Providing a Framework for Identifying and Analyzing Drivers Affecting the Future of Banking with an Emphasis on Blockchain

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Abstract

Blockchain technology, with its advantages such as reducing intermediaries, controlling costs, and increasing security, has garnered attention from the financial industry. This technology, besides centralizing banking processes, can help improve operational efficiency. This study aims to identify and analyze the drivers influencing the future of banking in Iran, with a focus on blockchain technology. The research is applied in terms of orientation and quantitative in terms of methodology. Two methods, fuzzy Delphi and MARCOS, were used for data analysis. Initially, 29 drivers were extracted through a literature review and interviews with banking experts. Subsequently, nine drivers were selected for final prioritization using the MARCOS method after distributing expert questionnaires and screening them with the fuzzy Delphi method. The final drivers were ranked through a questionnaire distribution. The perceived organizational benefits, the compatibility of blockchain technology with the IT systems of the banking sector, the development of RegTech in the country, and the regulatory approaches of lawmakers regarding digital financial technologies were, respectively, identified as the highest-priority drivers. The most important practical recommendations of the study include developing a tool to measure the benefits of blockchain technology, adopting a systemic view towards the implementation of new technologies, making necessary changes before transferring the technology to the banking sector, leveraging RegTech capacities to assess the risks of using digital financial technologies, and ensuring the integration of regulatory policies and comprehensive regulation.

Keywords: *Banking, Future, Driver, Financial Technology, Blockchain Technology.*

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1. Introduction

Financial technology, known as FinTech, is the intersection between technology and capital. When technology and finance merge, they create a reciprocal reaction and generate a multilayered effect that is greater than the sum of their parts. FinTech refers to a set of activities and businesses that leverage modern software capabilities to provide financial services on a broad scale, often beyond geographical boundaries. FinTechs can be considered as banking and financial technology startups that seek to transcend traditional intermediary boundaries. Financial technology is a field within financial services that is based on technology. FinTech is also related to startups, digital companies, or even longstanding financial firms that offer financial services by applying new technologies [1-3].

FinTech can be understood in two ways [4]. The first pertains to traditional financial companies that, by utilizing technology, adapt to new changes and improve their services. The second concerns technology companies that attempt to use their technologies to develop financial services. After the credit crisis of 2008, the financial industry's landscape was completely transformed due to innovations in financial technology [5]. FinTech pursues three primary goals. The first goal is mobile payment, the second is smart contract tracking, and the third, which has gained significant popularity, is blockchain. The main characteristics of these three FinTech objectives are instant connectivity, real-time data, credit scoring, and updates.

Today, in the age of digital transformation, the use of financial technologies has become an integral part of the banking industry. FinTech leverages products and innovations developed by companies utilizing new digital and online technologies within the banking and financial services industries. Leading banks and financial institutions are also exploring the potential use of blockchain technology across various aspects of their operations, including payments, transactions, and other transaction-based activities. Some of the advantages of blockchain for the banking sector include customer differentiation, fraud reduction, business platform, and banking payments [6].

The following sections review the research conducted in the field of banking and blockchain technology. Deepa et al. (2022) examined the approaches, opportunities, and future directions of blockchain technology in big data. According to the researchers, despite the many advantages and applications of blockchain, significant challenges exist in big data that must be addressed to improve the quality of services. Some of these challenges include big data analytics, big data management, and the preservation of privacy and security. Blockchain, with its decentralized and secure nature, has great potential to improve big data services and applications [7]. Yaqub et al. (2022) identified the opportunities, challenges, and future directions of blockchain technology in the healthcare sector. Today's healthcare data management systems face key challenges in terms of data transparency, traceability, immutability, auditing, data provenance, flexible access, trust, privacy, and security. Additionally, a large part of the existing healthcare systems used for data management are centralized, which significantly increases the risk of system failure during natural crises. This study explored how blockchain can be used for healthcare data management systems to stimulate innovations and create major advancements. The study also identified the key features of blockchain, its superior benefits for adoption in the healthcare sector, its opportunities in healthcare, blockchain projects and applications in this sector, and the challenges of blockchain deployment in healthcare, along with its future directions [8].

Chowdhury et al. (2021) identified and analyzed the applications of blockchain technology in the banking system. Currently, there are major challenges in banking, and blockchain could help resolve these issues. The goal of their study was to provide a review and analysis of blockchain applications and opportunities for a secure banking system. Initially, related works by other researchers in this field were discussed. Then, the operational method of blockchain technology was analyzed. Finally, the use of blockchain technology for secure banking was discussed. The main contribution of this research was demonstrating how blockchain functions and how it can be beneficial in the secure banking industry [9]. Garg et al. (2021) measured the perceived business benefits of blockchain technology implementation in the banking sector and developed indices for measuring these benefits. Data was collected from 291 respondents, including blockchain consultants, blockchain marketing experts, and CEOs of banking businesses (who are involved in the consultation or implementation process of blockchain technology). A tool was developed to measure the perceived benefits, which demonstrated sufficient validity and reliability. Using this tool, the benefits of blockchain technology can be measured before its implementation in the banking sector [10].

Wu and Duan (2019) identified and managed the applications of blockchain technology in the management

and operations of commercial banks. This study examined the benefits of blockchain technology for commercial banks in several aspects. Initially, blockchain technology development and theory were introduced. Then, the benefits of blockchain technology in billing operations, international payments, and the securitization of commercial bank assets were analyzed. The results showed that blockchain technology can reduce transaction costs for both parties and increase the operational efficiency of commercial banks in terms of operations and management [11].

Guo and Liang (2016) explored the applications and future prospects of blockchain in the banking sector. Blockchain is a core and foundational technology with promising application prospects in the banking industry. The banking industry in China faces the impact of interest rate liberalization and reduced profits due to a decrease in the interest rate gap. On the other hand, economic changes, internet development, and financial innovations have also transformed the banking sector. As a result, the banking industry urgently needs transformation and is seeking new avenues for growth. Blockchain could revolutionize the fundamental information systems and payment settlement in banks, upgrading and transforming them. By eliminating intermediaries and reducing centralization, blockchain increases the efficiency of the banking industry. However, despite the decentralized nature of blockchain, the actual implementation and regulation of a decentralized system pose significant challenges that must be addressed. Developing standards in the banking industry and regulatory sandboxes are the study's recommendations to overcome these challenges [12].

In Iran, studies have also been conducted on blockchain technology and its applications, which will be discussed further. Zandi et al. (2022) developed a conceptual model of the driving factors for blockchain in promoting entrepreneurship. The study used qualitative content analysis, with semi-structured interviews as the main data collection tool. The results indicated that six driving factors for blockchain in promoting entrepreneurship were identified, including economic, technological, political, legal, social, and environmental factors. Since blockchain technology has not yet reached full maturity and is still developing, this moment represents a great opportunity for businesses to adopt appropriate strategies to reduce the risks of potential threats and capitalize on potential opportunities to create a sustainable competitive advantage for their businesses [13].

Mousavi, Salehan, and Yousefi Zenuz (2022) aimed to review and categorize blockchain studies, identify subfields, and obtain a coherent view of its research trends. Using bibliometric analysis, this research examined the blockchain research field. Based on the findings, blockchain research is divided into five clusters (1. computer systems, 2. financial sciences, 3. smart contracts, 4. data management and authentication, and 5. electronic money). Additionally, recent topics such as machine learning, trust, deep learning, risk assessment, edge computing, Ethereum, and consensus have gained more attention in this field [14].

Khalili et al. (2021) provided a framework for identifying the readiness indicators of commercial banks to use blockchain technology. Four organizational, technical, individual, and environmental factors were extracted from the literature as indicators of the readiness of commercial banks to use blockchain technology. Organizational indicators included infrastructure development, managerial skills, human resource development, company or organization size, financial resources, receptive organizational culture, organizational policies, and top management support. The technical indicators included complexity, technological security, technology access, technology application, and skilled workforce. Individual indicators included attitudes towards use, ease of use, perceived usefulness, and understanding of blockchain technology. Finally, environmental indicators included laws and regulations, technological maturity, information exchange, compatibility, market dynamics, and government support [15].

Despite the rapid growth of FinTechs and their core technology, blockchain, globally, the development of this technology in Iran has been very slow. Most Iranian FinTechs operate in the payment sector and face numerous limitations and challenges, including regulatory issues, weak infrastructure, and destructive competition (Koushesh Kordshouli et al., 2020; Koushesh Kordshouli, Maleki, & Gholami Jamkarani, 2021). In the near future, the banking sector, considering the advantages of blockchain technology in various areas, will increasingly adopt it. This technology will improve efficiency, speed, security, and cost reduction in various financial and banking operations, leading to significant improvements in the quality of banking services provided to end users. Considering these points, the present study seeks to identify and analyze the drivers of the future of the banking industry with an emphasis on blockchain technology.

The research questions are as follows:

1. What are the drivers influencing the future of the banking industry with a focus on blockchain technology?
2. How are the drivers influencing the future of the banking industry with a focus on blockchain technology prioritized?

2. Methodology

The aim of the present study is to identify and analyze the drivers influencing the future of Iran's banking industry with a focus on blockchain technology. For this purpose, two methods were used for data analysis: the fuzzy Delphi method and the MARCOS method. Both are quantitative methods that rely on quantitative data for analysis. The fuzzy Delphi technique was employed for screening the drivers, while the MARCOS method was used for analyzing and ranking them. Given the quantitative nature of the methods used in the research, the study follows a mixed-method quantitative approach. Due to the practical benefits of the study's outcomes for the banking sector, the research also has an applied orientation.

Two tools, interviews and questionnaires, were used to collect the data. The research drivers were extracted from a review of related studies on banking, banking FinTechs, and the applications of blockchain technology in the banking sector. Subsequently, two questionnaires—fuzzy expert evaluation and MARCOS prioritization—were distributed among experts for the analysis of the research drivers. The expert evaluation questionnaires were assessed using the fuzzy Delphi technique, while the prioritization questionnaires were evaluated using the MARCOS technique. Since the drivers of the questionnaires were derived from a review of credible international and domestic articles on banking and blockchain and interviews with banking experts specialized in digital finance, both the expert evaluation and prioritization questionnaires were deemed to have adequate validity. Moreover, due to the appropriate sample size (10 participants) and the screening of drivers, the prioritization questionnaire was considered reliable. The sample size in this research was 10 participants, which is an optimal number for expert-oriented methods with a judgmental nature.

The experts in this study were senior managers and experts from Iranian banks specializing in digital finance (FinTechs, big data, and blockchain technology). The sampling method was judgmental, and the participants were selected based on their expertise in banking and blockchain technology.

This study was conducted in three phases. First, the future drivers of the banking industry, with a focus on blockchain technology, were identified through a literature review and interviews with experts. Then, these drivers were screened using the fuzzy Delphi method. Finally, the most critical drivers were identified using the MARCOS method.

In this research, the Delphi technique was used for screening the study's drivers. In the fuzzy Delphi method's algorithm for screening, the first step is to develop an appropriate fuzzy scale to fuzzify the linguistic expressions of the experts. Conventional fuzzy scales can be used for this purpose. In this study, a five-point Likert scale was used, as shown in Table 1.

Table 1. Fuzzy Scale for the Delphi Method

Linguistic Variable	Fuzzy Value	Triangular Fuzzy Number
Very Low	$\tilde{1}$	(0, 0, 0.25)
Low	$\tilde{2}$	(0, 0.25, 0.5)
Medium	$\tilde{3}$	(0.25, 0.5, 0.75)
High	$\tilde{4}$	(0.5, 0.75, 1)
Very High	$\tilde{5}$	(0.75, 1, 1)

The MARCOS method, a new multi-criteria decision-making (MCDM) approach, was introduced by Stević and Pamučar in 2020. It evaluates and ranks options based on a compromise solution. In this study, the MARCOS method was used to analyze and prioritize the drivers. The evaluation criteria in this research were derived from the Global Business Network approach, which is a well-established and classical method in futures studies. The evaluation criteria for the drivers in this study included: expert expertise, the intensity of the importance of each driver, and the degree of certainty of each driver. The expertise of the experts and the intensity of importance have an increasing nature, while the certainty criterion has a decreasing nature. In summary, the higher the level of expertise of the experts on a driver, the greater its importance and the lower its certainty, making it more suitable for scenario planning.

The steps of the MARCOS method are as follows:

Step 1: Forming the Decision Matrix

The first step in all MCDM methods aimed at ranking options is forming the decision matrix. In the MARCOS method, the evaluation of m options is based on n criteria. Each option is assigned a score for each criterion. In this research, the experts expressed their opinions on each driver based on the three evaluation criteria using a 10-point scale. Since 10 experts participated in this study, a composite matrix of the arithmetic mean of expert opinions was generated.

Step 2: Determining the Ideal and Anti-Ideal Solutions

In this step, the values for the ideal and anti-ideal solutions are determined based on the following relationships.

$$AI = \max_i x_{ij} \quad if\ j \in B \quad and \quad \min_i x_{ij}\ if\ j \in C$$

$$AAI = \min_i x_{ij} \quad if\ j \in B \quad and \quad \max_i x_{ij}\ if\ j \in C$$

Step 3: Normalization

In this step, the data from the composite matrix are normalized using the following relationships. Normalization will be done linearly, and the normalization method will differ for positive and negative criteria.

$$n_{ij} = \frac{x_{aj}}{x_{ij}} \quad if\ j \in C$$

$$n_{ij} = \frac{x_{ij}}{x_{aj}} \quad if\ j \in B$$

Step 4: Forming the Weighted Normal Matrix

By multiplying the normalized matrix by the weight of the criteria, the weighted normal matrix is obtained. In this study, the weights of the criteria were obtained using the Shannon entropy method.

Step 5: Calculating the Degree of Desirability for Each Option (Driver)

In this step, the degree of desirability for the ideal and anti-ideal solutions of each option is determined based on the following relationships.

$$K_i^+ = \frac{S_i}{S_{ai}}$$

$$K_i^- = \frac{S_i}{S_{aai}}$$

Step 6: Determining Final Performance and Ranking the Options

In this step, the final performance of each option is determined using the following relationship.

$$f(K_i) = \frac{K_i^+ + K_i^-}{1 + \frac{1 - f(K_i^+)}{f(K_i^+)} + \frac{1 - f(K_i^-)}{f(K_i^-)}}$$

3. Findings

The drivers influencing the future of Iran's banking industry were extracted through an analytical review of the literature and interviews with banking experts. These drivers are listed in Table 2. To identify the research drivers, relevant studies on banking and blockchain technology were examined and analyzed.

Table 2. Future Banking Drivers with a Focus on Blockchain Technology

Research Drivers
Intensity of competition among banks
Development of FinTechs in Iran
Strategic partnerships between banks and FinTechs
Development of technology-driven banking in the country
Regulatory approaches of lawmakers regarding digital financial technologies
Limitations of financial technology transfer
Costs of financial technology transfer
Support from senior management for new technologies
Compatibility of blockchain technology with the IT systems of the banking sector
Coordination among banks in the country for implementing new changes
Employee training
IT staff skills in banks
Financial literacy of users

Security considerations
Blockchain adoption in other sectors, including the supply chain
Development of national cryptocurrencies
Level of international communication between banks
Development of smart contracts in the banking sector
Development of decentralized banking in the country
Anti-money laundering standards in the country
The country’s macroeconomic policies regarding banks
Corporate governance status in the country
Development of open innovation in the banking sector
Performance of banks' research and development units
Organizational structure of banks
Perceived organizational benefits
Development of RegTech in the country
Hardware and software capabilities of banks
Financial capabilities of banks

The 29 drivers, identified through a literature review and expert interviews, were screened using the fuzzy Delphi method. Methods such as MARCOS are highly sensitive to a large number of factors. At this stage, 20 drivers were eliminated, and nine drivers were selected for final ranking. Drivers with a defuzzified number greater than 0.7 were considered for final analysis using the MARCOS method. In this study, nine drivers had a defuzzified number higher than 0.7. The threshold value for evaluating and screening the drivers was set at 0.7. In most studies, the threshold value ranges from 0.5 to 0.7, and in this study, 0.7 was considered the threshold. Table 3 presents the final list of drivers along with their defuzzified numbers.

Table 3. Fuzzy Delphi Output of Screened Drivers

Defuzzified Number	Upper Limit	Median	Lower Limit	Research Drivers
0.76	0.94	0.76	0.58	Strategic partnerships between banks and FinTechs (A)
0.75	0.91	0.73	0.61	Regulatory approaches of lawmakers regarding digital financial technologies (B)
0.85	0.95	0.88	0.72	Compatibility of blockchain technology with the IT systems of the banking sector (C)
0.77	0.97	0.80	0.55	Blockchain adoption in other sectors, including the supply chain (D)
0.78	0.94	0.77	0.63	Development of smart contracts in the banking sector (E)
0.75	0.90	0.77	0.58	Corporate governance status in the country (F)
0.79	0.93	0.80	0.64	Development of open innovation in the banking sector (G)
0.84	0.95	0.85	0.71	Perceived organizational benefits (H)
0.86	1.00	0.89	0.68	Development of RegTech in the country (I)

Subsequently, the nine screened drivers were ranked using the MARCOS technique. In this process, experts' opinions were collected on a 10-point scale for each driver, based on three criteria: expert expertise, intensity of importance, and certainty. These data were combined using the arithmetic mean, resulting in a composite decision matrix. The values of this matrix were normalized using a linear method, and by multiplying the weights of the criteria with the normalized matrix, a weighted normalized matrix was obtained. The weights of the criteria were determined using the Shannon entropy method.

Table 4 shows the values of the weighted normalized matrix, with the last column indicating the row sum for each driver.

Table 4. Weighted Normalized Matrix

Si	Certainty	Intensity of Importance	Expert Expertise	Research Drivers
0.555	0.211	0.233	0.111	A
0.626	0.241	0.263	0.122	B
0.689	0.243	0.298	0.148	C
0.417	0.169	0.171	0.077	D
0.500	0.222	0.175	0.103	E
0.458	0.157	0.210	0.091	F
0.348	0.172	0.124	0.052	G
1.000	0.530	0.320	0.150	H
0.662	0.231	0.292	0.139	I
1.000	0.530	0.320	0.150	Ideal Option
0.333	0.157	0.124	0.052	Anti-Ideal Option
-	0.530	0.320	0.150	Weight of Criteria

Based on the data in

Table 4, the ideal and anti-ideal desirability of the drivers, their overall performance, and their prioritization were determined.

Table 5. Scores and Prioritization of Each Driver

f(Ki)	f(Ki-)	f(Ki+)	Ki-	Ki+	Research Drivers
0.512	0.249775	0.750225	1.667	0.555	A
0.578	0.249800	0.750200	1.880	0.626	B
0.636	0.249819	0.750181	2.069	0.689	C
0.385	0.249850	0.750150	1.252	0.417	D
0.462	0.249750	0.750250	1.502	0.500	E
0.423	0.249864	0.750136	1.375	0.458	F
0.321	0.249821	0.750179	1.045	0.348	G
0.923	0.249813	0.750187	3.003	1.000	H
0.611	0.249811	0.750189	1.988	0.662	I

According to the scores of the drivers in Table 5, the highest priorities were the perceived organizational benefits, the compatibility of blockchain technology with the IT systems of the banking sector, the development of RegTech in the country, and the regulatory approaches of lawmakers regarding digital financial technologies. Practical recommendations were provided based on these prioritized drivers.

4. Discussion and Conclusion

Blockchain, as an emerging technology, is expected to transform many industries and service sectors in the near future. In the financial industry, many FinTech businesses, particularly cryptocurrency FinTechs, are based on blockchain. The banking sector, as the most critical part of the financial industry, is undergoing significant changes due to financial innovations. Blockchain technology offers potential benefits for this sector, including cost reduction, increased efficiency, improved performance, enhanced security, and the elimination of intermediaries. Most studies on blockchain technology have focused on descriptive reviews of its applications and advantages across various industries and sectors [16, 17]. Some studies have specifically examined the applications of this technology in specific areas such as banking [12], supply chain [18-20], and energy (Wu & Tran, 2018). In addition to applications, researchers have also explored the challenges of this technology in various domains [21, 22]. Regarding the future of banking and new technologies, research has examined the future of banking with a focus on FinTechs and FinTech startups. These studies have explored the effects of FinTechs and their different business models on the banking industry and their collaboration patterns [23]. However, limited research has been conducted on the future of blockchain technology and its impact on the banking sector, with most studies focusing on niche areas such as marketing and advertising [24].

Given the research gap in the area of banking and blockchain, this study aimed to identify and analyze the drivers influencing the future of banking with a focus on blockchain. To this end, 29 drivers were initially identified through a literature review and interviews with banking experts. These drivers were screened using expert evaluation questionnaires and the fuzzy Delphi method. Nine drivers were selected for final prioritization using the MARCOS method. These drivers were evaluated based on three criteria: expert expertise, importance, and certainty. According to the MARCOS output, the perceived organizational benefits, the compatibility of blockchain technology with the IT systems of the banking sector, the development of RegTech in the country, and the regulatory approaches of lawmakers regarding digital financial technologies were the most important drivers.

Practical recommendations were provided based on these key drivers. Senior banking managers are highly sensitive to the benefits and advantages of any technology before its implementation. The cost-benefit logic of senior managers leads them to thoroughly examine the tangible advantages and applications of a technology. Therefore, developing tools that list the benefits and applications of blockchain technology in the banking sector and demonstrate its added value from various dimensions—such as economic, social, and cultural considerations, human resources, system and process improvements, customer satisfaction, and services—would encourage banking managers to adopt this technology.

Another important consideration is a systemic approach to the implementation of new technologies. If new technologies are not compatible with the systems, structures, and processes of the bank, their application will bring significant risks and challenges. Functional disruptions, lack of synergy, and conflicts between departments may ultimately weaken banking performance and cause frustration among managers. This frustration could lead to skepticism towards future innovations and act as a barrier to innovation for years. In addition to structural and systemic compatibility, training employees to use and interact with these technologies is crucial.

RegTech helps financial institutions, such as banks, automate compliance mechanisms and manage risks related to regulatory obligations and reporting. Furthermore, this technology allows banks to make informed decisions based on real-time data provided by the system. These data highlight the actual compliance risks faced by the bank and provide insights into how to mitigate and manage these risks. In the future, more governments will invest in RegTech to ensure the security of their citizens. This will lead to greater investment in developing effective regulatory tools. Experts predict that artificial intelligence (AI) will also be incorporated into RegTech in the future. AI and machine learning will create tools that enhance financial data monitoring processes, making them more accurate, cost-effective, and agile. Therefore, banks can leverage RegTech to identify and analyze the challenges and risks of implementing blockchain technology and ensure its compatibility with their systems and structures. Additionally, banks can use RegTech to predict technology trends and enhance customer security.

One of the concerns and risks for senior banking managers regarding the use of new technologies, particularly blockchain, is weak regulatory frameworks and legal ambiguities. Legal uncertainties make banks apprehensive about the consequences of adopting and collaborating with these technologies in the future, which may also stifle startup innovations. In this regard, some recommendations include considering all stakeholders in the technology during the legislative process, adopting comprehensive and fair regulations instead of biased regulations, and focusing legislative efforts by eliminating or weakening parallel regulatory bodies.

For future research, studies on the future of banking with a focus on blockchain, the development of an optimal scenario for blockchain technology adoption in the banking sector, and an analysis of the future drivers of the insurance industry with a focus on this technology are suggested. Additionally, due to the significant role of RegTech in the optimal performance of the banking sector during the implementation of new technologies, identifying and analyzing the factors influencing the development of RegTech in the financial industry is recommended as a valuable research avenue.

Authors' Contributions

Authors equally contributed to this article.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

All procedures performed in this study were under the ethical standards.

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