



Identifying and prioritizing financial resilience strategies of financial technological business with a risk management approach

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ABSTRACT

The purpose of resilience is to create the capacity to improve a system for survival, from a shock and facing change and instability, to resist the effects of shock by creating the capacity to adapt and grow. In this research, using the opinions of 10 FinTech business experts, 4 different types of business uncertainty were identified and based on that, 12 types of possible problems were determined. In the following, using error analysis technique and RPN calculation, the most important failure modes were identified. In the next step, through interviews with experts, the number of resilience as well as strategies before and after failure were determined, and using the FDAHP approach, strategies were prioritized and the most important strategy was identified. The results indicate that to increase financial resilience in FinTech businesses with a risk management approach, strategies to pay attention to legal infrastructure; Establishment of risk and exchange rate fluctuation committee; Development of strategic and operational plans for financial resilience; Transparency in providing financial and entrepreneurial services to contracting companies; Ensuring financial stability in FinTech businesses and identifying alternative suppliers are the most important strategies. Finally, solutions for the development of the most important strategies were presented as practical suggestions for FinTech businesses.

Keywords: resilience, financial resilience, FinTech businesses, ranking and prioritization, Fuzzy FDAHP method

1. Introduction

Following the developments that have emerged with the expansion of the use of the Internet, traditional banks and financial institutions found that they have no choice but to accept the transition process, on the other hand, the financial crisis of 2008 revealed the inefficiency of the traditional banking and investment system. In this way, a suitable opportunity was provided for startups and technology field activists to enter the financial field. In this regard, FinTech creates the innovative application of technology in financial services. Fintech in the economy, relying on the financial industry, causes a transformation in the field of investment and access to financial resources, advanced payment systems, customer relationship management, issuing invoices to all businesses and conducting online transactions through mobile phones or tablets with higher efficiency. With the help of FinTech, the conditions for easy liquidity flow, more efficient capital management, and the attraction of safe and stable financial resources are provided, and the result of these changes is the promotion of financial resilience and economic prosperity.

In recent years, many researches have been conducted regarding the failure rate of financial startups. In a report of all the startups launched in 2014, only 26% entered 2018 and the rest failed during the previous years (Mansfield, 2019). In summary, it can be said that the main problem of financial startups is their high failure rate, and the main goal of this research is to design the financial resilience model of these technology-based businesses. Today, we witness the failure of some Iranian entrepreneurs and businesses, as well as the high rate of their exit from entrepreneurial activities. Also, the results of some researches show that the business environment of Iran is low capacity (Mohammadi Eliasi, 2015), and it is institutionally weak and has legal, political and economic institutional weaknesses (Kansik, 2012). In addition to that, in the context of such a business environment, the conditions of international sanctions and economic crises of recent years have also become the cause, dealing with the issue of "financial resilience" as an issue can be one of the areas highlight the less noticed national technology or FinTech in the country; So that they and Iranian businesses can be resilient against disruptions by using appropriate strategies and give appropriate responses to internal and external crises and disturbances or adapt

themselves to it. Therefore, the development of technologies can be seen as an engine for major transformations at macroeconomic levels.

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An important and key part in the development of financial markets is the introduction of new financial technologies that emerge with innovation and the addition of creativity in financial management styles and the use of digital infrastructure. At the end of 2014, investment in this sector reached 157 billion dollars. After that, the term FinTech started to catch on and it grew rapidly with the prospect of becoming a huge industry. Financial resilience is the capacity to respond, adapt, and change in response to sudden adverse events, which is often considered a desirable feature for organizations that seek to prepare, recover, and adapt in the face of crises, shocks, and other adverse financial events. (Kanter and Iseri-Say, 2012; Lagerström et al., 2010; Fulk et al., 2003). The capacity to process major failures appears to be particularly important for FinTech firms, most of which face the wide-ranging consequences of internal crises and external shocks, including resource depletion, productivity changes, and employee stress (Gail Pico, & Yechie, 2012; Graham, 2007). This is despite the fact that financial resilience seems to be accepted as a fundamental characteristic in many companies facing uncertain conditions (Barma, 2016; Fulk et al., 2003). In this regard, in this article, appropriate strategies to increase the financial resilience of FinTech businesses before and after failure will be identified and prioritized.

Financial resilience

Currently, the majority of societies, organizations and individuals are in diverse and changing environmental conditions. Despite the fact that these environments

can provide significant opportunities for the success and growth of organizations, they can also create important threats and challenges. All kinds of events such as natural hazards, political unrest, economic instability and human errors can severely threaten the organizational performance. As a result, to overcome these complex and destructive events, the need to develop financial resilience in organizational systems and infrastructure in the direction of technological businesses is highlighted. The question that comes to mind is why some of the financial organizations have remained strong despite these incidents and continue their growing path, and some others are able to face environmental risks in such conditions. Are they doomed to fail? What is the secret of success and distinction of such organizations? The need to achieve sustainable survival and success has caused many organizations to reconsider their business priorities and focus on adapting to business changes and responding appropriately to environmental requirements. In order to achieve this important new concept called financial resilience has entered the science of management. Resilience refers to the capacity of a company to survive, adapt and grow against changes. Today, due to the expansion of information technology, the increase in the penetration of the Internet and the simultaneous evolution of the virtual space, the need for innovation in the financial industry is felt more. Fintech or financial technology is the application of technological innovations to improve financial functions. Fintech is a combination of the two words Technology and Financial, i.e. technology and financial affairs, and is considered one of the transformative and growing fields of the fourth industrial revolution technologies that change the shape, improve the quality and create the financial landscape along with Cost reduction and services have become more diverse (Gamber et al., 2017). Business financial resilience is defined as the ability to predict, avoid and adjust positively against financial disturbances and changes. This ability is a combination of the necessary capacities to restore efficiency after a disruption and create the necessary capacities before responding to a crisis. Therefore, flexibility and adaptability for all businesses has become an important necessity in today's rapidly changing environment, and the need to create a strong attitude towards it is strongly felt for all businesses.

Features of financial resilience of technological business

In the last four decades, technological businesses have become an increasingly important global phenomenon and have been seen as a necessity for growth, differentiation and competitive advantages at regional and national levels. In these businesses, leaders and senior management teams of small and large companies that use technology to create, deliver and sustain value for their stakeholders apply. Also, in these businesses, requests are made for the personnel of regional economic development representatives who attract investments in production technologies, and the primary function of these technological businesses is to gather a combination of specialized people and heterogeneous assets in order to create and Maintaining value for the company is through shared experiences and discoveries (Abdi Jamiraan et al., 2016). Although the importance and interest in the development of technology-based businesses is increasing and technology-oriented companies have attracted a lot of attention (media and policymakers), however, research-based knowledge is still limited. Recent research has provided some concepts, answers and ideas, but there is still a need for more research. And the research about this type of technology-based activities is still a new and raw topic.

The indicators and characteristics of financial resilience can be considered as including: assets and resources, dynamic competitiveness, learning and culture (Chitsazan et al., 2017). If the organization is improved in terms of resilience, when a negative disturbance occurs in the normal functioning of the organization, the resilient organization can improve its situation by adapting to the changes and reconstructing the damaged items (Cantor and Isser-Say, 2015). In conditions of risk and uncertainty, promoting the organization's resilience characteristics will be able to increase the organization's success against risk. Therefore, a resilient organization is less damaged by environmental incidents and discontinuities (Bernard and Bamra, 2018). Therefore, according to the literature review and the existence of environmental disturbances, it is necessary to examine resilience in organizations and try to improve resilience to deal with crises.

In general, the basic premise of financial engineering is engineering. The basis of financial

engineering knowledge is financial economics or the application of economic principles in the dynamics of the securities market, especially the design, pricing and risk management of financial contracts. The basis of financial engineering knowledge is financial economics or the application of economic principles in the dynamics of the stock exchange, especially the design, pricing and risk management of financial contracts. With the development and complexity and diversity in business, the function of financial engineering has become very diverse. Because financial processes in business have become complicated and diverse. Business excellence and organizational excellence are the main goals of economic enterprises in the field of business competition. Therefore, solving complex problems and predicting the future that leads to organizational excellence, and this is in the group of solving complex financial problems, is considered one of the necessities of the third millennium. The tremendous developments in technology and the application of more and more mathematical and scientific methods such as engineering in processes caused special attention to be paid to these developments and methods. Financial processes are not excluded from this category. This

field tries to adapt the existing financial instruments with market conditions and design new financial instruments to use profitable opportunities in the market. In the last few decades, large service and manufacturing companies have tried to attract stray funds in the financial markets by designing instruments such as bonds, options, forward contracts and stocks, or reforming the existing financial markets. Invest in profitable industrial and service companies.

Research background

In the field of resilience and its various dimensions, various studies and researches have been carried out since long ago. From the planning of war activities of Iranian sultans and other ancient civilizations to modern issues of resilience such as financial resilience, all of them, including research and experiences, are considered to be the subject of resilience. Of course, in the field of financial resilience of FinTech businesses, few studies have been done inside the country, but in the following, a number of similar studies are mentioned:

Table 1- Summary of the research done in financial resilience

Row	research fellow	Research year	Research results
1	Partoi et al.	2022	factors of foresight, strategic partnership with FinTech, and the existence of a risk analysis system, respectively, have the highest priority in banking resilience.
2	Gholami et al.	2022	Causal factors affecting the implementation of the policy model are: legislation, legal infrastructure, government facilities, legal incentives, reforming macro-government policies. In addition, in this path, factors such as technological infrastructure, creation of communication channels have an intervening role, and the factors of intention to use technology, culture of participation, entrepreneurial culture, risk taking, learning and training, trust building play a background role in this regard.
3	Shah Karmi Zule et al.	2021	The factors affecting the increase of resilience are in the following four dimensions: <ul style="list-style-type: none"> ✓ Causal conditions include expansion of communication, resistance economy, clarification of laws and empowerment of management; ✓ Interactive strategies including organizational planning, expanding service quality, effective organizational strategy ✓ Intervening conditions include government support and regulation of financial policies ✓ Background conditions include organizational participation, capable human resources and employee satisfaction
4	Qara Daghi and Esfahani	2019	Financial resilience depends on various factors, each of these factors plays a role in the degree of resilience of a company. Using these factors, companies were divided into three categories in terms of financial resilience. <ul style="list-style-type: none"> ✓ About 30% of companies in the strong category ✓ 37% in the middle category ✓ 33% of companies are in the weak category
5	Lan-San et al.	2022	The results show that low-income families and single-parent families with dependent children did well, but were still in a weaker position considering their ability to save regularly. In general, households with a low income rate could not obtain sufficient financial information through counseling, or receive a specialized counseling.

Row	research fellow	Research year	Research results
6	Robert L. Clark and Olivia S. Mitchell	2022	Policies and programs that increase financial resilience can help low- and moderate-income households withstand economic shocks and better meet unexpected income needs.
7	Crystal C. Hall	2021	One of the constant concerns in the world of public policymakers has been the lack of personal savings. The results of this research are to present psychology as a tool to improve the financial security of the most vulnerable people and expand it in a deeper way.
8	Tang, Hianiman, and Koja	2019	The researchers' criterion has the ability to effectively measure the cycles of variable resilience in the fluctuating ranges of the stock markets. Also, large-scale resilience cycles are relatively sensitive to stability range fluctuations.

Research Methodology

This research has been formed by choosing the qualitative research method and based on the ideas from the opinions and views of 10 experts, professors and academic board members, CEOs of financial technology businesses and financial institutions. After conducting the interviews, the questionnaire was compiled and approved by the experts, in this regard, the challenges and gaps were identified, and in order to solve them, ideas were proposed to replace the related questions. Finally, based on the questions and questionnaire compiled in the fields of financial technological businesses and the related risk management approach, the researcher presented a conceptual model of resilience for financial technological businesses, which includes the stage of turmoil to recovery from failure. Turbulence in technological businesses in the form of uncertainty in technology, financing, demand and control affects the activities of financial technological businesses. Uncertainty causes 12 types of failure. Any of these failure modes may lead to disruption and disorder in financial technology businesses. Therefore, strategies must be determined to prevent failure. Two company resilience parameters, namely "probability of failure" and "failure tolerance threshold" have a direct impact on the occurrence of failure. But if these two parameters cannot prevent failure. Failure, which is the same as stopping in updating and providing infrastructure for financial technology businesses, happens with a certain "failure intensity". After a failure occurs, an attempt must be made to recover from the failure and reach the initial or more favorable

state. For this purpose, resilience strategies are also determined after failure. Three resilience parameters namely "recovery time", "recovery cost" and "recovery quality" are effective on recovery from failure. After determining resilience strategies, important strategies were identified using the FDAHP method.

data analysis

In this research, using library data and interviews with experts, there are 12 failure modes: 1) learning problems and culture of resilience in the field of FinTech; 2) environmental problems and related factors; 3) human capital problems; 4) organizational problems and related factors; 5) marketing problems; 6) problems of crisis and crisis management; 7) problems caused by strategic and entrepreneurial thinking; 8) problems caused by demand management; 9) financing problems; 10) problems of technological factors; 11) planning problems in FinTech processes and 12) process supply problems were identified as failure modes affecting financial risk in the direction of FinTech businesses. In the following, a conceptual model of resilience was developed for financial technology businesses with a risk management approach, which starts from the stage of confusion and uncertainty and continues until recovery from failure, and all the concepts of resilience, including uncertainty and failure states, resilience parameters Recovery, preventive resilience strategies, resilience strategies after failure and recovery from failure are integrated in this model, which is shown in figure number one.

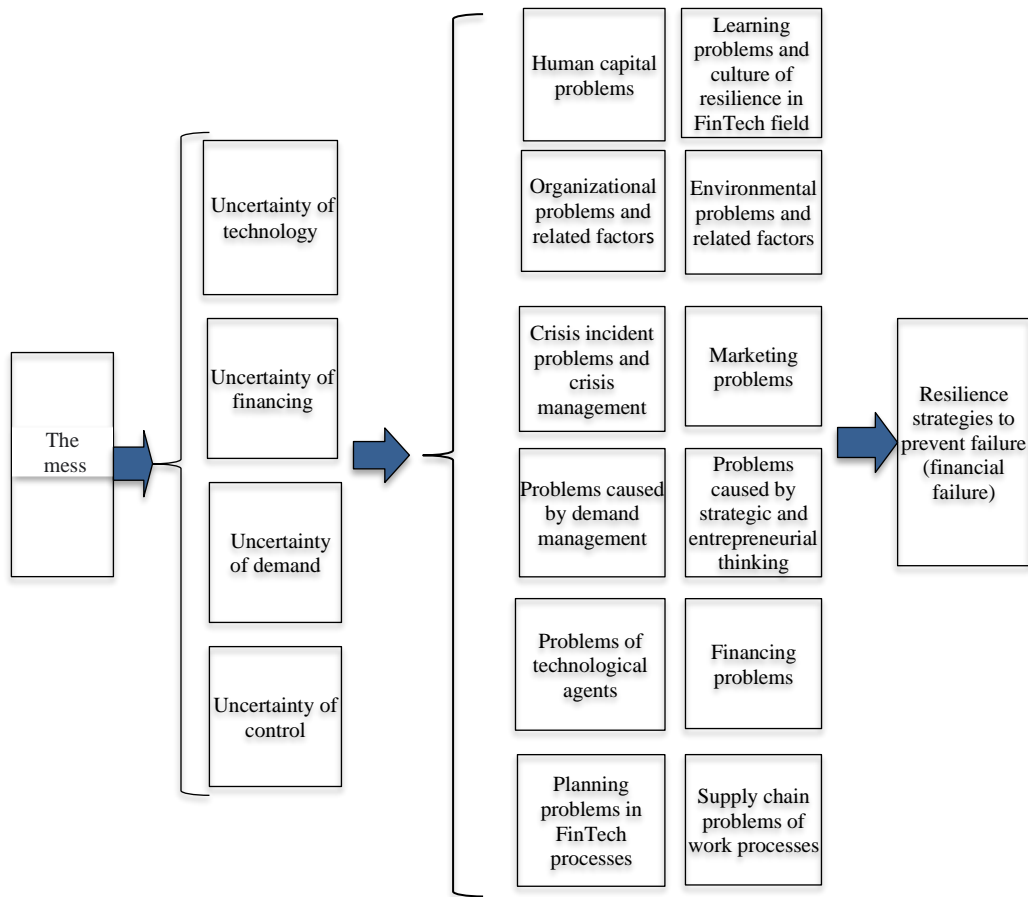


Figure 1: Conceptual model of resilience of financial technology businesses

In the conceptual model, six resilience parameters 1) severity of failure, 2) probability of failure, 3) tolerance threshold for failure, 4) speed (time) of recovery, 5) quality of recovery and 6) cost of recovery have been identified, which explain resilience in businesses. It is FinTech and also other industries can be influenced and affected by it. In addition, the strategies obtained from FFMEA and FFAAO techniques are also present in this model and the whole model has been evaluated and approved. Then, according to the optimal Pare-To law, the factors with the highest score (top 20%) were identified as effective factors. After examining the above failure situations, the FMEA team determined resilience strategies before failure in the financial resilience of technological businesses according to table number two:

In this research, the fuzzy FAAO technique is used to identify resilience strategies after failure. The research experts formed the FAAO team to analyze the failure

modes and for each of the failure modes, they rated the recovery time, recovery cost and recovery quality as linguistic variables. After examining the four failure modes, the FAAO team determined resilience strategies after failure in FinTech businesses as follows:

- 1) Ensuring financial stability in FinTech businesses
- 2) Coordinating financial capability with FinTech business strategy and operations
- 3) Creating a risk management department (resilience department)
- 4) Fintech business planning and budgeting in relation to risk management
- 5) Establishing strong internal controls in relation to FinTech business accounting

Table 2- selected resilience strategies before failure in the financial technology business

Failure modes	RPN	strategies
Financing problems	365	1) Financial Security 2) Improved savings rate 3) Revival of small businesses 4) profitability ratio 5) Liquidity 6) Market risk 7) Establishing strong internal controls related to financial technology business accounting 8) Quality of service delivery 9) Structure and ownership 10) Financial stability 11) Invest in FinTech 12) Capital management 13) cost management
Problems of technological agents	281	1) Technology infrastructure 2) Communication channels 3) Information flow 4) Technology management 5) Monitoring and using new technologies
Supply chain problems of work processes	211	1) Identifying and evaluating supply chain risks and prioritizing them 2) Focus on demand management and supply and production planning based on 3) Forming a supply chain joint action team to deal with the crisis 4) Customer demand 5) Marketing and sales 6) Production of goods 7) Competitors
Environmental problems and related factors	171	1) Legislation 2) Legal infrastructure 3) Government facilities 4) Legal incentives 5) Macro policies of governance 6) Political factors 7) Economic Strength

Prioritizing financial resilience strategies and parameters with the FDAHP approach

After refining the research components and strategies obtained through FMEA and FAAO methods and techniques, table number three was obtained. In this table, the dimensions and parameters affecting the increase of business resilience (before and after the failure) were categorized into six areas, which are the dimensions of probability of occurrence, tolerance threshold and severity of failure related to before the failure, and the dimensions of recovery time, recovery quality and the cost of recovery is related to the failure.

Next, the importance of each of the above strategies was determined. To determine the priority level of the research components, the following steps were taken:

A) Forming a paired matrix of experts' opinions

At this stage, the desired components are first grouped in related dimensions and then important and priority components are identified for each group separately. For this purpose, a square matrix was formed in each group with n components extracted from the consensus of experts (n number of extracted components of each group) and their opinions were obtained from the experts regarding the importance of the components relative to each other. In the following, the fuzzy numbers of experts' opinions were determined in three sections: low limit, middle limit, and upper limit, and the average of fuzzy numbers was

determined, which is before failure, after failure, and each of the related components in its own section, as described below. be:

1- Before failure: Prioritization before failure was determined with the following steps. First, the average of the fuzzy numbers of experts' opinions about the final three components was determined, which is specified in table number three.

Calculating the fuzzy weight of the components: After forming the fuzzy pair matrix, in this step, the fuzzy weight of the components or Z_i was determined, whose values are specified in table number four.

De-weighting of the components and prioritization: Finally, after determining the de-fuzzified value of the weight of the components (W_i), the importance of each of the research components was determined, the results of which are specified in tables number five and six.

As it is clear in the above table, according to experts, the most important factor affecting the development and increase of resilience is the severity of failure, and the tolerance threshold is next.

Table 3: Fintech business parameters and strategies

Dimensions	Financial resilience strategies
Probability of failure (D1)	Developing strategic and operational plans for financial resilience (C1)
	Coordinating financial ability with strategy and operationalizing resilience programs in FinTech (C2)
	Improving financing policies (C3)
	Attention to the establishment of strong internal controls in relation to the accounting of financial technological businesses (C4)
	Promoting FinTech customer satisfaction (C5)
Tolerance threshold (D2)	Loss bearing allocated based on liquidity position (C6)
	Recruiting and maintaining more diligent and specialized employees (more efficient) (C7)
	Increasing financial literacy (C8)
	Establishment of risk and exchange rate fluctuation committee (C9)
Recovery speed (D3)	Increasing organizational agility (C10)
	Fintech business planning and budgeting in relation to risk management (C11)
	Transparency in providing financial and entrepreneurial services to contracting parties (C12)
	Formation of specialized departments for each type of failure (C13)
Recovery quality (D4)	Dealing with unscrupulous customers (C14)
	Improving communication with the customer and putting the customer first (C15)
	Development of new financial services to attract resources (C16)
	Management of bank assets and liabilities (C17)
Recovery Cost (D5)	Accelerating FinTech logistics planning (C18)
	Identifying alternative suppliers (C19)
	Amendment of related financial laws and regulations (C20)
Severity of Failure (D6)	Ensuring financial stability in FinTech businesses (C21)
	Attention to information and communication incentives (C22)
	Using the FAAO technique to control the quality of service delivery (C23)
	Increasing the frequency of risk assessment (C24)
	Developing transparency in customer management (C25)
	Attention to legal infrastructure (C26)
	Attention to teaching and learning (C27)

Table 3: Average fuzzy numbers before failure

AVERAGE	category one			category two			Category three		
	L	M	U	L	M	U	L	M	U
probability of occurrence	1.000	1.000	1.000	0.683	0.812	0.995	0.500	0.625	0.892
Tolerance	1.464	1.232	1.005	1.000	1.000	1.000	0.567	0.698	0.771
Severity of failure	2.000	1.600	1.121	1.764	1.433	1.297	1.000	1.000	1.000

Table 4: Fuzzy weight of components before failure

	u	m	l
z1	0.961	0.798	0.699
z2	0.918	0.951	0.940
z3	1.133	1.319	1.522
sum	3.012	3.067	3.161

Table 5: Weighting of components and ranking

Wi	L	M	U
W1	0.232	0.265	0.319
W2	0.312	0.316	0.305
W3	0.505	0.438	0.376

Table 6: Priority of components before failure

The title of the component	rank	Non-phase weight
probability of occurrence	3	0.27
Tolerance	2	0.31
Severity of failure	1	0.44

2- **After failure:** prioritization after failure was determined with the following steps. First, the average of the fuzzy numbers of the experts' opinions about the three final components was determined, which is specified in table number seven.

Calculating the fuzzy weight of the components: after forming the fuzzy pair matrix, in this step, the fuzzy weight of the components or Zi was determined, whose values are specified in table number eight.

De-weighting of the components and prioritization: Finally, after determining the de-fuzzified value of the weight of the components (Wi), the importance of each of the research components was determined, the results of which are specified in tables number nine and ten.

As it is clear in the above table, according to the experts, the most important factor affecting the development and increase of resilience after failure is the recovery time, followed by recovery cost. Now,

after determining the most important priorities before and after the failure, it is necessary to prioritize each component and their related strategies.

Calculating the fuzzy weight of the components: after forming the fuzzy pair matrix, in this step, the fuzzy weight of the components or Zi was determined, whose values are specified in table number twelve.

De-weighting of the components and prioritization: Finally, after determining the de-fuzzified value of the weight of the components (Wi), the importance of each of the research components was determined, the results of which are specified in tables number thirteen and fourteen.

As it is clear in the above table, according to the experts, the most important factor affecting the development and increase of resilience before failure in the component of failure severity, attention to legal infrastructure, and the next rank is the increase in the number of times of risk assessment.

Table 7: Average fuzzy numbers after failure

AVERAGE	category one			category two			Category three		
	L	M	U	L	M	U	L	M	U
Recovery cost	1.000	1.000	1.000	0.683	0.708	1.97	0.625	0.725	1.892
Recovery quality	1.464	1.412	0.507	1.000	1.000	1.000	0.524	0.628	0.771
Recovery time	1.600	1.379	0.529	1.908	1.592	1.297	1.000	1.000	1.000

Table 8: Fuzzy weight of components after failure

	u	m	l
z1	1.550	0.801	0.753
z2	0.731	0.961	0.915
z3	0.882	1.300	1.451
sum	3.164	3.061	3.119

Table 9: weighting of components and ranking

Wi	L	M	U
W1	0.238	0.253	0.490
W2	0.289	0.304	0.231
W3	0.459	0.411	0.279

Table 10: Priority of components after failure

The title of the component	rank	Non-phase weight
Recovery cost	2	0.31
Recovery quality	3	0.27
Recovery time	1	0.37

Table 11: Average fuzzy numbers related to failure severity

strategies	C23	C23	C23	C24	C24	C24	C25	C25	C25	C26	C26	C26	C27	C27	C27
C23	1.000	1.000	1.000	0.674	0.736	0.857	1.102	1.321	1.758	0.423	0.532	0.852	1.002	1.274	1.312
C24	1.48368	1.358696	1.166861	1.000	1.000	1.000	0.612	0.732	0.845	0.325	0.532	0.672	215	0.876	0.942
C25	0.907	0.757	0.569	1.634	1.366	1.183	1.000	1.000	1.000	0.638	0.745	0.928	2.141	2.258	2.439
C26	2.364066	1.879699	1.173709	3.076923	1.879699	1.488095	1.567	1.342	1.078	1.000	1.000	1.000	0.059	734	1.256
C27	0.998004	0.784929	0.762195	0.004651	1.141553	1.061571	0.467	0.443	0.410	16.949	0.001	0.796	1.000	1.000	1.000

Table 12: Fuzzy weight of fracture intensity components

	u	m	l
Z1	1.109876	0.919967	0.793615
Z2	0.910037	0.857452	2.293415
Z3	1.08787	1.117103	1.151598
Z4	1.187754	5.109087	0.923765
Z5	0.766236	0.222117	0.51647
sum	5.061774	8.225726	5.678863

Table 13: weighting of components and ranking

Wi	L	M	U
W1	0.139749	0.11184	0.219266
W2	0.403851	0.10424	0.179786
W3	0.202787	0.135806	0.214919
W4	0.162667	0.621111	0.234652
W5	0.090946	0.027003	0.151377

Table 14: Priority of failure severity components

rank	Non-phase weight	The title of the component
4	0.321354	Using the FAAO technique to control the quality of service delivery (C23)
2	0.376533	Increasing the frequency of risk assessment (C24)
3	0.358465	Developing transparency in customer management (C25)
1	0.473128	Attention to legal infrastructure (C26)
5	0.206087	Attention to teaching and learning (C27)

2- Tolerance threshold: Prioritization of the tolerance threshold was determined with the following steps. First, the average of the fuzzy numbers of experts' opinions about the final five components was determined, which is specified in table number fifteen.

Calculating the fuzzy weight of the components: after forming the fuzzy pair matrix, in this step, the fuzzy weight of the components or Zi was determined, whose values are specified in table number sixteen.

De-weighting of the components and prioritization: Finally, after determining the de-fuzzified value of the weight of the components (Wi), the importance of each of the research components was determined, the results of which are specified in tables number seventeen and eighteen.

As it is clear in the above table, according to the experts, the most important factor influencing the increase of financial resilience before failure and in

line with the threshold of tolerance is the establishment of the risk committee and exchange rate fluctuations, and the next rank is the increase of organizational agility.

Table 15: Average fuzzy numbers related to tolerance threshold

strategies	C5	C6	C6	C7	C7	C7	C8	C8	C8	C9	C9	C9	C10	C10	C10
C6	1.000	1.000	1.000	0.587	0.756	0.859	0.741	0.795	0.801	0.123	0.218	0.357	1.268	1.268	1.264
C7	1.703578	1.322751	1.164144	1.000	1.000	1.000	0.658	0.692	0.822	0.387	0.462	0.492	1.962	3.265	4.251
C8	1.350	1.258	1.248	1.520	1.445	1.217	1.000	1.000	1.000	0.497	0.571	0.619	0.712	0.775	0.801
C9	8.130081	4.587156	2.801112	2.583979	2.164502	2.03252	2.012	1.751	1.616	1.000	1.000	1.000	0.059	0.275	0.357
C10	0.788644	0.788644	0.791139	0.509684	0.306279	0.235239	1.404	1.290	1.248	16.949	3.636	2.801	1.000	1.000	1.000

Table 16: Fuzzy weight of tolerance threshold components

	u	m	l
Z1	0.791422	0.698382	0.583843
Z2	1.14886	1.06665	0.968277
Z3	0.944852	0.957399	0.937904
Z4	1.268437	1.367476	1.200538
Z5	0.917682	1.025351	1.570977
sum	5.071253	5.115257	5.26154

Table 17: weighting of components and ranking

Wi	L	M	U
W1	0.110964	0.136529	0.15606
W2	0.184029	0.208523	0.226544
W3	0.178257	0.187165	0.186315
W4	0.228172	0.267333	0.250123
W5	0.298578	0.20045	0.180958

Table 18: Priority of tolerance threshold components

rank	Non-phase weight	The title of the component
5	0.29836	Loss bearing allocated based on liquidity position (C6)
3	0.387114	Recruiting and maintaining more diligent and specialized employees (more efficient) (C7)
4	0.361996	Increasing financial literacy (C8)
1	0.433205	Establishment of risk and exchange rate fluctuation committee (C9)
2	0.404509	Increasing organizational agility (C10)

3- Probability of occurrence: The prioritization of the probability of failure was determined with the following steps. First, the average of the fuzzy numbers of the experts' opinions about the final five components related to the occurrence of failure was determined, which is specified in the table number nineteen.

Calculating the fuzzy weight of the components: after forming the fuzzy pair matrix, in this step, the

fuzzy weight of the components or Z_i was determined, whose values are specified in Table 20.

De-weighting of the components and prioritization: Finally, after determining the de-fuzzified value of the weight of the components (W_i), the importance of each of the research components was determined, the results of which are specified in tables number twenty-one and twenty-two.

As it is clear in the above table, according to the experts, the most important factor affecting the

development and increase of the transition and sustainability before failure in line with the probability of occurrence in the first place is the development of strategic and operational plans for the financial

resilience of entrepreneurial businesses and in the rank Next is the improvement of financing policies. Similar to the prioritization process before the failure, the following steps were implemented for the recovery process after the failure:

Table 19: Average fuzzy numbers related to probability of occurrence

strategies	C1	C1	C1	C2	C2	C2	C3	C3	C3	C4	C4	C4	C5	C5	C5
C1	1.000	1.000	1.000	3.547	4.256	6.359	1.018	1.065	1.386	1.023	2.528	2.852	1.268	1.228	1.264
C2	0.281928	0.234962	0.157257	1.000	1.000	1.000	1.415	1.759	2.251	2.265	2.536	2.269	1.062	1.265	1.251
C3	0.982	0.939	0.722	0.707	0.569	0.444	1.000	1.000	1.000	3.248	3.268	4.258	1.041	1.114	1.246
C4	0.977517	0.39557	0.350631	0.441501	0.394322	0.440723	0.308	0.306	0.235	1.000	1.000	1.000	0.059	1.005	1.256
C5	0.788644	0.814332	0.791139	0.94162	0.790514	0.799361	0.961	0.898	0.803	16.949	0.995	0.796	1.000	1.000	1.000

Table 20: Fuzzy weight of failure probability components

	u	m	l
Z1	1.997146	1.696935	1.361823
Z2	1.000958	1.058037	0.991785
Z3	1.112031	1.142116	1.186076
Z4	0.539213	0.544743	0.379191
Z5	0.834253	0.895225	1.646231
sum	5.4836	5.337056	5.565106

Table 21: weighting of components and ranking

Wi	L	M	U
W1	0.244708	0.317953	0.364203
W2	0.178215	0.198244	0.182537
W3	0.213127	0.213997	0.202792
W4	0.068137	0.102068	0.098332
W5	0.295813	0.167738	0.152136

Table 22: Priority of probability components

rank	Non-phase weight	The title of the component
1	0.49031	Developing strategic and operational plans for financial resilience (C1)
4	0.364669	Coordinating financial ability with strategy and operationalizing resilience programs in FinTech (C2)
2	0.39194	Improving financing policies (C3)
5	0.232806	Attention to the establishment of strong internal controls in relation to the accounting of financial technological businesses (C4)
3	0.376336	Promoting FinTech customer satisfaction (C5)

1- Recovery time: Prioritization of recovery time was determined with the following steps. First, the average of the fuzzy numbers of the experts' opinions about the four final components in relation to the recovery time was determined, which is specified in table number twenty-three. Calculating the fuzzy weight of the components: After forming the fuzzy pair matrix, in this step, the fuzzy

weight of the components or Z_i was determined, whose values are specified in the twenty-fourth table. De-weighting of the components and prioritization: Finally, after determining the de-fuzzified value of the weight of the components (W_i), the importance of each of the research components was determined, the results of which are specified in tables twenty-five and twenty-six.

As it is clear in the above table, according to the experts, the most important factor influencing the increase of financial resilience after a failure in terms of speed and recovery time is the transparency in

providing financial and entrepreneurial services to the contracting parties and in the next rank is the organization to Bad customers.

Table 23: Average fuzzy numbers related to recovery time

strategies	C11	C11	C11	C12	C12	C12	C13	C13	C13	C14	C14	C14
C11	1.000	1.000	1.000	0.257	0.256	0.751	0.785	0.985	1.0023	0.256	0.718	1.124
C12	3.891051	3.90625	1.331558	1.000	1.000	1.000	1.011	1.185	1.364	0.756	0.937	1.238
C13	1.274	1.015	0.998	0.989	0.844	0.733	1.000	1.000	1.000	0.742	0.825	1.327
C14	3.90625	1.392758	0.88968	1.322751	1.067236	0.807754	1.348	1.212	0.754	1.000	1.000	1.000

Table 24: Fuzzy weight of recovery time components

	u	m	l
Z1	0.959072	0.652304	0.476717
Z2	1.224542	1.443127	1.313212
Z3	0.992578	0.916906	0.983322
Z4	0.857848	1.158565	1.624458
sum	4.03404	4.170902	4.39771

Table 25: weighting of components and ranking

Wi	L	M	U
W1	0.108401	0.156394	0.237745
W2	0.298613	0.345999	0.303552
W3	0.223599	0.219834	0.246051
W4	0.369387	0.277773	0.212652

Table 26: Priority of recovery time components

rank	Non-phase weight	The title of the component
4	0.251966	Fintech business planning and budgeting in relation to risk management (C11)
1	0.420827	Transparency in providing financial and entrepreneurial services to contracting parties (C12)
3	0.331625	Formation of specialized departments for each type of failure (C13)
2	0.384336	Dealing with unscrupulous customers (C14)

2- Recovery cost: Prioritization of recovery cost after failure was determined with the following steps. First, the average of the fuzzy numbers of experts' opinions about the three final components related to the cost of recovery was determined, which is specified in table number twenty-seven.

Calculating the fuzzy weight of the components: After forming the fuzzy pair matrix, in this step, the fuzzy weight of the components or Zi was determined, whose values are specified in table number twenty-eight.

De-weighting of the components and prioritization: Finally, after determining the de-fuzzified value of the weight of the components (Wi), the importance of each of the research components was determined, the

results of which are specified in tables number twenty-nine and thirty.

As it is clear in the above table, according to the experts, the most important factor affecting FinTech businesses after failure in terms of recovery cost is firstly ensuring the financial stability of FinTech businesses and in the next place is the amendment of related financial laws and regulations. is.

Table 27: Average fuzzy numbers related to recovery cost

AVERAGE	C20	C20	C20	C21	C21	C21	C22	C22	C22
C20	1.000	1.000	1.000	0.583	0.808	0.95	2.500	2.925	2.992
C21	1.715	1.237	1.053	1.000	1.00	1.000	1.500	1.628	1.971
C22	0.400	0.342	0.334	0.667	0.614	0.507	1.000	1.000	1.000

Table 28: Fuzzy weight of recovery cost components

	u	m	l
Z1	1.417	1.332	1.134
Z2	1.275	1.263	1.370
Z3	0.553	0.594	0.644
sum	3.245	3.189	3.148

Table 29: weighting of components and ranking

Wi	L	M	U
W1	0.355	0.418	0.444
W2	0.430	0.396	0.400
W3	0.202	0.186	0.174

Table 30: Priority of recovery cost components

rank	Non-phase weight	The title of the component
2	0.404	Amendment of related financial laws and regulations (C20)
1	0.408	Ensuring financial stability in FinTech businesses (C21)
3	0.187	Attention to information and communication incentives (C22)

3- Quality of recovery: prioritizing the quality of recovery after failure was determined with the following steps. First, the average of the fuzzy numbers of the experts' opinions about the five final components related to the quality of recovery after failure was determined, which is specified in table number thirty-one.

Calculating the fuzzy weight of the components: After forming the fuzzy pair matrix, in this step, the fuzzy weight of the components or Zi was determined, whose values are specified in table number thirty-two.

De-weighting of the components and prioritization: Finally, after determining the de-

fuzzified value of the weight of the components (Wi), the importance of each of the research components was determined, the results of which are specified in tables number thirty-three and thirty-four.

As it is clear in the above table, according to experts, the most important factor affecting financial resilience after failure in terms of quality of recovery is identifying alternative suppliers in the first place and speeding up the logistics planning of FinTech in the next place.

Table 31: Average fuzzy numbers related to recovery quality

strategies	C15	C15	C15	C16	C16	C16	C17	C17	C17	C18	C18	C18	C19	C19	C19
C15	1.000	1.000	1.000	0.087	0.056	2.959	2.514	4.321	2.258	0.423	0.528	0.652	0.268	0.268	0.864
C16	11.49425	17.85714	0.337952	1.000	1.000	1.000	2.415	3.759	4.951	0.565	0.596	0.669	0.962	0.265	0.251
C17	0.398	0.231	0.443	0.414	0.266	0.202	1.000	1.000	1.000	0.348	0.468	0.558	0.141	0.014	5.246
C18	2.364066	1.893939	1.533742	1.769912	1.677852	1.494768	2.874	2.137	1.792	1.000	1.000	1.000	0.959	1.005	1.256
C19	3.731343	3.731343	1.157407	1.039501	3.773585	3.984064	7.092	71.429	0.191	1.043	0.995	0.796	1.000	1.000	1.000

Table 32: Fuzzy weight of recovery quality components

	u	m	l
Z1	1.303545	0.509223	0.477388
Z2	0.775764	1.603523	1.720776
Z3	0.764908	0.20948	0.381508
Z4	1.38847	1.468277	1.630685
Z5	0.931106	3.981668	1.956728
sum	5.163792	7.772172	6.167085

Table 33: weighting of components and ranking

Wi	L	M	U
W1	0.077409	0.065519	0.25244
W2	0.279026	0.206316	0.150231
W3	0.061862	0.026953	0.148129
W4	0.264417	0.188915	0.268886
W5	0.317286	0.512298	0.180314

Table 34: Priority of recovery quality components

rank	Non-phase weight	The title of the component
4	0.263914	Improving communication with the customer and putting the customer first (C15)
3	0.386712	Development of new financial services to attract resources (C16)
5	0.189903	Management of bank assets and liabilities (C17)
2	0.422303	Accelerating FinTech logistics planning (C18)
1	0.493629	Identifying alternative suppliers (C19)

Conclusion

The dimensions and components of the development of financial resilience in fintech businesses were investigated according to the extent of dimensions and variables of the model in addition to the limitation of some failure modes in the conceptual model due to the selection of several failure modes from among all the failure modes in FMEA and FAEO techniques. Finally, to determine the priority of effective strategies on increasing financial resilience with a risk management approach (probability of failure, tolerance threshold, recovery time, recovery quality, recovery cost, and failure severity) in 27 strategies, the results were used for Each of them indicates that:

Strategies for the possibility of failure: in this dimension, the number of 5 strategies for developing strategic and operational plans for financial resilience, coordinating financial ability with the strategy and operationalizing resilience plans in FinTech, improving financing policies, paying attention to creating controls A strong internal in relation to the accounting of financial technological businesses and promoting the satisfaction of FinTech customers was expressed by the experts that after prioritizing it was determined that the most important strategy is to

develop strategic and operational plans in the direction of financial resilience, hence gaining And FinTech works should design and compile a written plan to implement strategies to increase resilience while paying attention to developing a strategic plan in the field of developing financial resilience.

The quality of recovery: in the ranking, it has been done that the result of the experts' opinion is the research in the quality of recovery after failure and returning to the equilibrium state in the organization, among the strategies for improving customer relations and putting the customer first, the development of new financial services In order to attract resources, manage bank assets and debts, accelerate FinTech logistics planning and identify alternative suppliers, the most important strategy in improving the quality of recovery is the use of alternative supplier identification solutions. These companies provide several services in order to prevent FinTech from being exposed to bankruptcy. Therefore, paying attention to the formation of a comprehensive database of suppliers and sellers of raw materials needed by FinTech companies should be their priority.

Recovery time: One of the most important components in increasing resilience in the current

conditions of the country is to be able to return to the initial state as soon as possible after a possible failure. For this purpose, the experts have developed strategies such as planning and budgeting of FinTech businesses in relation to risk management, transparency in providing financial and entrepreneurial services to contracting parties, forming specialized departments for any type of failure and organizing Customers brought up bad accounts, and finally it became clear that the most important strategy in this field is transparency in providing financial services to the contracting companies. Therefore, the design of information systems and reliable and accurate media by FinTech can help a lot in the development of quick returns.

Gambling cost: in the field of strategies related to the cost of recovery and its control, the opinion of the experts in this research in this regard, including the strategies of amending related financial laws and regulations, ensuring financial stability in FinTech businesses and paying attention to informational incentives and it was a connection that finally paying attention to ensuring financial stability in FinTech businesses became the most important strategy. Therefore, companies that provide FinTech financial services should pay special attention to the issue of sustainability reporting and targeted and sustainable development in the field of financial profitability.

Severity of failure: In this area, the strategies of using the FAAO technique to control the quality of service provision, increasing the number of times of risk assessment, developing transparency in customer management, paying attention to legal infrastructures and paying attention to training and learning by experts were proposed, according to the strategy of paying attention to legal infrastructures and increasing the frequency of risk assessment were identified as the most important strategies. The results indicate that FinTech companies should pay special attention to the legal infrastructure and how to deal with legal issues in the country or move towards attracting legal consultants.

Tolerance threshold strategy: In order to increase the tolerance threshold of FinTech companies, experts of loss tolerance strategies are allocated based on the liquidity situation, attracting and maintaining more diligent and specialized employees (more efficient), increasing financial literacy, establishing a risk committee and exchange rate fluctuations, and

increasing agility. They named an organization that was determined to be the most important strategy for the establishment of risk and exchange rate fluctuations committee in the evaluation. In this regard, paying attention to changes in exchange rates and exchange rates in financial technology exchanges will be one of the most important approaches that should be considered.

Finally, it should be mentioned that for the development of resilience in FinTech businesses, it is better to be periodically evaluated in shorter time intervals and if resilience is not improved, alternative strategies should be determined. Also, determining the team leader for each type of failure and specifying the duties of all committees in a completely specialized manner can be very useful in facing times of failure. The use of the FAAO technique, which is discussed in this research, can be very effective in solving quality problems. In addition, the use of appropriate statistical process control techniques to control high-risk financing processes and techniques and to gradually act in the process of financing and preventing high-risk risks and in the direction of valid alternatives. In this direction, ensuring the financial stability in technological businesses and the necessary coordination to create financial ability with the strategy and operations of financial technological businesses should be on the agenda of managers and trustees in each of the businesses. In any case, the creation of risk management committees (resilience committees) should be considered in improving the necessary systems and controls for available resources and maximizing the ability to cope with minimizing damage to prevent failure and damage to the business. Any kind of planning and budgeting of technological businesses in connection with financial risk management requires knowledge of internal capabilities and the feasibility of available resources, which will strengthen the business' ability in times of crisis and deal with any It becomes difficult. As much as a business can step correctly in standard frameworks by creating strong internal controls in relation to the accounting of financial technological businesses, it will certainly face threats or possible failures with less risk, and in order to succeed in this, it needs We have strict rules and standards for success so that we can run a successful and improved business.

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