewski, L., and Mrdalj, S. (2006). "A comparison of enterprise architecture frameworks." *Issues in information systems*, 7(2), 18-23.
- Valero, S., Climent, F., and Esteban, R. (2020). "Future banking scenarios. Evolution of digitalisation in Spanish banking." *Journal of Business Accounting and Finance Perspectives*, 2(2), 13-39.
- VanBoskirk, S., Gill, M., Green, D., Berman, A., Swire, J., and Birrell, R. (2017). "The digital maturity model 5.0." *Forrester Research*.
- Varma, R. R., Umesh, I. M., Nagesh, Y. N., and KS, K. S. (2021). "Digital Transformation in Higher Education Institutions-An Overview." *International Journal of Applied Engineering Research*, 16(4), 278-282.
- Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., and Haenlein, M. (2021). "Digital transformation: A multidisciplinary reflection and research agenda." *Journal of business research*, 122, 889-901.
- Vial, G. (2019). "Understanding digital transformation: A review and a research agenda." *The journal of strategic information systems*, 28(2), 118-144.
- Wang, G., Gunasekaran, A., Ngai, E. W., and Papadopoulos, T. (2016). "Big data analytics in logistics and supply chain management: Certain investigations for research and applications." *International journal of production economics*, 176, 98-110.
- Westerman, G., Bonnet, D., and McAfee, A. (2014). "The nine elements of digital transformation." *MIT Sloan Management Review*, 55(3), 1-6.
- Wu, T., Shi, X., Liao, L., Zhou, C., Zhou, H., and Su, Y. (2019). "A capacity configuration control strategy to alleviate power fluctuation of hybrid energy storage system based on improved particle swarm optimization." *Energies*, 12(4), 642.
- Xie, X., and Wang, S. (2023). "Digital transformation of commercial banks in China: Measurement, progress and impact." *China Economic Quarterly International*, 3(1), 35-45.
- Zapata, M. L., Berrah, L., and Tabourot, L. (2020). "Is a digital transformation framework enough for manufacturing smart products? The case of Small and Medium Enterprises." *Procedia Manufacturing*, 42, 70-75.