

# The role of key factors in the success of Iran's banking digital transformation model, case study: The country's specialized banks

Adel Neyestani<sup>a</sup>, Alireza Derakhshan<sup>b,\*</sup>, Ghanbar Abbaspour Esfadan<sup>c</sup>, Ashraf Shah Mansouri<sup>c</sup>

<sup>a</sup>Department of Management, South Tehran Branch, Islamic Azad University, Tehran, Iran

<sup>b</sup>Department of Information Technology Management, South Tehran Branch, Islamic Azad University, Tehran, Iran

<sup>c</sup>Department of Industrial Management, South Tehran Branch, Islamic Azad University, Tehran, Iran

(Communicated by Asadollah Aghajani)

---

## Abstract

Digital transformation shows that digital technology integration provides opportunities for cost-effective businesses and increases customer satisfaction. Therefore, this has gained importance in the banking industry with the presence of new competitors and the complexity of economic variables and social needs. In the age of information and communication technology, the specialized banks of Iran's senior managers face challenges caused by the deficiency of attitude and necessary attention to the banking processes' digitalization effects and consequences in our country as a process to help create value and banking system transformation for achieving higher performance. Therefore, this article identifies the factors affecting the specialized banks of Iran's digital transformation to enable managers of this competitive industry to improve the customer experience by using emerging technologies. The statistical population included 11 prominent experts and specialists who are familiar with the specialized banks' banking system developments and based on the qualification conditions in the panel of experts, and all were considered as a statistical sample. Also, the fuzzy Delphi technique was used to analyze the collected data and identify and extract factors of digital transformation. First, a list of 124 relevant and frequently adopted digital transformation components, indicators, and dimensions were extracted from the theoretical literature, followed by determining their significance through a questionnaire, and the expert panel opinions. As a result, the number of components was reduced to 43 items. Again, by using the fuzzy Delphi questionnaire, the experts' opinions were collected in two stages and analyzed and reached a final consensus. The results showed that 42 components and 11 related indicators were effective and confirmed in the digital transformation of Iran's specialized banks, and the component "starting B2B and B2C businesses" was not confirmed either. Other results also showed that the "Information Technology Risk Mechanism" and "Investment on startups" components were the most important and the least important dimensions, respectively. Moreover, this is an applied descriptive survey with an exploratory approach.

Keywords: digital transformation, digital banking, specialized banks  
2020 MSC: 93C62

---

\*Corresponding author

Email addresses: [adel.neyestani@yahoo.com](mailto:adel.neyestani@yahoo.com) (Adel Neyestani), [ard1331@gmail.com](mailto:ard1331@gmail.com) (Alireza Derakhshan), [gh\\_abbaspour@azad.ac.ir](mailto:gh_abbaspour@azad.ac.ir) (Ghanbar Abbaspour Esfadan), [shahmansoury92@gmail.com](mailto:shahmansoury92@gmail.com) (Ashraf Shah Mansouri)

## 1 Introduction

With the progress of the fourth industrial revolution, industrial companies and businesses are trying to adapt themselves to the global digitalization process and create real changes in the foundations, procedures, and current approaches. This level of evolution and transformation is known as the digital transformation of the business model [3, 13, 46]. The growth and development of digital technologies hardware and software aspects have created numerous changes and innovations in human life and work [3, 15]. The density of developments and changes in the industry and production sector has been much higher [18] and simultaneously with the introduction of Industry 4.0, the need for digital transformation has become more apparent [17, 49]. Digital transformation has provided new opportunities for the development of new business models for the use of digital technologies and innovation management [30]. On the other hand, the Covid-19 virus pandemic showed the importance of digital business models even more. Currently, many businesses have made digital transformation the main part of their strategies [48].

Today, digital transformation is one of the important topics in the background of organizational transformation, and its realization brings a strategic and competitive advantage for the organization, in addition to technological superiority [39]. Digital transformation is the innovative implementation of new digital technologies to influence the improvement of the organization's business [31]. Digital technology has created such a tremendous transformation in the field of business and economy that failure to keep up with it will mean the complete elimination of the organization. These developments in the financial and economic fields have turned the digital economy and digital banking into one of the most important development and transformation programs [43].

In 1998, the deputy of banking, insurance, and state-owned companies affairs of the Ministry of Economy presented a document under the title of future banking and Digital Transformation, in which, while explaining the advantages of digital banking, he emphasized the need to implement a model to realize this. Accordingly, reaching a framework for the establishment of a new banking model has requirements and prerequisites, the first and most important of which is the recognition and determination of the factors of digital banking components that differentiate it from traditional banking. With this knowledge, along with the fact that the future business model of the banking industry is digital, the task of Iranian banks is to try to identify the infrastructure and mechanisms that help to de-sign and implement this new business model. The lack of research in the field of identifying the necessary dimensions and components for digital banking planning in Iran's specialized and development banks required that the researchers examine the transformative role of using new and technological tools in the transition from the traditional approach to the new banking approaches such as digital banking while studying the existing gaps between the current performance of the traditional banking system and monitoring the strengths and opportunities, weaknesses and threats to the banking business in Iran. Therefore, they identified the necessary dimensions and components and a suitable model for the optimal application of digital-oriented banking in specialized and development banks, taking advantage of the theoretical literature results in digital banking.

Digital banking is no longer a strategic choice to gain an advantage and attract customers, but it is vital to maintain survival and continuity. The changing customers' demands and lifestyles, the need to reduce costs, agility, ease of use, the attractiveness and prevalence of digital services, and the resulting revenue s are among the reasons that make digital transformation an inevitable necessity for banks. Nonetheless, one of the most important reasons for the organizations' failure in creating organizational transformation is the absence of employees' commitment to transformation. Thus, intra-organizational communication is a key tool for increasing job attachment and creating commitment to organizational transformation in employees [40].

Today's challenge for the senior managers of the country's banking system, especially specialized banks, is the deficiency of attention to the effects and consequences of digitalization as a transformative process in achieving higher performance, which requires the members of the board of directors and executive boards of the aforementioned banks to understand the competitive conditions. Despite the international limitations, they have an evolutionary look at this phenomenon as a basic strategy to improve the financial and non-financial situation, and by using new approaches of digital technologies, they can improve the services provided to customers to survive and continue to operate in the new competitive conditions.

According to IBM definition [23], digital banking means the technology used to ensure the integration of processes related to banking operations and transactions [38]. Digital banks do not separate their channel; but, they monitor a collection of digital channels to provide consistent services. Moreover, inclusive and developed services will be provided in the case of integrated human components and digitization. Moreover, the term digital transformation refers to the use of new technologies to make organizations competitive in the Internet era [6]. The effect of digital technologies on financial services is huge and pervasive, and probably the result will be the formation of a very different field of financial services. Traditional players will fundamentally change the structure of their operations. Also, Complex

collaborations between financial services players and other fields will be established. New entrants will emerge, some with very different business models. This changing field will create new challenges for policymakers in times when both the revival of economic growth and financial stability are necessary. New sources of competition, improved innovation, and higher productivity are essential for this economic growth, especially in mature economies [26].

During the last two decades, the world has witnessed amazing changes due to the transformation in information and network technology, which have connected all the people of the planet so that everyone can share their information. Banking has also been affected by the global information revolution and the power of today the social network. Now is the time to think about banking as an electronic structure. At the end of the first decade of the third millennium, we finally reached a point where electronic expansion reached the necessary maturity and efficiency and was approved [42].

The requirements of the Ministry of Economy in Document No. 10982 dated 2019.04.17 under the title "Future banking and digital transformation; policy approach and establishment framework based on the smart economy paradigm" which, while explaining the benefits of digital banking, emphasized the necessity to implement a model to realize a new style of digital banking. Digital banking aims to create a new banking style [32]. But what is distinctive and decisive in digital banking is knowing the customer and his behaviour. Where the customer is the main axis; not the product. When the customer knows that there is a bank, upon entering it, the bank knows him and can offer him certain products based on the operations he has done so far. In most cases, the customer can choose a customized product. With these definitions, it is clear that digital banking is not a product, it is a process, and its purpose is to change people's lifestyles. With this claim, in line with these changes and developments, the presence of an ecosystem to manage the mentioned matters seems necessary.

In addition, considering the rapid changes of new technologies, the role of the country's specialized banks in redefining and replacing the traditional and conventional methods of providing services with new methods relying on new technologies is very important, because not only specialized banking is moving towards a smaller industry, but it is forced to undergo many transformations to meet the needs and expectations of economic activists and customers. This vision, being implemented in our country, requires the transformation of the banking system by the growth of technology to realize and develop a sustainable economy. Therefore, the need to identify the effective factors in the implementation of digital transformation in the banking industry, especially the specialized banks of the country, is considered as a research gap from the researcher's point of view. The leading managers of the country's specialized banking system should help in filling this gap, and thus, this research seeks to find an answer to the main question, "What are the factors affecting the planning of digital transformation for Iran's specialized and developmental banks?"

## 2 Research literature

### 2.1 Theoretical research literature

With the emergence of 4th generation banking, banks must also change their framework and business model to stay competitive in the digital transformation era. The digital banking development importance and necessity can be analyzed from different dimensions. On the one hand, the development of digital banking has been emphasized in the country's macro policies. On the other hand, and from a competitive point of view, digital banking will lead to cost reduction, manpower reduction, improvement of service quality, diversification of services, increase of competitiveness of banks, and other such advantages. In addition, digital banking will lead to a reduction in intra-city travel, an increase in the welfare of customers, a reduction in the risks caused by the transportation of cash, and consequently a reduction in the cost of printing money and an increase in the access of customers to banking services, although the rules governing the market are subject to influence. However, the rules governing the market have changed due to technological changes and changes in customer expectations and behaviour. The need for high capacities in the processing and analysis of customer data has provided the ground for the presence of prominent super companies in this field (Amazon, Google, Facebook, etc.) The needs have caused the presence of smaller competitors such as fintech, payment companies, etc. The presence of both groups of competitors has and will rule a new atmosphere in the market, which will necessitate new approaches to confront and manage them [35].

Buvat and KVG [10] show that the role of digitalization in improving the key indicators of banking performance cannot be overlooked. Furthermore, digitalization of the country's banking industry is essential for the undeniable effects of new technologies, including the web space development, broadband, and high-speed internet, the influence of social networks and smartphones in the country, and the emergence of a generation of customers with new needs and demands, who are more willing and eager to do bankings on new technological platforms.

DeLaCastro et al. [14] compared the digital readiness of 27 countries based on banking capabilities, market dynamics, customer readiness, and legal factors. The most developed regions, include Britain, Singapore, Denmark, Sweden, the Netherlands, the United States, and Australia. These areas have adopted forward-thinking and creating a suitable environment, using advanced technologies and having an advanced banking perspective for digital banking. The Netherlands, Australia, and Singapore have developed appropriate banking capabilities, including advanced digital offerings, strong financial positions, and digital structures.

Boulton [8] states that many researchers believe that the term digital transformation can be replaced by the term technology. Digital transformation involves technology, but it also involves integrating emerging digital capabilities that impact all areas of business. Digitalization is not something that is bought and attached to the organization. This issue is multi-layered and diffuse and does not just involve technology. Digital transformation is an ongoing process of changing the way business is done. This requires basic investments in skills, projects, infrastructure, and often in reforming IT systems. This requires bringing people, machines, and business processes together, with all the chaos that entails [8, 20].

Capgemini and the MIT Digital Business Center have put the challenges of digital transformation into three categories: initial, executive, and governance. In the initial challenges, they point to the lack of motivation, regulations, and the uncertain business situation, in the implementation challenges, they point to the lack of skills, cultural problems, and problems in information technology, and in the governance challenges, they point to the increase in vision and coordination issues. They stated the importance of executive challenges; although it is important to have motivation in the organization's top managers for the implementation of digital transformation, it is not enough, and they emphasize that the three factors stated in this section are threats that hinder the successful progress of organizations. Also, the lack of skills is considered the key challenge in this part. Ultimately, managers and employees must navigate the digital frontier together, and this requires a new set of leadership skills. Success in the digital age is not in the efficiency of the technology, but in the agility and adaptability of the people who operate it [7].

Brunetti et al. (2020) also identified the challenges of digital transformation in research. Their findings showed that the challenges were placed in three categories culture and skills (including the three strategic areas of digital education, talents, and digital culture), infrastructure and technologies (including the areas of need for information, interaction, and artificial intelligence), and ecosystem [9].

According to PWC's report on the evolution of the banking industry, it is expected that the digital footprint of banks will increase along with the decrease in the size of branches and the increase in the presence of banks in social media. According to this report, banks are gradually focusing on designing new products and service delivery channels for customers and their needs to provide them with an integrated experience in all digital channels. Also, social media will become the main platform for informing and communicating with customers as well as identifying their needs. Strengthening the bank's digital tracking increases its credibility in the digital environment, which, in addition to influencing the opinion of customers and improving their experience of the bank's services, can play an important role in encouraging potential customers to use the bank's products and services [36].

This article adopts Westerman (2011) and Capgemini (2017) model as the basic model [12, 50]. Table 1 depicts the model.

Table 1: Digital transformation components [12, 50]

Business model	Operational process	Customer experience
Modified digital business	Digitalization process	Customer understanding
Product/service increase	Improve performance	Analysis-based segmentation
Physical to digital transfer	New characteristics	Knowledge of social studies
Digital packages		
New digital business	Empowering employees	Growth of raw digital digits
Digital products	Working anywhere and anytime	Higher digital sales
Changing the organizational boundaries	Wider and faster communication	Proactive marketing
	Sharing the collective knowledge	Effective customer processes
Digital globalization	Digital globalization	Customer contact points
Organizational integration	Organizational integration	Customer services
Redistribution of decision power	Redistribution of decision power	Cross-channel coherence
Joint digital services	Joint digital services	Self service
Integration of IT and business	Digital capabilities	Data and uniform processes transformability

## 2.2 Applied research literature

In senior digital management, in research to investigate the competencies needed by senior managers (as the most basic governance mechanism of digital transformation), a two-stage strategy was used to explain the competency model. Their results showed that personal characteristics and professional skills are the places of consensus for the job position of the majority of senior managers, but the point of distinguishing the competencies of the senior digital manager is at the level of technical knowledge and his extensive knowledge of digital technologies. Chief Digital Officers need a wide range of technical and business knowledge to be competent to govern the organization's digital transformation. Various pieces of research have been conducted in the field of digital transformation leadership [21].

Accordingly, Moradi and Kashmiri [33] investigated the readiness to lead the digital transformation in the schools of Zarandiye City, and their results showed that the indicators of digital vision development, digital literacy, adaptability, and fast learning are the main factors for leading the digital transformation. Based on the results, they suggested that to succeed in digital transformation leadership, it is better to consider strategy, culture, innovation, and employee skills as links along with technology.

Shahabi and Adel Azar [41] addressed the issue of modelling the impact of the Covid-19 virus pandemic on the adoption and development of digital banking. This paper examined the impact of the spread of the pandemic as an interfering element in the adoption of digital banking. By studying the theoretical foundations and interviewing experts, the factors affecting the acceptance and development of digital banking in Iran were identified, and by identifying the effects of the COVID-19 virus pandemic on the acceptance of offline services, the research model was simulated using systems dynamics. The simulation results showed that with the implementation of the policy of reducing the number of branches, the bank's incentive policies and increasing the bank's budget in the information technology sector, the acceptance and use of digital technologies by customers will increase, and the Covid-19 virus pandemic through increasing the acceptance rate, acts as a positive factor in the adoption and development of digital banking.

Tajerlo et al. [45] conducted research for "Designing a new product development framework with a digital banking approach in Mellat Bank". The paper followed the field descriptive, qualitative, and applied methods. The initial model was identified in the form of 6 factors for the development of a new product with a digital banking approach, including driving factors (internal and external causes), new digital product development (planning, development, and evaluation of new products), strategies (market penetration, diversification, market development, new product development), consequences (customer, organizational, market and economic) and two intervening factors (environmental, managerial and organizational) and context (cultural, political, legal, process barriers, organizational characteristics, and environmental context). Using the development of the new product model and the presented approach of digital banking, it is possible to present the new product according to the customer's needs. Also, the feasibility and evaluation of the target market, if it is scientifically investigated, can bring the success of new product development, customer satisfaction and productivity, and competitive advantage to the bank.

Soltani and Tahmasabi Aghblaghi with research titled "Explaining the Role of Tejarat Bank's Strategic Partnership with Fintech in Efficiency by Mediating Technological Developments and Digital Banking" using the Correlation Method to Explain the role of Tejarat Banks strategic partnership with fintech in efficiency with the mediation of technological developments and digital banking. The findings confirmed the role of the strategic partnership of Tejarat Bank with fintech, digital technological developments, digital banking, and the role of digital technology developments and digital banking on efficiency. On the other hand, the indirect role of mediating variables of digital technological developments and digital banking between Tejarat Bank's strategic partnership with fintech and efficiency was confirmed [44].

Also, in this context, Nouri et al. designed the conceptual framework of digital transformation leadership in Iranian organizations. Their results indicate the categories of digital transformation leadership, including digital roadmap (including the concepts of digital vision, digital strategy, and digital transition plan), digital governance (including the concepts of planning and coordination and monitoring and control), digital organization (including the concepts of digital leaders, organizational structure, digital partners, digital culture and digital work environment) and digital resources (including the concepts of digital infrastructure, digital talent, and digital investment) [34].

In research entitled "Evaluation of the quality of electronic banking services using the combination of fuzzy Delphi hierarchical process and fuzzy TOPSIS methods of Post Bank branches in Tehran", Qeshlaghi stated that nowadays with the competitiveness of the banking industry and the development of services based on information technology in banks, the evaluation of the quality Electronic banking services have become a basic need. Therefore, the need for new methods to evaluate the quality of such services in banks also increases with the increasing development of electronic banking services [37].



Ehsan Karimi et al. in their joint research on the topic of designing a framework to improve the customer's digital experience in internet banking with a focus on customer contact points pointed out how to improve the customer's digital experience in online banking and at customer touch points. Their findings showed that customer contact points are known as the building blocks of customer experience, and to design and improve customer experience, these points should be well identified and analyzed to create an attractive experience for customers. They pointed out that in recent years, digital transformation has also increased the complexity of controlling and managing customer journeys [25].

Zamani [51] research entitled "The relationship between the dimensions of electronic banking, customer experience, and financial performance through the mediating role of customer satisfaction and loyalty in Mellat Bank branches in Gilan Province", states that the trend of using electronic banking services for its unique features and the presence of the bank to transfer financial resources has made banking an inseparable part of electronic commerce with a fundamental role in its implementation. On the other hand, the conducted research shows that customer experience has an effect on customer retention and as a result on the profitability and success of organizations in competition. Factors affecting customer experience in the model of this research include customer perceived value, customer convenience, bank performance quality, bank internet service quality, trust, perceived usability, innovation, customer satisfaction, customer loyalty, risk and privacy, employee accountability, and bank financial performance.

Asadamerji et al. presented a digital transformation model using the meta-combination method in pharmaceutical companies, and their results showed that the maturity model of digital transformation capability has 10 dimensions, including leadership, information technology, employees, digital operations and processes, digital culture, organizational structure, innovation and changes, digital strategy, smart products and services, and customers [4].

Sami Bashir [5] examined digital banking and pointed out the benefits of digital customer communication systems, and concluded that this will greatly affect customers in the banking sector. With easier access to information online, customers are more demanding, so they can easily switch banks if their demands are not met.

Ahmed et al. investigated the factors affecting the organization's digital transformation and organization decision-making during the Covid-19 pandemic, and their results showed that senior management support and technology infrastructure readiness positively affects digital transformation and performance. As a result, data breach threats harm the organization's digital transformation adoption [2]. Accordingly, Martínez-Caro et al. [29] investigated the impact of digital transformation on company performance with the mediating role of digital organizational culture. Their findings showed that culture is a very effective prerequisite for digital transformation success. Digital transformation through digital organization culture positively and significantly affects company performance. Brunetti et al. [9] also identified the challenges of digital transformation. Their findings showed that the challenges we replaced in three categories of culture and skills (including the three strategic areas of digital education, talents, and digital culture), infrastructure and technologies (including the areas of need for information, interaction, and artificial intelligence), and ecosystem.

The research about the digital entrepreneur ecosystem entitled "Digital Entrepreneurship Ecosystem: The Impact of Digital Technologies and Collective Intelligence in Reshaping the Entrepreneurial Process" by Elia et al. [16] based on literature and highlighting the views of integration output and digital environment define digital entrepreneurship ecosystem. In this article, four dimensions related to digital agents (who), digital activities (what), digital motivations (why), and digital organization (how) are defined and discussed. This framework aims to provide a description of 9 companies and their digital initiatives as digital entrepreneurial ecosystems and analyzed in four main dimensions. Also, Buvat et al. have generally had a wide network of branches, and then ATMs, call centers, internet, and mobile phones have been added to their service delivery channels. Each channel was an additional layer based on the branch distribution network. Mobile, social networks, data analysis, and cloud computing have changed the economy and changed the way of using information, interacting with others, and shopping [11].

TorresVila [47] in a research entitled "Factors determining the quality of relationships and outputs in digital banking services: The role of customer experience" states that promoting high-quality relationships with customers is of great importance in the banking sector. The research conducted by Code Halo Group considered the technologies required for the implementation of digital banking in seven strategic axes, including infrastructure, data and data analysis, content, business process, social networks, mobile phones, and experience [14].

A.T. Kearney Institute by Jaubert announced in a report on the investigation of banks in the Digital era that nowadays customers do not use only the branch channel to make decisions and they like to benefit from the opinions of other people who are in contact with them through social networks. For this reason, banks use various digital methods such as video consultations, social networks, peer-to-peer consultations, and access to professional research tools to attract and satisfy customers. Regarding the percentage of success factors in digitalization, A.T. Kearney Consulting

Services Institute has considered seven factors to be effective: focus on customer experience, long-term vision, and short-term execution, digital teams, digital culture, open innovation ecosystem, agile information technology platform, and branches network revision. Six of the mentioned factors, except for digital culture, explain the three dimensions of customer orientation, innovativeness, and flexibility of the organization [24].

Table 2 presents the main factors and secondary factors in the literatures relevant to the field of digital transformation.

Table 2: Main factors and secondary factors obtained from library studies

Main factors	Secondary factors
Digital governance	Drawing the perspectives and position of digital transformation
	Managing and controlling the operation of digital transformation program
	Development plan of banking digital governance
	Comprehensive support for digital transformation plan
Digital business	Open banking business development plan
	Investing in startups
	The bank's data-driven business development plan
	Establishment of business analysis system in the development of digital bank services and products
Ecosystem	Providing integrated services in the comprehensive or omnichannel
	Setting up B2B and B2C businesses
	Identification and analysis of actors and stakeholders
	Designing and developing a portfolio of new financial products and services with the cooperation of start-ups
Digital processes	Interactive development and personalization of digital bank products and services
	Redesigning processes, structure in order to create a digital organization
	Implementation and installation of integrated BPM business process management system
Integrated infrastructure	Establishment of information technology governance system based on Cobit framework
	Establishment of information technology service management system based on ITIL framework
	Integrated and biometric authentication
	Using the emerging technology of cloud computing, artificial intelligence, Internet of Things, blockchain, social networks
Data management and big data analysis	Creating information systems and management dashboard
	Advanced data analysis and preparation of comprehensive customer profiles
	Designing and personalizing banking services based on customer needs
Customer experience	The possibility of consulting customers for different investments, types of savings through artificial intelligence and analytical software
	Simplicity and ease of access to services
	Providing banking services 24 * 7
	Appropriate user interface and digital channels for interactions with customers
Digital employees	Establishment of the knowledge and experience management system of employees and customers
	Special trainings for creativity and digital innovation for employees, especially managers
	Holding public educational seminars in the field of new digital technologies and the evolution of digital banking.
	Encouraging entrepreneurs to create digital products and services
Digital culture	Training business analysis skills for employees
	Drafting of regulations for the protection of personal data and privacy of customers
	The importance of commitment to digital culture by the heads of the organization
	Drafting of program analysis and recruitment of digital talents with a focus on multidisciplinary and analytical skills.
Information technology risk management	Digital banking professional development plan in the main areas of business
	The plan of the replacement system of digital talents in the main areas of the bank's business
	Information technology risk mechanism
	Implementation of information security management system
Rules and requirements	Help in customer risk management through analytical software and artificial intelligence
	Payment system rules based on PSD2 requirement
	Compliance with the requirements of the central bank
	The existence of comprehensive instructions regarding the use of digital banking
	Compliance with anti-money laundering laws

### 3 Research methodology

This is an exploratory approach applied-descriptive survey. At first, this research examined and identified 11 indicators and 43 components of digital transformation factors by reviewing the theoretical literature, then a questionnaire was designed that included the topic of the research, the purpose of the research, the duration, and the approximate number of rounds of the research. Then the questionnaire was distributed among 15 identified experts and they were asked to express their consent to participate in the panel. In total, 11 experts showed their consent to participate in this research. Table 3 shows the participants' information. The experts included specialists in this field (experts, university professors, and banks' information technology managers). This panel has more than 20 years of service experience, considering the number of 11 of them, the entire sample size was considered.

Table 3: Panel of experts and their expertise

Expert type of activity	No.	Degree	Experience (yrs)
Member of the academic faculty of the university	2	Ph.D.	25
The board of directors of banks	2	Ph.D.	23
The board of directors of IT companies	3	Master Degree	20
Information technology managers of banks	4	Ph.D.	22

#### 3.1 Data analysis method

Analysis as a process of scientific method is one of the foundations of every research. In general, analysis is a method through which the entire research process is directed toward a result. The researcher uses different methods of analysis to answer the formulated problem [1]. This research considered digital transformation and digital banking model important indicators, and for this purpose, the de-phased value of the indicators along with the average of the questionnaire spectrum (as a threshold indicator) was used to identify the important indicators. In other words, indicators with a de-phased value greater than or equal to the average of the spectrum of the questionnaire (threshold indicator) are known as important and effective, and indicators with a de-phased value less than the average value of the spectrum are known as less effective or less important. The purpose of the research is only to identify the important and effective indicators, for this reason, the less-important indicators were eliminated from the research. Also, regarding the consensus condition of the experts, to address the level of consensus or agreement based on the opinions of the research team, if 40% of the respondents give the same answer to one of the answer options for each indicator, the consensus has been reached on that indicator. Also, the fuzzy Delphi method was used to select the factors, determine their importance relative to each other, and screen them. For this purpose, a questionnaire was designed in which each question represents a factor. The questionnaires were distributed among experts to answer, and all the questionnaires were fully completed and collected. These questionnaires were reorganized based on a seven-point Likert scale from completely unimportant to completely important. In the first stage survey, the main and secondary factors were sent to the members of the expert group with descriptions and explanations to obtain their level of agreement with each factor. The obtained absolute average indicates the intensity of experts' agreement with each of the considered factors.

##### 3.1.1 Fuzzy Delphi steps

Figure 1 shows the steps of fuzzy Delphi

##### 3.1.2 Algorithm for implementing fuzzy Delphi technique for screening

The algorithm for implementing the fuzzy Delphi technique in this research includes the following steps:

1. Converting the qualitative expressions of each of the options into fuzzy numbers The use of ordinal scales to interpret linguistic variables has been criticized by some researchers. The researchers' main justification for this claim is that the linguistic variables used in rating scales are not interpreted in the same way by the respondents. In other words, it cannot be assumed that the respondents consider the distance between both pairs in a ranking spectrum to be the same. For example, in a rating scale, answer 1 (very little) is less than answer 2 (little), but it is not clear how much less it is [22].

Rating scale and Likert scale were used to get respondents' opinions. Since the answer range of each question was a seven-point scale [27], using the presented model, the triangular membership function was defined in the range of zero to one as described in Table 4.



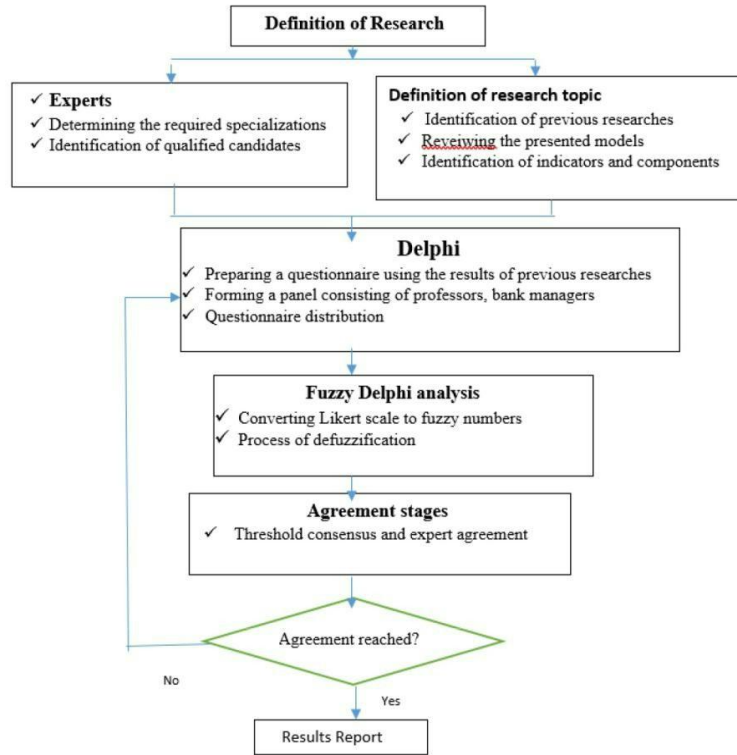


Figure 1: Fuzzy Delphi steps

Table 4: 7 degree Likert scale to express importance

Extremely important	Important	Slightly important	Neutral	Slightly not important	Not important	Not important at all
7	6	5	4	3	2	1

2. Fuzzifying the numbers

In the algorithm for implementing the fuzzy Delphi technique for screening, a suitable fuzzy spectrum should be developed to fuzzify the verbal expressions of the respondents. For this purpose, it is possible to use fuzzy spectrum development methods or to use common fuzzy spectrums for this purpose. For example, the triangular fuzzy spectrum for the seven-point Likert scale in expressing the importance of indicators is as follows:

Table 5: Triangular fuzzy numbers equivalent to 7-degree Likert spectrum

Extremely important	Important	Slightly important	Neutral	Slightly not important	Not important	Not important at all
(0.9,1,1)	(0.75,0.9,1)	(0.5,0.75,0.9)	(0.3,0.5,0.75)	(0.1,0.3,0.5)	(0,0.1,0.3)	(0,0,0.1)

After choosing or developing a suitable fuzzy spectrum, the experts’ opinions are collected and recorded in fuzzy form. In the second step, we should aggregate the experts’ opinions. Several methods have been proposed for the experts’ opinions fuzzy aggregation. If the view of each expert is represented as a triangular fuzzy number (l, m, u), one of the conventional methods to collect the point of view of n experts, from the minimum l for the low limit, from the geometric mean m for the middle limit and finally from the maximum u for the upper limit is considered.

$$F_{AGR} = \min\{l\}, m, \max\{u\} \tag{3.1}$$

After collecting the experts’ opinions, the average score of their opinions about each dimension is calculated. According to the theoretical framework, if there is no agreement, the calculated average is given to the experts as a controlled feedback along with the questionnaire.

After going through different rounds, when consensus is reached, items are screened based on the average of the final round, the average below 4 is the basis for eliminating factors for the seven-point scale spectrum.

3. Determination of criteria and level of consensus among experts

Another problem with the Delphi technique is a scientific method for determining the level of consensus. Different methods have been proposed in different studies. Some researchers have determined the basis for reaching an agreement based on the rounds of the Delphi technique. It has been reported between 2 and 10 rounds in different articles. In some researches, it has been mentioned that three rounds are enough for the Delphi technique [19]. A seven-point Likert scale was used in this research. The snowball technique was also used to identify and select the sample.

#### 4. De-fuzzification process

The de-fuzzification process is to use the results obtained in the ranking process of each component to determine its importance level. This ranking process is used to determine the presence or absence of components [28]. For this purpose, it was necessary to convert fuzzy numbers into definite numbers. Using the following formula, fuzzy numbers were converted to definite numbers. The average fuzzy scores for the de-fuzzification process are indicated by  $l$ ,  $m$  and  $u$ .

$$F = \frac{l + 4m + u}{6} \quad (3.2)$$

#### 5. Determining the acceptability of factors and consensus of opinion

To determine the acceptability of structures and components and their order, three prerequisites are completed [28].

##### (a) Determining the threshold value of the indicators and components:

The average value of fuzzy numbers for each item should be more than 0.7. In this regard, the ratio of each component and each indicator of these values has been calculated, which indicates its confirmation. The only component that was not confirmed is "starting B2B and B2C businesses" with 0.342 value.

##### (b) Fuzzy value of components:

According to the seven-point Likert spectrum, the components whose fuzzy value is more than 4 are approved and rejected otherwise. For the component of "starting B2B and B2C businesses", the value of 2.964 was obtained, which was not accepted.

##### (c) Experts' agreement on the evaluated items:

Also, regarding the level of consensus or agreement, based on the opinions of the research team, if 40% of the respondents give the same answer to one of the answer options for each indicator, the agreement has been reached about that indicator. Therefore, according to the number of specialists' agreement, according to the number of 11 experts, at least 5 people must have given the same answer to one of the options.

## 4 Research findings

The results of the first round of Delphi show that the component of "starting B2B and B2C businesses" did not reach the maximum score and was removed. Also, the components of "Information Technology Risk Mechanism" and "Investment on Startups" were found to be the most and least important from the experts' opinion.

### 4.1 The second round of fuzzy Delphi

At this round, the second questionnaire was prepared and sent to the expert group members, with the previous opinions of each person and the extent of their difference from the other experts' opinions. In the second round, the expert group members answered the questions again according to the other group members' opinions. The item will be accepted if the difference between the de-fuzzified average of the experts' opinions for each item is less than 0.2.

According to the first round presented opinions comparison with the results of this round, if the difference between the two rounds is less than the threshold of 0.2, then the survey process is stopped. As the above table shows, the expert group reached a consensus, and the amount of disagreement in the first and second rounds was less than the threshold of 0.2, so regarding the above factors the survey was stopped. Table 7 shows experts' opinions are the same, and the results are confirmed. Cronbach's alpha was used to check the reliability of the questionnaire. In this way, Cronbach's alpha of the questionnaire was obtained separately for the constituent components of each indicator, and all values were higher than 0.7. This test was also done for the whole questionnaire, with a value of 0.886 indicating the reliability of the questionnaire. These rounds were also performed for the second questionnaire, and the value was 0.871. Finally, the following factors were calculated and confirmed.

Therefore, during two stages of the survey, out of forty-three secondary factors, one secondary factors was removed from the main model and the final model included eleven main factors and 42 secondary factors, as shown in Table 8.

Table 6: The results of the first round of Delphi

Indicator	Components	Mean	Normal weight	Rank
Digital governance	Drawing the perspectives and position of digital transformation	0.74	0.02216210895	33
	Managing and controlling the operation of digital transformation program	0.842	0.02475070361	5
	Development plan of banking digital governance	0.801	0.02422849185	15
	Comprehensive support for digital transformation plan	0.784	0.02093124237	21
Digital business	Open banking business development plan	0.751	0.02375540406	32
	Investing in startups	0.703	0.02189836809	42
	The bank's data-driven business development plan	0.771	0.0224098822	26
	Establishment of business analysis system in the development of digital bank services and products	0.71	0.02191170396	40
Ecosystem	Providing integrated services in the comprehensive or omnichannel	0.766	0.02388320885	29
	Identification and analysis of actors and stakeholders	0.784	0.02323242141	21
Digital processes	Designing and developing a portfolio of new financial products and services with the cooperation of start-ups	0.789	0.02025669023	19
	Interactive development and personalization of digital bank products and services	0.789	0.02412470579	19
Integrated infrastructure	Redesigning processes, structure in order to create a digital organization	0.762	0.02234470455	30
	Implementation and installation of integrated BPM business process management system	0.754	0.02524822577	31
	Establishment of information technology governance system based on Cobit framework	0.824	0.02448071363	10
	Establishment of information technology service management system based on ITIL framework	0.778	0.02398386833	23
Data management and big data analysis	Integrated and biometric authentication	0.718	0.02347865962	38
	Using the emerging technology of cloud computing, artificial intelligence, Internet of Things, blockchain, social networks	0.736	0.02217076063	35
Customer experience	Creating information systems and management dashboard	0.707	0.02188478246	41
	Advanced data analysis and preparation of comprehensive customer profiles	0.796	0.02423783628	17
	Designing and personalizing banking services based on customer needs	0.792	0.02561890055	18
	The possibility of consulting customers for different investments, types of savings through artificial intelligence and analytical software	0.777	0.02393212702	24
Digital employees	Simplicity and ease of access to services	0.715	0.0234513582	39
	Providing banking services 24 * 7	0.825	0.02441614774	9
	Appropriate user interface and digital channels for interactions with customers	0.771	0.0224098822	26
	Establishment of the knowledge and experience management system of employees and customers	0.771	0.0224098822	26
	Special trainings for creativity and digital innovation for employees, especially managers	0.819	0.02283614603	11
	Holding public educational seminars in the field of new digital technologies and the evolution of digital banking.	0.83	0.02591142608	7
	Encouraging entrepreneurs to create digital products and services	0.827	0.02441614774	8

Digital culture	Training business analysis skills for employees	0.837	0.02446841905	6
	Drafting of regulations for the protection of personal data and privacy of customers	0.85	0.02467419831	4
	The importance of commitment to digital culture by the heads of the organization	0.8	0.02563953324	16
	Drafting of program analysis and recruitment of digital talents with a focus on multidisciplinary and analytical skills.	0.727	0.0189136439	36
	Digital banking professional development plan in the main areas of business	0.774	0.02244440449	25
	The plan of the replacement system of digital talents in the main areas of the bank's business	0.807	0.02273729973	13
Information technology risk management	Information technology risk mechanism	0.928	0.0285941296	1
	Implementation of information security management system	0.913	0.02697263999	2
	Help in customer risk management through analytical software and artificial intelligence	0.853	0.02617043607	3
Rules and requirements	Payment system rules based on PSD2 requirement	0.809	0.02424931425	12
	Compliance with the requirements of the central bank	0.803	0.02109009812	14
	The existence of comprehensive instructions regarding the use of digital banking	0.724	0.02043397825	37
	Compliance with anti-money laundering laws	0.74	0.02370759085	33

Table 7: Summary of the two rounds of fuzzy Delphi method

Round 1				Round 2				Result
Item	Experts' fuzzification	opinions average	de-	Experts' fuzzification	opinions average	de-	The average difference of the first and second questionnaires	
1	0.74			0.76			0.02	Accepted
2	0.842			0.86			0.018	Accepted
3	0.801			0.819			0.018	Accepted
4	0.784			0.796			0.012	Accepted
5	0.751			0.769			0.018	Accepted
6	0.703			0.703			0	Accepted
7	0.771			0.778			0.007	Accepted
8	0.71			0.728			0.018	Accepted
9	0.766			0.784			0.018	Accepted
10	0.36			0.342			0.018	Accepted
11	0.784			0.777			0.007	Accepted
12	0.789			0.807			0.018	Accepted
13	0.789			0.789			0	Accepted
14	0.762			0.781			0.019	Accepted
15	0.754			0.769			0.015	Accepted
16	0.824			0.816			0.008	Accepted
17	0.778			0.793			0.015	Accepted
18	0.718			0.733			0.015	Accepted
19	0.736			0.754			0.018	Accepted
20	0.707			0.725			0.018	Accepted
21	0.796			0.789			0.007	Accepted
22	0.792			0.784			0.008	Accepted
23	0.777			0.762			0.015	Accepted
24	0.715			0.733			0.018	Accepted
25	0.825			0.819			0.006	Accepted
26	0.771			0.804			0.033	Accepted
27	0.771			0.771			0	Accepted
28	0.819			0.837			0.018	Accepted
29	0.83			0.822			0.008	Accepted
30	0.827			0.819			0.008	Accepted
31	0.837			0.853			0.016	Accepted
32	0.85			0.842			0.008	Accepted

33	0.8	0.784	0.016	Accepted
34	0.727	0.712	0.015	Accepted
35	0.774	0.789	0.015	Accepted
36	0.807	0.8	0.007	Accepted
37	0.928	0.928	0	Accepted
38	0.913	0.906	0.007	Accepted
39	0.853	0.845	0.008	Accepted
40	0.809	0.827	0.018	Accepted
41	0.803	0.815	0.012	Accepted
42	0.724	0.736	0.012	Accepted
43	0.74	0.74	0	Accepted

Table 8: The results of accepting or rejecting the main and secondary factors

Indicator	Components	Mean	Normal weight	Rank	Percentage of agreement	Expert consensus
Digital governance	Drawing the perspectives and position of digital transformation	0.74	0.02216210895	33	0.454545	Accepted
	Managing and controlling the operation of digital transformation program	0.842	0.02475070361	5	0.454545	Accepted
	Development plan of banking digital governance	0.801	0.02422849185	15	0.454545	Accepted
	Comprehensive support for digital transformation plan	0.784	0.02093124237	21	0.545455	Accepted
Digital business	Open banking business development plan	0.751	0.02375540406	32	0.636364	Accepted
	Investing in startups	0.703	0.02189836809	42	0.454545	Accepted
	The bank’s data-driven business development plan	0.771	0.0224098822	26	0.545455	Accepted
	Establishment of business analysis system in the development of digital bank services and products	0.71	0.02191170396	40	0.636364	Accepted
Ecosystem	Providing integrated services in the comprehensive or omnichannel	0.766	0.02388320885	29	0.545455	Accepted
	Identification and analysis of actors and stakeholders	0.784	0.02323242141	21	0.545455	Accepted
Digital processes	Designing and developing a portfolio of new financial products and services with the cooperation of start-ups	0.789	0.02025669023	19	0.545455	Accepted
	Interactive development and personalization of digital bank products and services	0.789	0.02412470579	19	0.454545	Accepted
Integrated infrastructure	Redesigning processes, structure in order to create a digital organization	0.762	0.02234470455	30	0.454545	Accepted
	Implementation and installation of integrated BPM business process management system	0.754	0.02524822577	31	0.818182	Accepted
	Establishment of information technology governance system based on Cobit framework	0.824	0.02448071363	10	0.454545	Accepted
	Establishment of information technology service management system based on ITIL framework	0.778	0.02398386833	23	0.454545	Accepted
Data management and big data analysis	Integrated and biometric authentication	0.718	0.02347865962	38	0.636364	Accepted
	Using the emerging technology of cloud computing, artificial intelligence, Internet of Things, blockchain, social networks	0.736	0.02217076063	35	0.454545	Accepted
Data management and big data analysis	Creating information systems and management dashboard	0.707	0.02188478246	41	0.454545	Accepted
	Advanced data analysis and preparation of comprehensive customer profiles	0.796	0.02423783628	17	0.454545	Accepted



Customer experience	Designing and personalizing banking services based on customer needs	0.792	0.02561890055	18	0.636364	Accepted
	The possibility of consulting customers for different investments, types of savings through artificial intelligence and analytical software	0.777	0.02393212702	24	0.636364	Accepted
	Simplicity and ease of access to services	0.715	0.0234513582	39	0.454545	Accepted
	Providing banking services 24 * 7	0.825	0.02441614774	9	0.636364	Accepted
	Appropriate user interface and digital channels for interactions with customers	0.771	0.0224098822	26	0.545455	Accepted
Digital employees	Establishment of the knowledge and experience management system of employees and customers	0.771	0.0224098822	26	0.545455	Accepted
	Special trainings for creativity and digital innovation for employees, especially managers	0.819	0.02283614603	11	0.727273	Accepted
	Holding public educational seminars in the field of new digital technologies and the evolution of digital banking.	0.83	0.02591142608	7	0.545455	Accepted
	Encouraging entrepreneurs to create digital products and services	0.827	0.02441614774	8	0.636364	Accepted
	Training business analysis skills for employees	0.837	0.02446841905	6	0.727273	Accepted
Digital culture	Drafting of regulations for the protection of personal data and privacy of customers	0.85	0.02467419831	4	0.636364	Accepted
	The importance of commitment to digital culture by the heads of the organization	0.8	0.02563953324	16	0.545455	Accepted
	Drafting of program analysis and recruitment of digital talents with a focus on multidisciplinary and analytical skills.	0.727	0.0189136439	36	0.545455	Accepted
	Digital banking professional development plan in the main areas of business	0.774	0.02244440449	25	0.545455	Accepted
	The plan of the replacement system of digital talents in the main areas of the bank's business	0.807	0.02273729973	13	0.636364	Accepted
Information technology risk management	Information technology risk mechanism	0.928	0.0285941296	1	0.545455	Accepted
	Implementation of information security management system	0.913	0.02697263999	2	0.545455	Accepted
	Help in customer risk management through analytical software and artificial intelligence	0.853	0.02617043607	3	0.545455	Accepted
Rules and requirements	Payment system rules based on PSD2 requirement	0.809	0.02424931425	12	0.636364	Accepted
	Compliance with the requirements of the central bank	0.803	0.02109009812	14	0.545455	Accepted
	The existence of comprehensive instructions regarding the use of digital banking	0.724	0.02043397825	37	0.454545	Accepted
	Compliance with anti-money laundering laws	0.74	0.02370759085	33	0.545455	Accepted

Table 9: The results of the weight of indicators and components and their ranking

Indicator	Components	Mean	Component normal weight	Component rank	Indicator weight	Indicator rank
Digital governance	Drawing the perspectives and position of digital transformation	0.74	0.02216210895	33	0.092073	6
	Managing and controlling the operation of digital transformation program	0.842	0.02475070361	5		
	Development plan of banking digital governance	0.801	0.02422849185	15		
	Comprehensive support for digital transformation plan	0.784	0.02093124237	21		
Digital business	pen banking business development plan	0.751	0.02375540406	32	0.113859	4
	Investing in startups	0.703	0.02189836809	42		
	The bank's data-driven business development plan	0.771	0.0224098822	26		

	Establishment of business analysis system in the development of digital bank services and products	0.71	0.02191170396	40		
	Providing integrated services in the comprehensive or omnichannel	0.766	0.02388320885	29		
Ecosystem	Identification and analysis of actors and stakeholders	0.784	0.02323242141	21		
	Designing and developing a portfolio of new financial products and services with the cooperation of start-ups	0.789	0.02025669023	19		
Digital processes	Interactive development and personalization of digital bank products and services	0.789	0.02412470579	19		
	Redesigning processes, structure in order to create a digital organization	0.762	0.02234470455	30		
	Implementation and installation of integrated BPM business process management system	0.754	0.02524822577	31		
Integrated infrastructure	Establishment of information technology governance system based on Cobit framework	0.824	0.02448071363	10	0.043489	11
	Establishment of information technology service management system based on ITIL framework	0.778	0.02398386833	23		
	Integrated and biometric authentication	0.718	0.02347865962	38		
	Using the emerging technology of cloud computing, artificial intelligence, Internet of Things, blockchain, social networks	0.736	0.02217076063	35		
Data management and big data analysis	Creating information systems and management dashboard	0.707	0.02188478246	41	0.071718	9
	Advanced data analysis and preparation of comprehensive customer profiles	0.796	0.02423783628	17		
Customer experience	Designing and personalizing banking services based on customer needs	0.792	0.02561890055	18	0.094114	5
	The possibility of consulting customers for different investments, types of savings through artificial intelligence and analytical software	0.777	0.02393212702	24		
	Simplicity and ease of access to services	0.715	0.0234513582	39		
	Providing banking services 24 * 7	0.825	0.02441614774	9		
	Appropriate user interface and digital channels for interactions with customers	0.771	0.0224098822	26		
Digital employees	Establishment of the knowledge and experience management system of employees and customers	0.771	0.0224098822	26	0.046123	10
	Special trainings for creativity and digital innovation for employees, especially managers	0.819	0.02283614603	11		
	Holding public educational seminars in the field of new digital technologies and the evolution of digital banking.	0.83	0.02591142608	7		
	Encouraging entrepreneurs to create digital products and services	0.827	0.02441614774	8		
	Training business analysis skills for employees	0.837	0.02446841905	6		
Digital culture	Drafting of regulations for the protection of personal data and privacy of customers	0.85	0.02467419831	4	0.119828	2

#### 4.2 Final identified factors in digital banking

Figure 2 shows the identified indicators confirmed as the main factors of digital banking by experts after studying the subject literature.

	The importance of commitment to digital culture by the heads of the organization	0.8	0.02563953324	16
	Drafting of program analysis and recruitment of digital talents with a focus on multidisciplinary and analytical skills.	0.727	0.0189136439	36
	Digital banking professional development plan in the main areas of business	0.774	0.02244440449	25
	The plan of the replacement system of digital talents in the main areas of the bank's business	0.807	0.02273729973	13
Information technology risk management	Information technology risk mechanism	0.928	0.0285941296	1
	Implementation of information security management system	0.913	0.02697263999	2
	Help in customer risk management through analytical software and artificial intelligence	0.853	0.02617043607	3
Rules and requirements	Payment system rules based on PSD2 requirement	0.809	0.02424931425	12
	Compliance with the requirements of the central bank	0.803	0.02109009812	14
	The existence of comprehensive instructions regarding the use of digital banking	0.724	0.02043397825	37
	Compliance with anti-money laundering laws	0.74	0.02370759085	33

## 5 Discussion and conclusion

Today, banking is like a cascade of multiple technologies, laws and regulations, and population factors that cut the length and breadth of its value chain. These factors affect the way of conducting business by banks, in such a way that the usual banking methods are not enough to meet the ever-increasing expectations of customers and also to improve the level of profitability. The influential factors in the transformation of the banking industry can be classified into two main categories: business transformations and technical transformations. In the field of business development, new non-bank players in the form of fintech or start-ups have disrupted the banking business and undermined the intermediary role of banks. In the technical sector, the emergence of new technologies such as blockchain, robotics, etc. has had a significant impact on the functions of the banking industry [35].

The results of this research and the literature provide a list of effective factors in "identifying digital banking", and then an initial screening was performed and duplicate or synonymous indicators were removed, and finally 11 indicators and 43 components remained. The indicators of digital governance, digital business, ecosystem, digital processes, integrated infrastructure, big data, customer experience, digital employees, digital culture, risk management, and rules and requirements were approved by the experts. Among the components, the component "starting B2B and B2C businesses" under the digital business index was not accepted. Finally, 42 components were approved. In the end, Cronbach's test was performed on the components of each index, which confirms the reliability of both Delphi questionnaires.

According to the factors of importance prioritization and ranking based on the findings of the fuzzy Delphi method, the following results are obtained:

1. IT risk management and attention to customer privacy (levels 1-4)
2. Digital governance and attention to the performance control of the digital transformation program, rank 5
3. Attention to digital employees ranks 6-8
4. Attention to customer experience rank 9



Figure 2: Factors, dimensions and effective components in the digital banking transformation

5. Integrated infrastructure and attention to the establishment of the information technology governance system based on the Cobit framework, rank 10

The above cases indicate that attention to the privacy of customers and their information is of great importance, which must be identified and managed in the field of Information and Communications Technology. On the other hand, digital governance and comprehensive follow-up of banks' digital transformation programs should be taken into consideration. In the meantime, it is of special importance to address the motivations of the human force in advancing the goals of the banks. On the other hand, one of the identified components that were approved and agreed upon by experts is the help in customer risk management through analytical software and artificial intelligence, which has been assigned the third rank. Undoubtedly, the presence of digital employees has led to the growth of banking, and neglecting this group, who have a close relationship with customers, will have a significant effect on the customer's experience.

### 5.1 Suggestions

The banking industry has undergone significant changes due to customer demand for new products, along with new competition from other banks and non-financial institutions. Most banks have embarked on digital transformation initiatives to innovate, shorten new product development cycles, and reduce costs. For banks that want to meet the evolving needs of consumers and overcome new digital competitors, organizational agility and the ability to innovate, adapt and respond quickly is no longer a choice, but the cornerstone of successful digital transformation.

Specialized and development banks have a great role and importance in the economic growth and development of the country and the realization of a resilient economy due to the completion of the supply and value chain, based on the studies conducted, there are mainly 4 activities in their business model, including loan services, investments,

consulting services, and other services. Also, financial and non-financial activities are defined, and the resources they need are provided by the government and through development programs, and a part is through deposit attraction, and mainly the goal of these banks will be to move in line with the same development programs.

Accordingly, the following are recommended to senior managers of specialized banks:

### **Strong governance**

Considering that the component "attention to control the performance of the digital transformation program" of the digital governance indicator was highly important, it follows that digital banks must ensure that they have comprehensive frameworks for risk monitoring and control. They also have strong governance to determine clear roles and responsibilities, technology monitoring, cyber risk control, and outsourcing risk.

### **IT Risk**

IT managers of specialized banks should have a specific plan in place to protect against cyber attacks and digital fraud. Today's threats are highly advanced and attackers are sophisticated enough to identify the types of precautions banks can take. They are smart and design their attacks accordingly. Banks should be well aware of this issue and take necessary preventive measures. The information security management system as a solution is strongly recommended to be implemented at least in the area of the organization's important assets and services. According to the "Information Technology Risk" indicators ranks, it is recommended to senior managers of specialized banks use analytical software and artificial intelligence to manage the risk of customers, because, with proper analysis, it is possible to prevent huge financial losses from customers and made them more confident about the success of their economic plans and ultimately their loan repayment.

### **Modernization of old systems**

Today, information technology governance by using information and using technology is recognized as an important success factor in achieving the company's goals. Considering the component of establishing the governance system of information technology based on the Cobit framework and the fact that the benefits created by organizational investments in information technology, which are directly influenced by information technology, have been widely accepted, it is recommended to the senior managers of specialized banks to accept the rule of information technology in their banks and pay attention to the necessity of a strategic alliance between business and information technology to create a competitive advantage and gain more market share. While digital technologies such as artificial intelligence, cloud computing, and data analytics can improve efficiency, they still depend on the flow of information in old systems and on-site data. Therefore, the reconstruction of old systems is an issue that is recommended to the IT managers of banks to overcome one of the challenges and obstacles in the direction of digitalization.

### **Analyzing data to improve customer experience**

Considering the importance of the "customer experience" component of any interaction with customers through any channel, it allows the bank to collect data and create new insights to improve the customer experience. Therefore, IT managers of specialized banks are advised to integrate the channels to get the right insight from the customer. Also, with the help of artificial intelligence-based technologies such as machine learning and deep learning, use them to understand, predict and create new value for their customers.

### **Workforce promotion**

Digital transformation is a complex process and to become a digital bank, experts in this field are needed. Finding the right people who can guide the organization during this transformation is a real challenge for many banks. Because some components of the digital employees index have been ranked 6 to 8, it is recommended to managers of specialized banks improve the skill sets of their employees to meet the current and changing needs of their functions. In this regard, holding public educational seminars in the field of new digital technologies and the evolution of digital banking, as well as encouraging entrepreneurs to create digital products and services will be effective.

## **References**

- [1] Q. Abbaspour Esfaden, *Application of Decision Making Theory in Management and Enginee Ring (Classical and Fuzzy) with a thesis writing approach*, Asatid Bartar Publisher, 2021.
- [2] S. Ahmed and S. Sur, *Change in the uses pattern of digital banking services by Indian rural MSMEs during demonetization and Covid-19 pandemic-related restrictions*, Vilakshan-XIMB J. Manag. **20** (2021), no. 1.
- [3] M. Amini, M. Hassanzadeh, and M. Morshedi, *An improved methodology for digital transformation of business*



- model*, *Sci. Tech. Inf. Manag.* **8** (2022), no. 1, 393–426.
- [4] E. Asadamerji, A. Mohammadian, A. Rajabzadeh Qatari, and M. Shoar, *Presenting the maturity model of the digital transformation capability using the hybrid method: the case study of pharmaceutical companies*, *Inf. Manag. J.* **5** (2019), no. 2, 48–69.
- [5] S. Bashir, *The evolution of customer relationship management in the digital age and its impact on banks*, *J. Glob. Soc.-Econ. Dyn.* **3** (2021), no. 28.
- [6] S. Berghaus and A. Back, *Stages in digital business transformation: results of an empirical maturity study*, *Mediterr. Conf. Inf. Syst. (MCIS)*, **22** (2016), pp. 1–17.
- [7] C.E. Bouée and S. Schaible, *Die Digitale Transformation der Industrie. Roland Berger Strategy Consultants und Bundesverband der Deutschen Industrie e. V., Berlin*, Roland Berger Strategy Consultants, 2021.
- [8] C. Boulton, *What is digital transformation? A necessary disruption*, <https://www.cio.com/article/3211428/whatis-digital-transformation-a-necessary-disruption.html>, 2020.
- [9] F. Brunetti, D.T. Matt, A. Bonfanti, A. De Longhi, G. Pedrini, and G. Orzes, *Digital transformation challenges: strategies emerging from a multi-stakeholder approach*, *TQM J.* **32** (2020), no. 4, 697–724.
- [10] J. Buvat and S. KVG, *Doing business the digital way: how capital one fundamentally disrupted the financial services industry*, Capgemini Consulting, Available at: <https://www.capgemini.com>, 2014.
- [11] J. Buvat, B. Solis, C. Crummenerl, C. Aboud, K. Kar, H. El Aoufi, and A. Sengupta, *The digital culture challenge: closing the employee-leadership gap*, Capgemini Digital Transformation Institute Survey, **2017** (2017), 1–32.
- [12] Capgemini Consulting, *Digital transformation: A roadmap for billion-dollar organizations*, MIT Center for digital business and Capgemini consulting, Available at: <https://www.capgemini.com>, 2017.
- [13] A. Coskun-Setirek and Z. Tanrikulu, *Digital innovations-driven business model regeneration: A process model*, *Technol. Soc.* **64** (2021).
- [14] S. DeLaCastro, A. Vaidyanathan, and S. Karthik, *Digital Marketing in Banking: Evolution and Revolution*, Cognizant Inc., 2016.
- [15] R. Dornberger, *New Trends in Business Information Systems and Technology: Digital Innovation and Digital Business Transformation*, Springer Nature, 2020.
- [16] G. Elia, A. Margherita, and G. Passiante, *Digital entrepreneurship ecosystem: How digital technologies and collective intelligence are reshaping the entrepreneurial process*, *J. Technol. Forecast. Soc. Change* **150** (2020), 119–129.
- [17] Y. Eremina, N. Lace, and J. Bistrova, *Digital maturity and corporate performance: The case of the Baltic states*, *J. Open Innov.: Technol. Market Complexity* **5** (2019), no. 3, 54.
- [18] M. Gadre and A. Deoskar, *Industry 4.0–digital transformation, challenges and benefits*, *Int. J. Future Gen. Commun. Network.* **13** (2020), no. 2, 139–149.
- [19] A. Habibi, A. Sarafrazi, and S. Izadyar, *Delphi technique theoretical framework in qualitative research*, *Int. J. Eng. Sci.* **3** (2014), no. 4, 8–13.
- [20] A.A. Haddadi Harandi, M. Rezai Fard, and S. Esmaili, *Digital transformation maturity model, fields and research trends in Iran*, *Digital Transform. J.* **2** (2021), no. 2, 43–72.
- [21] M. Hosseini Nasab, M. Shami Zanjani, and A. Qalipour, *Presenting the competence model of the chief digital manager as the ruler of digital transformation in the organization*, *J. Inf. Process. Manag.* **36** (2021), no. 3, 835–860.
- [22] D. Hubbard and D. Evans, *Problems with scoring methods and ordinal scales in risk assessment*, *IBM J. Res. Dev.* **54** (2010), no. 3, 1–10.
- [23] IBM, *The paradox of banking 2015: Achieving more by doing less*, Available at: <https://thebankwatch.com>, 2015.
- [24] M. Jaubert, S. Marcu, M. Ullrich, J.B. Malbate, and R. Dela, *Going Digital: The Banking Transformation Roadmap*, AT Kearney, 2014.

- [25] E. Karimi, M. Shami Zanjani, M. Kiamsi, and A. Hasanzadeh, *Designing a framework to improve the customer's digital experience in Internet banking*, *Bus. Manag. Persp.* **18** (2019), no. 4.
- [26] G. Kelly, *The Digital Revolution in Banking*, Washington DC: Group of Thirty Publications, 2014.
- [27] R. Likert, *A technique for the measurement of attitudes*, *Arch. Psychol.* **22** (1932), no. 140.
- [28] S.K. Manakandan, *Pesticide applicators questionnaire content validation: A fuzzy Delphi method*, *Med. J. Malaysia*, **4** (2017), no. 72, 228–235.
- [29] E. Martínez-Caro, J.G. Cegarra-Navarro, and F.J. Alfonso-Ruiz, *Digital technologies and firm performance: The role of digital organisational culture*, *Technol. Forecast. Soc. Change* **154** (2020), 119962.
- [30] D.T. Matt, V. Modrák, and H. Zsifkovits, *Industry 4.0 for SMEs: Challenges, Opportunities and Requirements*, Springer Nature, 2020.
- [31] I. Mergel, N. Edelman and N. Haug, *Defining digital transformation: Results from expert interviews*, *Government Inf. Quart.* **36** (2019), no. 4.
- [32] Ministry of Economic Affairs and Finance, *Future banking and digital transformation; The policy approach and establishment framework based on the smart economy paradigm of the Vice-Chancellor of banking, insurance and state companies*, Ministry of Economic Affairs and Finance, 2019.
- [33] S. Moradi and S. Keshmiri, *Preparing to lead digital transformation in schools*, *School Manag.* **9** (2021), no. 2, 387–415.
- [34] M. Nouri, M. Shah Hoseini, M. Shami Zanjani, and B. Abedin, *Designing a conceptual framework for leading digital transformation in Iranian companies*, *J. Manag. Plann. Educat. Syst.* **12** (2019), no. 2, 211–242.
- [35] S. Oyarhossein, A. Toloui Ashlaqi, R. Radfar, and A. Pour Ebrahimi, *Digital transformation in corporate banking: theoretical approach and behavioral analysis*, *Sci. Res. Quart. J. Invest. Knowledge*, **11** (2022), no. 44, 603–630.
- [36] PWC, *Retail banking 2020 evolution or revolution*, <https://www.pwc.com/gx/en/banking-capitalmarkets/banking-2020.assets/pwc-retail-banking-2020-evolution-orrevolution.pdf>, 2020.
- [37] M. Qeshlaghi, *Evaluating the quality of electronic banking services using the combination of Fuzzy Delphi hierarchical process (F.D.AHP) and Fuzzy TOPSIS (F.TOPSIS) methods, a case study: Tehran Post Bank branches*, *Bus. Manage. J.* **43** (2018).
- [38] B. Robinson, C. McGinnis, and M. Leyva, *Shifting sands: banking in the digital era*, Temenos and Capgemini, Available at: <https://www.temenos.com>, 2015.
- [39] D. Savić, *Digital transformation and grey literature professionals*, *Grey J.* **16** (2020), 11–17.
- [40] N. Shafeian, M. Aghaei, N. Gharibnavaz, and B. Banimahd, *Designing and explaining local digital marketing model in the Iranian banking system*, *Quart. J. Brand Manag.* **7** (2020), no. 3, 15–53.
- [41] V. Shahabi, A. Azar, F. Faizi Razi, and M.F. Falah Shams, *Modeling the impact of covid-19 virus pandemic on the acceptance and development of digital banking*, *Consumer Behav. Stud.* **8** (2021), no. 2, 92–113.
- [42] C. Skinner, *Digital bank: Strategies to Launch or Become a Digital Bank*, Marshall Cavendish Business, Singapore: Marshall Cavendish, 2014.
- [43] F. Soheili and N. Malekian, *The study mental health in the type of virtual communication and providing a model for social network users*, *New Media Stud.* **6** (2020), no. 23, 169–203.
- [44] M. Soltani and D. Tahmasabi Aghbalaghi, *Explaining the role of Tejarat Bank's strategic partnership with fintechs in efficiency through the mediation of technological developments and digital banking*, *Bus. Manag.* **12** (2019), no. 3, 800–832.
- [45] A. Tajerloo, M. Ansari, A. Divandari, and M. Kimasi, *Designing a new product development framework with a digital banking approach (case study: Mellat Bank)*, *Ind. Manag.* **13** (2021), no. 4, 559–579.
- [46] C. Tonder, C. Schachtebeck, C. Nieuwenhuizen, and B. Bossink, *A framework for digital transformation and business model innovation management*, *J. Contemp. Manag. Issues* **25** (2020), no. 2, 111–132.
- [47] C. TorresVila, *Looking ahead: digital banking*, London, BoAML banking and insurance CEO conference, Available

at: <https://shareholdersandinvestors.bbva.com>, 2014.

- [48] S. Tripathi, *Determinants of digital transformation in the post-Covid-19 business world*, JRDO-J. Bus. Manag. **7** (2021), no. 6, 75–83.
- [49] G. Vial, *Understanding digital transformation: A review and a research agenda*, J. Strat. Info. Syst. **28** (2019), no. 2, 118–144.
- [50] G. Westerman, C. Calm ejane, D. Bonnet, P. Ferraris, and A. McAfee, *Digital transformation: A roadmap for billion-dollar organizations*, MIT Center Digital Bus. Capgemini Consul. **1** (2011), 1–68.
- [51] S. Zamani, *The relationship between the dimensions of electronic banking, customer experience and financial performance through the mediating role of customer satisfaction and loyalty in branches of Mellat bank of Gilan province*, Quart. J. New Res. Approach. Manag. Account. **3** (2018), no. 19.