Identifying and Analyzing the Barriers to the Development of Iranian FinTechs in the Financial Industry

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Abstract

FinTechs play a significant role in enhancing services within the financial industry through the introduction of new innovations and technologies. However, Iranian FinTechs have not experienced considerable growth due to various barriers and exhibit limited diversity. The majority of Iranian FinTechs are payment-based. Given this challenge, the present study seeks to identify and analyze the most significant barriers to the development of Iranian FinTechs in the financial industry. This research is applied in nature and employs a quantitative methodology. The theoretical population of the study consists of FinTech experts in the country, and sampling was conducted based on expertise in the field of financial technologies using the judgmental method. The sample size for the study was 10 individuals. Initially, 24 barriers to FinTech development were identified through a review of the literature and structured interviews with experts. These extracted barriers were filtered using expert evaluation questionnaires and the fuzzy Delphi method. Eleven barriers with a defuzzification value greater than 0.7 were selected for final prioritization. The final barriers were examined using prioritization questionnaires and the Kokusho method. Since the content validity index of all extracted barriers exceeded 0.79, all research questionnaires were deemed to have acceptable validity. The prioritized barriers included: limited depth and diversity of financial markets in Iran, closed innovation policies of large financial institutions, lack of customer trust in innovative financial services, and the low budget for research and development projects in large financial institutions.

Keywords: *Financial technology, Financial industry, FinTech, Barriers, Development*

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1. Introduction

The financial industry, as one of the critical sectors of the service-based economy, plays a significant role in the economic development of countries. Many nations across the globe have shifted their economies from industry towards services [1]. Key service sectors that have gained attention include tourism, healthcare, financial services, and banking [2]. For instance, in the Middle East, the United Arab Emirates is striving to become a major international financial center by developing FinTechs and introducing new financial technologies and innovations [3, 4].

The financial industry comprises a collection of financial institutions such as banks and insurance companies, whose aim is to provide new and effective financial services to customers. FinTechs and financial startups play a crucial role in advancing the financial industry. FinTechs are businesses that leverage artificial intelligence and digital technologies to offer innovative financial services [5]. In recent years, FinTechs have experienced considerable growth in terms of both diversity and quality [6, 7]. Some types of FinTechs include payment, insurance, financing, wealth management, investment, and cryptocurrency [8].

FinTech, a combination of "financial" and "technology," refers to the design, delivery of products, and provision of financial services through information technology [9]. The history of technological innovation in finance began with the introduction of checks as a payment instrument (1945). Subsequently, American banks created the first credit card (1958), and automated teller machines (ATMs) were introduced in 1967 to assist in processing financial transactions. In the 1990s, with the support of internet advancements, online banking emerged [10]. Therefore, FinTech companies are those that utilize new financial technologies to deliver more efficient financial services, fostering innovation in financial services. Some FinTech companies compete directly with banks, while others collaborate with them, offering services to banks [11].

Financial technology, referred to as FinTech, is a link between technology and capital. When technology and finance merge, they create a reciprocal effect, generating a multilayered impact that is greater than the sum of its parts. FinTech encompasses activities and businesses that, using modern software capabilities, provide financial services on a broader scale beyond geographical boundaries. FinTechs can be viewed as banking and financial technology startups aiming to surpass the conventional boundaries of intermediaries. Financial technology is an area of financial services that is fundamentally technology-driven. FinTech also pertains to startups, digital companies, or even long-established financial institutions that employ new technologies to deliver financial services [12-14].

FinTech has had a profound impact on the traditional financial industry. After the 2008 credit crisis, the financial industry landscape drastically changed due to financial technology innovations [15]. FinTech pursues three primary goals. The first goal is mobile payment, exemplified by WeChat Pay and Apple Pay. The second goal involves the execution of smart contracts, with some Chinese brands like Jingdong being active in this area. Peer-to-peer lending is also classified under smart connectivity. The third significant goal is blockchain, which has gained considerable importance. The critical features of these three core FinTech objectives are instant connectivity, live data, credit scoring, and updates.

By leveraging digital technologies rooted in the Fourth Industrial Revolution, such as artificial intelligence, blockchain, business intelligence, and big data, FinTech startups are developing, testing, and delivering a wide range of innovative financial services, such as digital payment solutions, which create new opportunities and disrupt traditional banking [16]. FinTech innovation positively impacts the profitability of financial institutions, including banks. Traditional banking feels highly threatened by FinTechs, which is why, in recent years, banks have moved to acquire or partner with FinTech startups to offer higher-quality services [17].

In recent years, extensive research has been conducted in the FinTech domain. One of the critical areas of FinTech research involves examining and analyzing collaboration models between banks and FinTechs, as well as the effects and risks FinTechs pose to banks [18-22]. Additionally, some studies have explored the future of this industry, focusing on the role of FinTech [23-26]. Some research has aimed at identifying drivers, trends, and potential futures for FinTechs and related technologies [12, 14, 27].

Despite the acceptable growth of FinTechs in various countries, their development faces many limitations and challenges. One of the most significant challenges for FinTechs is the negative and destructive perception from large financial institutions, such as banks and insurance companies [28, 29]. These major institutions fear that if FinTechs grow, their role and significance in the financial industry will be greatly diminished. However, in recent years, some banks have sought to improve their service quality and diversity by supporting FinTechs and

collaborating with them on research and development projects. The opportunities and threats FinTechs pose to large financial institutions, such as banks and insurance companies, form an important part of the research literature [8, 22, 30, 31].

Another significant challenge and obstacle facing FinTechs in various countries is weak and unsupportive regulation [32-34]. Regulators often overlook FinTech institutions and associations, and legal drafts rarely achieve completion with their involvement. In Iran, the FinTech Association, as an influential entity in the FinTech domain, has received little attention from regulators. Due to the numerous challenges and obstacles in Iran, the majority of FinTech businesses are payment-based, playing a marginal role in the financial industry [33].

Identifying and managing challenges can contribute to the growth and development of various types of FinTechs in Iran. Past research has primarily focused on one or a few specific challenges, such as regulatory issues. Other studies have addressed the obstacles and challenges facing specific types of FinTechs, such as payment-based FinTechs. Therefore, a review of previous research reveals a gap in the field of barriers to FinTech development in the country. Given the importance and role of FinTechs in the national economy and financial industry, as well as the existing gap in identifying and analyzing FinTech development barriers, the present study aims to identify and prioritize the barriers to the development of Iranian FinTechs. Based on the aforementioned points, the research questions of this study are as follows:

1. What are the barriers to the development of Iranian FinTechs in the financial industry?
2. What are the most significant barriers to the development of Iranian FinTechs in the financial industry?

2. Methodology

The aim of the present study is to identify and prioritize the barriers to the development of Iranian FinTechs. For this purpose, the fuzzy Delphi and KOKOSO methods were used. Both the fuzzy Delphi and KOKOSO methods are quantitative in nature, utilizing quantitative data for analysis. The fuzzy Delphi method was employed to screen the barriers to the development of Iranian FinTechs, while KOKOSO was used to analyze and prioritize the final barriers. Given the quantitative nature of the methods employed, this study adopts a multi-method quantitative approach. Additionally, due to the relevance of the findings for the financial industry and FinTechs, the research is applied in its orientation.

The barriers to the development of Iranian FinTechs were identified through a literature review and structured interviews with experts. Initially, reputable databases such as Elsevier, Emerald, and Magiran were searched using keywords like "FinTech," "FinTech challenges," and "financial industry." To enhance the extracted list from the literature, interviews were also conducted with five experts for qualitative insights. These interviews were evaluated using thematic analysis.

Subsequently, to screen the extracted barriers, screening questionnaires and the fuzzy Delphi method were applied. The fuzzy Delphi method is primarily used for the preliminary assessment and screening of factors. In the next step, the screened barriers were analyzed using prioritization questionnaires and the KOKOSO method. The validity of the research questionnaires was assessed using the content validity index. The content validity index for all the extracted barriers was higher than 0.79, indicating acceptable validity for all components of the questionnaires.

The experts in this study included members of the FinTech Association, managers of Iranian FinTech companies, and prominent FinTech researchers. The criteria for selecting experts were their educational background, expertise in FinTech and related technologies, work experience in this field, and research and executive activity. All experts held a PhD and had research and practical experience in the FinTech domain. The sampling method in this study was judgmental, based on expertise in the FinTech field. The sample size for this study was 10 individuals.

The present research was conducted in three stages. In the first stage, barriers to the development of Iranian FinTechs were identified through a literature review and interviews with FinTech experts. In the next stage, these barriers were screened using the fuzzy Delphi technique. In the third stage, the priority level of the final barriers to the development of Iranian FinTechs was determined using the KOKOSO method.

To screen barriers in this study, the fuzzy Delphi method was used. This method is a single-stage technique and highly efficient. The execution algorithm for the fuzzy Delphi screening includes the following steps [35]:

Selection of the appropriate spectrum for fuzzification of linguistic expressions;

Fuzzy aggregation of the fuzzified values;

Defuzzification of the values;

Selection of the threshold intensity and screening of the criteria.

In this study, the KOKOSO method was used to prioritize the barriers to the development of Iranian FinTechs. This method prioritizes criteria with high accuracy using data from the fuzzy best-worst and fuzzy WASPAS methods and is recognized as one of the most modern and reliable ranking methods. The steps of the KOKOSO method are as follows [36]:

Step 1: In this stage, a decision matrix is developed based on the experts' opinions regarding the factors and options. The well-known 10-point spectrum was used in this study.

Step 2: In this part, the values of the decision matrix are normalized. Normalization is a common process in all multi-criteria decision-making techniques. In this step, the decision matrix is normalized using the following formulas. The first formula is used for positive indicators, and the second formula is applied for negative indicators. In the formulas below, max Xij and min Xij refer to the maximum and minimum values of each column, respectively. After normalization, all data are placed between 0 and 1.

$$\text{for positive indicators: } r_{ij} = \frac{x_{ij} - \min_i x_{ij}}{\max_i x_{ij} - \min_i x_{ij}}$$

$$\text{for negative indicators: } r_{ij} = \frac{\max_i x_{ij} - x_{ij}}{\max_i x_{ij} - \min_i x_{ij}}$$

Step 3: In this step, the weighted sum (S) and weighted product (P) for all options and factors (in this case, the barriers in the study) are calculated using the following formulas. In the formulas below, Wj is the weight of the indicators that are input into the KOKOSO method. The Si values are derived from the weighted sum formula, and the Pi values are derived from the WASPAS technique.

$$S_i = \sum_{j=1}^{n} (w_j r_{ij}),$$

$$P_i = \sum_{j=1}^{n} (r_{ij})^{w_j},$$

Step 4: In this section, the scores for the options and factors are calculated based on three strategies using the following formulas. The first formula represents the arithmetic mean of the WSM and WPM scores, while the second formula shows the relative scores of WSM and WPM compared to the most desirable options. The third formula is a compromise between the WSM and WPM models. The parameter λ is determined by the decision-maker, but a value of 0.5 provides considerable flexibility.

$$k_{ia} = \frac{P_i + S_i}{\sum_{i=1}^{m} (P_i + S_i)},$$

$$k_{ib} = \frac{S_i}{\min_i S_i} + \frac{P_i}{\min_i P_i},$$

$$k_{ic} = \frac{\lambda(S_i) + (1-\lambda)(P_i)}{\left(\lambda \max_i S_i + (1-\lambda)\max_i P_i\right)}, \quad 0 \le \lambda \le 1.$$

Step 5: In this section, the final score is calculated using the following formula. This formula represents the geometric and arithmetic mean of the three strategies from the previous step. The higher the score (k) for an option or factor, the more dominant and superior that option or factor is.

$$k_i = (k_{ia} k_{ib} k_{ic})^{\frac{1}{3}} + \frac{1}{3}(k_{ia} + k_{ib} + k_{ic}).$$

3. Findings

In this study, 18 barriers were initially identified through a literature review. The researchers examined reputable databases such as Magiran, Elsevier, and Emerald. Additionally, interviews were conducted with five experts, leading to the addition of six more barriers to the list. In total, 24 barriers were extracted. The content validity index for all barriers was above 0.79, indicating acceptable validity for all the identified barriers. The 24 barriers, identified from the literature review and expert interviews, were screened using the fuzzy Delphi technique. Eleven barriers, with a defuzzified value greater than 0.7, were selected for final prioritization. The threshold value in this study was set at 0.7, which is considered a strict value.

Table 1. Fuzzy and Defuzzified Values

Defuzzified Value	Upper Bound	Median	Lower Bound	Factor
0.85	0.96	0.85	0.74	Limited depth and diversity of financial markets in Iran
0.56	0.63	0.56	0.49	Low competition intensity in the financial industry

0.86	0.94	0.88	0.75	Weak and non-participatory technology regulation in Iran
0.63	0.73	0.64	0.53	Presence of parallel regulatory institutions
0.88	0.97	0.89	0.77	Dominance of a security-centric view among regulators
0.51	0.60	0.52	0.40	Lack of financial support for startups
0.87	0.96	0.88	0.78	Dominance of bank-based financing in the country
0.52	0.61	0.52	0.43	Weak fee structure
0.41	0.50	0.41	0.32	Broad financial sanctions and limitations
0.82	0.90	0.84	0.73	Weak international financial industry connections
0.48	0.55	0.48	0.40	Poor performance of incubators and science parks
0.56	0.63	0.57	0.49	Security challenges
0.86	0.93	0.89	0.76	Lack of customer trust in innovative financial services
0.89	0.97	0.89	0.80	Closed innovation policies in large financial institutions
0.87	0.95	0.88	0.78	Low budget for research and development projects in large financial institutions
0.57	0.64	0.57	0.50	Negative and destructive perception of financial institutions toward startups and FinTechs
0.82	0.90	0.82	0.73	Low economic complexity
0.84	0.93	0.84	0.75	Large-scale migration of startups and skilled workforce abroad
0.45	0.56	0.44	0.35	Religious and legal restrictions on the use of certain technologies and business models
0.38	0.49	0.37	0.28	Weak information technology infrastructure in the country
0.33	0.41	0.34	0.25	Lack of entrepreneurial culture in the country
0.40	0.50	0.41	0.30	Low financial literacy of users
0.86	0.96	0.84	0.77	High risk of collaboration with FinTechs
0.57	0.69	0.57	0.45	Presence of specialized managers in the field of digital technologies in large financial institutions

Eleven barriers had a defuzzified value greater than 0.7. These barriers were: limited depth and diversity of financial markets in Iran (F1), weak and non-participatory technology regulation in Iran (F2), dominance of a security-centric view among regulators (F3), dominance of bank-based financing in the country (F4), weak international financial industry connections (F5), lack of customer trust in innovative financial services (F6), closed innovation policies in large financial institutions (F7), low budget for research and development projects in large financial institutions (F8), low economic complexity (F9), large-scale migration of startups and skilled workforce abroad (F10), and high risk of collaboration with FinTechs (F11).

Next, the final barriers were ranked and analyzed using the KOKOSO method. Initially, FinTech experts were asked to express their opinion on the importance of each barrier to FinTech development on a 10-point scale. The decision matrix was developed based on the opinions of 10 experts. Due to the large volume of data, the decision matrix values are presented in two separate tables:

Table 2. Decision Matrix for FinTech Development Barriers (First Five Experts)

First Expert	Second Expert	Third Expert	Fourth Expert	Fifth Expert	Research Barriers
10	10	9	10	10	F1
4	3	4	5	4	F2
6	7	5	5	7	F3
6	5	5	6	5	F4
3	2	2	3	4	F5
7	8	7	7	6	F6
10	9	9	8	10	F7
6	7	6	5	7	F8
3	3	4	3	2	F9
5	4	4	5	5	F10
5	3	5	4	3	F11

The decision matrix data for the remaining five experts are presented in Table 3.

Table 3. Decision Matrix for FinTech Development Barriers (Next Five Experts)

Sixth Expert	Seventh Expert	Eighth Expert	Ninth Expert	Tenth Expert	Research Barriers

9	10	10	9	9	F1
6	5	4	4	4	F2
7	6	8	6	6	F3
4	5	5	6	5	F4
4	5	4	4	5	F5
7	8	7	7	6	F6
9	8	8	7	8	F7
8	7	7	6	6	F8
4	3	5	4	3	F9
5	4	3	3	2	F10
5	5	4	4	5	F11

These data were normalized using the fuzzy formula based on the second stage of the KOKOSO technique. The normalized values of the decision matrix for the research barriers are presented in the following:

Table 4. Normalized Decision Matrix for Research Barriers (First Five Experts)

First Expert	Second Expert	Third Expert	Fourth Expert	Fifth Expert	Research Barriers
1	1	1	1	1	F1
0.143	0.125	0.286	0.315	0.250	F2
0.429	0.625	0.429	0.315	0.625	F3
0.429	0.375	0.429	0.473	0.375	F4
0	0	0	0	0.250	F5
0.571	0.750	0.714	0.630	0.500	F6
1	0.875	1	0.788	1	F7
0.429	0.625	0.571	0.315	0.625	F8
0	0.125	0.286	0	0	F9
0.143	0.125	0.286	0.315	0.375	F10
0	0.125	0.429	0.158	0.125	F11

Normalized Matrix Data for the Next Five Experts are Presented in Table 5.

Table 5. Normalized Matrix of Research Barriers (Next Five Experts)

Sixth Expert	Seventh Expert	Eighth Expert	Ninth Expert	Tenth Expert	Research Barriers
1	1	1	1	1	F1
0.500	0.286	0.143	0.286	0.167	F2
0.667	0.429	0.714	0.571	0.500	F3
0.167	0.143	0.286	0.429	0.500	F4
0.167	0.286	0.286	0.429	0.167	F5
0.667	0.714	0.714	0.714	0.500	F6
1	0.714	0.714	0.714	0.833	F7
0.833	0.571	0.571	0.571	0.500	F8
0	0	0.286	0.286	0.167	F9
0.167	0.143	0	0	0.167	F10
0.333	0.286	0.143	0.143	0.333	F11

Based on the values of the normalized matrix, the weighted sum (S) and weighted product (P) matrices are calculated according to the formulas in Step 3 of the KOKOSO method. The following display the data for the weighted sum matrix of the research barriers. The values of the weighted sum matrix result from multiplying the normalized matrix values by the weight of expert opinions. The weight of all experts' opinions was considered equal to 0.1. This weight was derived by dividing 1 by 10. Finally, the values of this matrix must be combined using the S index. The S index is equivalent to the row sum of the weighted sum matrix, similar to the desirability of each option in the weighted average method.

Table 6. Weighted Sum Matrix (S) for Research Barriers (First Five Experts)

First Expert	Second Expert	Third Expert	Fourth Expert	Fifth Expert	Research Barriers
0.1	0.1	0.1	0.1	0.1	F1
0.014	0.013	0.029	0.032	0.025	F2
0.043	0.063	0.043	0.032	0.063	F3
0.043	0.038	0.043	0.047	0.038	F4
0	0	0	0	0.025	F5
0.057	0.075	0.071	0.063	0.05	F6
0.1	0.088	0.1	0.079	0.1	F7
0.043	0.063	0.057	0.032	0.063	F8
0	0.013	0.029	0	0	F9
0.014	0.013	0.029	0.032	0.038	F10
0	0.013	0.043	0.016	0.013	F11

Table 7. Weighted Sum Matrix (S) for Research Barriers (Next Five Experts)

Sixth Expert	Seventh Expert	Eighth Expert	Ninth Expert	Tenth Expert	S Index	Research Barriers
0.1	0.1	0.1	0.1	0.1	1	F1
0.029	0.014	0.029	0.017	0.025	0.252	F2
0.067	0.043	0.071	0.057	0.05	0.532	F3
0.017	0.014	0.029	0.043	0.05	0.362	F4
0.017	0.029	0.043	0.017	0.016	0.226	F5
0.067	0.071	0.071	0.071	0.05	0.646	F6
0.083	0.071	0.071	0.071	0.083	0.863	F7
0.083	0.057	0.057	0.057	0.05	0.562	F8
0	0.029	0.029	0.017	0.016	0.117	F9
0.017	0.014	0.029	0	0.157	0.157	F10
0.033	0.029	0.014	0.033	0.208	0.208	F11

In addition to the weighted sum matrix, the weighted product (P) matrix must also be calculated. The method for calculating this matrix and the P index follows the WASPAS technique. To derive the weighted product matrix, each value in the normalized matrix must be raised to the power of the weight of the expert opinions. The weight of each expert's opinion is 0.1. The values of the weighted product matrix are presented in the following.

Table 8. Weighted Product Matrix (P) for Research Barriers (First Five Experts)

First Expert	Second Expert	Third Expert	Fourth Expert	Fifth Expert	Research Barriers
1	1	1	1	1	F1
0.823	0.812	0.882	0.891	0.871	F2
0.919	0.954	0.919	0.891	0.954	F3
0.919	0.907	0.919	0.928	0.907	F4
0	0	0	0	0.871	F5
0.946	0.972	0.967	0.955	0.933	F6
1	0.987	1	0.976	1	F7
0.919	0.954	0.946	0.891	0.954	F8
0	0.812	0.882	0	0	F9
0.823	0.812	0.882	0.891	0.907	F10
0	0.812	0.919	0.832	0.812	F11

Table 9. Weighted Product Matrix (P) for Research Barriers (Next Five Experts)

Sixth Expert	Seventh Expert	Eighth Expert	Ninth Expert	Tenth Expert	P Index	Research Barriers
1	1	1	1	1	10	F1
0.933	0.882	0.823	0.882	0.836	8.635	F2
0.960	0.919	0.967	0.946	0.933	9.362	F3
0.836	0.823	0.882	0.919	0.933	8.973	F4
0.836	0.882	0.882	0.919	0.836	5.226	F5

0.960	0.967	0.967	0.967	0.933	9.567	F6
1	0.967	0.967	0.967	0.982	9.846	F7
0.982	0.946	0.946	0.946	0.933	9.417	F8
0	0.882	0.882	0	0	4.294	F9
0.836	0.823	0	0	0.974	5.974	F10
0.896	0.882	0.823	0.823	0.695	7.695	F11

The final score of the FinTech development barriers in the KOKOSO method is obtained using the K index. To measure the K index, the three indices Ka, Kb, and Kc must be calculated. The Kc index is derived from combining the Ka and Kb indices. The value of λ in this article was considered to be 0.5, which is very common in previous research. Finally, the K index is derived from the arithmetic and geometric averages of the three indices Ka, Kb, and Kc. The four evaluation indices for the barriers to the development of Iranian FinTechs in the KOKOSO method, along with the final ranking of each barrier, are presented in Table 10.

Table 10. Four Indices for Evaluating Research Barriers in KOKOSO

Research Barriers	Ka	Kb	Kc	K	Barrier Rank
Limited depth and diversity of financial markets in Iran	0.117	10.876	1	5.081	1
Weak and non-participatory technology regulation in Iran	0.095	4.165	0.808	2.373	7
Dominance of a security-centric view among regulators	0.105	6.727	0.899	3.437	5
Dominance of bank-based financing in the country	0.099	5.184	0.849	2.802	6
Weak international financial industry connections	0.057	2.585	0.49	1.46	10
Lack of customer trust in innovative financial services	0.109	7.749	0.928	3.851	3
Closed innovation policies in large financial institutions	0.114	9.669	0.974	4.61	2
Low budget for research and development projects in large financial institutions	0.106	6.996	0.907	3.546	4
Low economic complexity	0.047	2	0.401	1.151	11
Large-scale migration of startups and skilled workforce abroad	0.065	2.733	0.557	1.581	9
High risk of collaboration with FinTechs	0.084	3.57	0.718	2.057	8

According to the K index, the barriers of limited depth and diversity of financial markets in Iran, closed innovation policies in large financial institutions, lack of customer trust in innovative financial services, and low budget for research and development projects in large financial institutions have the highest priority and importance. The higher the K index for a factor, the more prioritized that factor is. Practical suggestions for the research are presented based on the most significant barriers.

4. Discussion and Conclusion

The present study aimed to identify and prioritize the barriers to the development of Iranian FinTechs. The research was conducted in three stages. In the first step, the barriers to the development of Iranian FinTechs were identified through a literature review and interviews with FinTech experts. In the second step, the extracted factors were screened using expert evaluation questionnaires and the fuzzy Delphi method. Among 24 factors, 11 with a defuzzified value greater than 0.7 were selected for final ranking and analysis. The remaining factors were prioritized using prioritization questionnaires and the KOKOSO method. Based on the scores of the factors, the barriers of limited depth and diversity in Iran's financial markets, closed innovation policies of large financial institutions, lack of customer trust in innovative financial services, and the low budget for research and development projects in large financial institutions had the highest priority.

The first factor, limited depth and diversity in Iran's financial markets, was identified through interviews. Financial markets are one of the key areas where financial innovations and new technologies can play a significant role. However, financial markets in Iran have not evolved sufficiently. The Iranian stock market has shallow depth, and the diversity of financial instruments is limited. Iran's economy is primarily bank-centric, with large industries mainly financed through banks. The limited financial instruments make it difficult for many asymmetric projects, such as energy smartification plans, to secure funding. In addition to the capital market, other new financial markets, such as cryptocurrencies, have not developed adequately in Iran, leaving many stakeholders confused in this area. To deepen and diversify financial markets, actions such as attracting foreign investors, building trust among investors, educating shareholders, eliminating insider trading, and legislating for new markets will contribute to the growth and development of FinTechs.

The second factor is the closed innovation policies of large financial institutions. This factor has been highlighted in many studies [16, 20, 28, 37], as a significant challenge in the relationships between financial institutions, such as banks, and FinTechs. Many banks, fearing the loss of their position in the financial industry, maintain a closed system towards their environment. Gradually, however, the negative perception of large financial institutions towards FinTechs is shifting towards strategic collaboration and partnership. Large financial institutions, such as banks, can benefit from new financial innovations by adopting an open innovation approach and sharing their data with startups. A significant portion of the technologies used by FinTechs are data-driven. In fact, without data, FinTechs cannot effectively operate in the financial industry. By sharing their data with FinTechs, banks can achieve mutual benefits. Moreover, the risks in the relationship between large financial institutions and FinTechs can be mitigated by utilizing RegTech capacities, which can predict and manage future risks in these relationships.

The third factor is the lack of customer trust in innovative financial services. This barrier has also been confirmed in previous research [38, 39]. The lack of customer trust in innovative financial services stems from factors such as security concerns, low financial literacy, and unfamiliarity with new technologies. In this regard, the development of security protocols and standards for new technologies, legislation for innovative technologies, and education on new financial services by large financial institutions, such as banks, can help build customer confidence and increase their inclination towards these innovations. Additionally, communicating the benefits and advantages of these technologies to customers is essential. If customers understand the benefits and advantages of these innovations, they are more likely to adopt them.

Finally, it should be noted that Iranian banks have limited budgets for research and development, which serves as a fundamental barrier to leveraging the capacities of FinTechs. A suitable strategy to overcome this barrier is for banks and large insurance companies to collaborate and participate in research and development projects. This strategy will lead to better utilization of financial resources and result in the adoption of integrated technologies and innovations at the financial industry level.

Future research could explore specific areas such as identifying barriers and challenges for Iranian FinTechs in financing and investment domains, as well as the capabilities of RegTechs in managing the relationships between large financial institutions and FinTechs.

Authors' Contributions

Authors equally contributed to this article.

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Declaration of Interest

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Ethical Considerations

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

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