



## Identifying business development challenges in knowledge-based companies (FinTech field)

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### Abstract

The purpose of this study is to identify and explain the challenges of business development in knowledge-based companies operating in the fintech sector. In terms of purpose, this research falls into the category of applied-developmental studies, and from a methodological perspective, it is an exploratory mixed-method study. In the qualitative phase, the grounded theory approach with Strauss and Corbin's systematic procedure was employed. Data were collected through semi-structured interviews with 20 experts (nine university professors and eleven fintech managers) and analyzed using MAXQDA software in three stages: open, axial, and selective coding. This process resulted in the extraction of 625 initial codes and 99 subcategories, ultimately leading to the selection of the core phenomenon of business development in knowledge-based fintech companies. In the final stage of qualitative analysis and based on the logic of theory building, the identified categories were organized into the paradigm model comprising causal conditions, contextual conditions, intervening conditions, strategies/interactions, and consequences. The resulting paradigm model indicates that factors such as managerial challenges, weak infrastructures, environmental pressures, and ineffective policies act as influencing conditions. In interaction with strategies such as focusing on open innovation, developing technological infrastructures, managing customer experience, and expanding cross-sector collaborations, these factors shape the path of fintech business development. In the quantitative phase, the conceptual model derived from grounded theory was tested using Interpretive Structural Modeling (ISM). In this stage, the identified variables were placed in the Structural Self-Interaction Matrix (SSIM), and the hierarchical relationships among them were determined. The results revealed that factors such as fostering a culture of adaptability, enhancing customer experience strategies, and improving operational and sustainability infrastructures play a fundamental and driving role in fintech business development. In contrast, outcomes such as increased competitiveness, market share growth, and improved productivity represent the final-level consequences of this process. The findings of this research provide both theoretical and practical insights for policymakers, managers, and entrepreneurs in the fintech sector to design effective strategies and overcome barriers to the development of knowledge-based companies.

**Keywords:** Business development challenges, Knowledge-based companies, FinTech, Grounded theory, Interpretive Structural Modeling (ISM).

**Paper Type:** Original Research

### 1. Introduction

In recent decades, one of the major challenges faced by small and medium-sized enterprises (SMEs) has been their inability to evolve into large or multinational companies and their weakness in competitiveness at the regional and global levels. This issue is especially evident in innovation- and technology-based fields such as fintech (Ramezi et al., 2019). Fintech, which broadly refers to financial technologies, is considered one of the leading and rapidly transforming sectors in the knowledge-based economy and plays a key role in transforming and improving financial and banking structures (Karimi Tararani et al., 2020). In this context, knowledge-based companies active in this field face specific challenges that, if not properly addressed and managed, can significantly impact their ability to grow and develop (Mirkamali & Zahedi, 2012). Experiences and research over the past few decades show that business development plays a vital role in shaping global markets and guiding them onto new paths (Khorsandi Pishkenari et al., 2022). Business development refers to the quantitative and qualitative improvement of a company's performance, which can occur either horizontally or vertically. For example, a company may expand its product or service offerings by pursuing geographic expansion strategies or by merging with or acquiring suppliers or distributors. Furthermore, if a company possesses strong technical and marketing capabilities, it can expand its product portfolio and enhance the range of goods and services offered (Fesharaki et al., 2017). With countries moving toward knowledge-based economies, the existence of so-called "knowledge-based companies" becomes

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essential. These companies emerge in knowledge economies where knowledge serves as the primary support, defined as the effective use of data and information through individual talents, skills, ideas, and human insight (Park et al., 2020). Despite their high potential, knowledge-based companies active in fintech face numerous challenges in business development. These include financial limitations, regulatory and legal complexities, difficulties in attracting and retaining specialized human resources, as well as the instability of financial markets and rapid technological changes (Gorjizadeh et al., 2023). On the other hand, opportunities in this field – such as the growing use of modern financial technologies, access to global markets, and increasing demand for digital financial services – require appropriate and innovative development strategies (Su et al., 2018). Despite their unique characteristics and essential role in sustainable development and economic growth, knowledge-based companies unfortunately have a higher probability of failure compared to large corporations. The role of these companies in technological development, economic growth, and job creation is only meaningful if they survive; new companies must maintain their operations over a significant period to contribute meaningfully. Therefore, small knowledge-based institutions are simultaneously the primary engines of economic growth and technological development, while also being highly vulnerable to various problems and high failure rates (Bagheri-Nejad, 2016). Enhancing knowledge in the specialized domain of a knowledge-based company itself constitutes an innovation and results in product/service differentiation in the target market, along with the improvement of indigenous knowledge and national development. Compared to other industries, knowledge-based businesses are distinct in terms of high levels of workforce education and skill, intensive research and development activities, a strong inclination toward exports, a high proportion of intangible assets (intellectual capital), and products/services with short life cycles and high gross profit margins. Additionally, knowledge-based companies often utilize advanced technologies or innovative processes in their products, services, or operations. In fact, the development and establishment of knowledge-based companies in recent years has been an entrepreneurial movement, with universities and academic communities playing a central role in increasing their numbers and advancing their capabilities. Ranking the challenges of product development in knowledge-based companies indicates that market research is the most significant challenge, while inaccurate estimates of the target market are considered the least problematic (Zhou et al., 2021). Su et al. (2018) proposed a model for knowledge dissemination within knowledge-based companies to foster their development. Their study examined factors such as initial information and knowledge, knowledge distribution, and the availability of knowledge among individuals. Managerial performance regarding the improvement of knowledge dissemination was identified as one of the most critical factors in enhancing knowledge diffusion and improving company performance. Mansouri et al. (2017) prioritized the factors influencing the development of knowledge-based companies as follows: technological factors, socio-cultural factors, human resources, institutional support for technology production, government-related factors, and infrastructural elements. The present study aims to identify and explain the business development challenges faced by fintech-oriented knowledge-based companies, given their important role in sustainable development and economic growth, their contribution to innovation and transformation in the financial industry, and their inherent vulnerability, in order to help improve their development processes.

## 2. Literature Review

### 2.1. History of the Term "FinTech"

In the 2000s, before the term "FinTech" became widely used in the context of information and communication technologies applied to the financial industry, various theories existed regarding the origin of this term in financial literature. For instance, Millian et al. (2019) believe that the term FinTech first appeared in academic literature in 1972. This view refers to the early days of using modern technologies in the financial sector – when technological innovations were emerging and still in their infancy. On the other hand, Puschmann (2017) claims that the term was likely used in the early 1990s, particularly in the context of the Smart Card Consortium, by John Reed, the chairman of Citigroup. This period marked the formation and development of new technologies in the financial industry, which facilitated financial interactions and the evolution of smart payment systems. At that time, financial technologies were still at an early stage, with many initial ideas and concepts gradually taking shape (Tija, 2017). By the late 2000s, the term FinTech gained more prominence, especially after the global financial crisis. This crisis clearly revealed the profound impact of financial technologies on the structure and performance of the financial industry, prompting increased attention to technical innovations in the sector. For example, Omarini (2018) argues that the word FinTech was first introduced in 2006 and quickly gained popularity, sparking a significant transformation in the financial services industry. These transformations included the emergence of new tools and technologies that led to widespread changes in how financial services were delivered (Sangwan et al., 2019). Historically, the term FinTech primarily described technologies used within the structure of financial institutions.

These technologies were typically limited to computing and information systems designed to improve efficiency and accuracy in financial data processing. However, with rapid technological advancements and changing market needs, the term gradually expanded and now encompasses any innovation in the financial services industry. As such, FinTech is now a broad concept that includes all technologies that enhance and transform financial processes, products, and services, becoming one of the main pillars of digital transformation in the financial industry (Goldstein et al., 2021). Since 2010, FinTech has increasingly penetrated various segments of the financial industry, contributing to the expansion and transformation of global financial and banking services. The emergence of new technologies such as blockchain, cryptocurrencies, artificial intelligence, and machine learning has led to fundamental changes in how financial services and investments are delivered. These advancements have enabled the creation of new business models, improved transaction security and efficiency, and enhanced customer experience in the financial sector (Nosrati et al., 2017). In summary, the history of FinTech reflects a continuous path from the early applications of technology in the financial sector to widespread and innovative transformations in financial and banking services. This ongoing evolution has allowed FinTech to become one of the primary drivers of change and advancement in the global financial industry, with significant impacts on service delivery, risk management, and financial interactions at the global level (Mirrazi, 2019).

utilizing sensitivity and fuzzy analysis, with a specific focus on road and belt projects. Nunes and Abreu (2020) consider open innovation project risks through the lens of social network analysis. Marle (2020) contributes to project risk management by applying complex systems and agile project management techniques. Nunes, Abreu et al. (2021) develop a model for managing risks in collaborative projects aimed at fostering knowledge creation and promoting sustainable business practices. Antoniou (2021) presents several models dedicated to evaluating delay risks in road projects. Alvand, Mirhosseini et al. (2023) identify and assess risks in construction projects using the SWARA, FMEA, and WASPAS methodologies within a fuzzy context, specifically targeting construction projects in Iran. Bepari, Narkhede et al. (2024) perform a comparative study on project risk management focusing on failure structures. Erlita, Amin et al. (2023) explore multi-step project risk management for construction projects in the food manufacturing industry. Senova, Tobisova et al. (2023) propose innovative approaches for project risk evaluation leveraging Monte Carlo methodologies. Nikolaenko and Sidorov (2023) analyze risks associated with information technology projects. Alawneh, Jannoud et al. (2024) introduce a novel method for evaluating project risk in sustainable construction projects within developing countries. He, Wang et al. (2024) assess advancements and systematic risk analysis concerning investment safety in water transfer projects and operational failures. Nge'tich and Munene (2024) investigate the impacts of project risk management on road projects in Kenya, while Gichohi, Iravo et al. (2024) examine its influence on the performance of road construction projects in the same region. Lastly, Khalilzadeh, Banihashemi et al. (2024) propose a hybrid stepwise approach that integrates multi-criteria methodologies with multi-objective optimization models for effective project risk management. Upon reviewing the literature, we observe that some studies, such as those conducted by Andrić, Wang et al. (2019) and Alvand, Mirhosseini et al. (2023), primarily concentrate on risk identification. In contrast, other research efforts, including those by Dandage, Mantha et al. (2018), Antoniou (2021), and Senova, Tobisova et al. (2023), focus on risk evaluation. A considerable number of studies address risk management, with notable contributions from Nunes, Abreu et al. (2021), and Marle (2020). However, there is a scarcity of research that concurrently examines all three dimensions: identification, evaluation, and management. Moreover, Alvand, Mirhosseini et al. (2023) and Alawneh, Jannoud et al. (2024) integrate uncertainty into their risk evaluation processes. Methodologically, the studies by Erlita, Amin et al. (2023) and Alvand, Mirhosseini et al. (2023) employ multi-criteria decision-making (MCDM) techniques. Heydarpour et al. (2023) provide a DEA and AHP hybrid model to evaluate contractors performance. Rasouli et al. (2023) evaluate risk factors in solar energy investment. They have a strategic approach for Iran market. Ayough et al. (2022) provide a new interactive method based on multi criteria preference degree functions for solar power plant site selection. Overall, the literature review reveals a significant gap in addressing the evaluation and management of risks specifically associated with startup projects. In particular, there is a lack of research utilizing hybrid techniques that combine statistical analysis, MCDM, and multi-objective mathematical models for effective project risk management. Given the growing importance of startup projects in the contemporary business landscape, it is essential to focus more intently on the risks they face. To address this identified gap, this research introduces several key innovations:

- Defining a hybrid approach that integrates risk identification, evaluation, and management
- Focusing on the specific risks associated with startup projects
- Considering the uncertainty in the risk assessment process
- Optimizing the risk response strategies
- Developing a model along with proposed solution

## 2.2. Knowledge-Based Economy in the Evolution of Economic Thought

In a knowledge-based economy, knowledge is the primary driver of growth, wealth creation, and employment across all activities. According to this definition, a knowledge-based economy is not limited to a few high-tech industries. Rather, in such an economy, all economic activities – including mining and agriculture – rely, in some form, on knowledge. Moreover, the knowledge required to build a knowledge-based economy is not solely technological; it also encompasses cultural, social, and managerial knowledge (Shabani & Abdolmaleki, 2011). The knowledge-based economy – also referred to by various terms such as the new economy, digital economy, and electronic economy – is considered a contemporary phenomenon in economic thought and development. This line of thinking in the modern era is a result of the increasing recognition of the role of knowledge and information in the production function and its scale, as well as factors such as globalization, the rapid growth of information and communication technology (ICT), and the rising demand for mass production. Nevertheless, the roots of the knowledge-based economy can be traced back to the thoughts of economists from past decades and even centuries. However, rapid advancements in knowledge-based technologies have made this concept a focal point in today's world (Shabani & Abdolmaleki, 2011). Rostow was among the first economists to formally emphasize the role of knowledge in production and development. In his historical analysis of economic development, he outlined five stages of economic growth for currently developed countries: the traditional society, the preconditions for take-off, the take-off, the drive to maturity, and the age of high mass consumption. Another economist who specifically addressed the role of knowledge in the economy was Joseph Schumpeter of the Austrian school. In Schumpeter's view, entrepreneurship serves as the driving force and architect of development. A lack of movement and stagnation in entrepreneurship leads to economic and social stagnation within capitalist systems. According to him, the process of economic development begins with entrepreneurs disrupting the prevailing modes of economic activity and creating a new environment. This environment eliminates inertia and enables economic transformations. Schumpeter believed that expanding economic activities through innovation leads to the development of new inventions and production methods, which in turn brings a wide range of new products to market (Kangard et al., 2019).

## 3. Research Methodology

This study is classified as applied-developmental research in terms of its objective, as it seeks to identify the challenges of business development in knowledge-based companies operating in the financial technology (FinTech) sector. From a methodological perspective, this research follows an exploratory mixed-method approach, with the qualitative phase conducted using the Grounded Theory strategy. The selection of this approach was based on the unique characteristics of the manufacturing sector in terms of management, structure, culture, and its operational environment. Moreover, theories derived from previous studies conducted in other countries were found to be insufficiently aligned with Iran's specific legal and commercial context. Grounded Theory, as a qualitative strategy, enables the development of a coherent set of concepts through the investigation of a central phenomenon – such as business development in knowledge-based companies – providing a comprehensive explanation of the related theory. In this phase, Strauss and Corbin's systematic approach was applied to analyze the data. Due to its structured and step-by-step nature, this method was deemed highly suitable for qualitative data collection and analysis. The software used for coding and analysis was MAXQDA. Participants were selected using purposeful sampling in conjunction with a theoretical sampling strategy. In total, 20 experts were interviewed, and data collection continued until theoretical saturation was achieved. The criteria for selecting experts were as follows:

- For academic experts: having at least one published article in the FinTech field.
- For industry professionals: a minimum of three years of experience in managing FinTech-based knowledge enterprises.
- A minimum educational qualification of a Master's degree.

Interviews were conducted in-person by one of the researchers, with each session lasting approximately 50 minutes. The general framework of the interviews included five sections: interviewee demographics, date and time of the interview, interview location, relevant background information, and interviewer details. Although an interview protocol was designed beforehand, the discussions were flexibly adjusted based on responses and emerging concepts during the interviews. All interviews were recorded and later fully transcribed. Some interviews, due to geographic constraints, were conducted via video conferencing or voice/video calls. Overall, the expert pool consisted of 9 university professors and 11 managers in the FinTech sector. In this study, based on the principles of Grounded Theory, open coding and selective coding techniques were employed to analyze and interpret the findings. During the open coding phase, initial codes were extracted from the interview transcripts (key point coding). At this stage, codes referring to common themes were categorized, leading to the emergence of conceptual

groupings. Through comparison and classification of these concepts, the main categories were identified. In the axial coding phase, using a paradigmatic model, the main categories were connected to related subcategories. This model facilitates the identification of key elements in axial coding, including causal conditions, central phenomenon, intervening conditions, contextual factors, strategies, and outcomes. Finally, through selective coding and with attention to the relational patterns among categories, the findings were interpreted, and a comprehensive theoretical framework was developed. In this study, semi-structured interviews were used as the data collection tool. To ensure the validity of the data, participant feedback was utilized. Additionally, to assess reliability, the test-retest method was applied. Three interviews from the sample were selected, and each was coded twice by the researcher over a 14-day interval. The results of this reliability test are presented in the following section.

**Table 1.** Test-Retest Reliability Calculation

No.	Interviewee Code	Total Codes in Two Rounds	Agreed Codes	Disagreed Codes	Reliability (%)
1	M5	128	58	12	90%
2	M8	137	62	11	90%
3	M11	112	52	10	92%
4	M15	105	50	8	95%
Total	—	482	222	41	92%

**Table 2.** Inter-Coder Reliability Calculation

No.	Interviewee Code	Total Codes in Two Rounds	Agreed Codes	Disagreed Codes	Reliability (%)
1	M2	132	61	14	92%
2	M11	134	61	14	91%
3	M12	111	52	10	93%
4	M17	106	48	18	90%
Total	—	483	222	56	92%

In the quantitative phase, using the Interpretive Structural Modeling (ISM) method, business development challenges in knowledge-based companies were prioritized and their levels of importance identified.

#### 4. Discussion and result

Data analysis in this study was conducted based on the three stages of open coding, axial coding, and selective coding, in accordance with Strauss and Corbin's grounded theory methodology. In the open coding stage, data were broken down into smaller parts, compared, conceptualized, and categorized. This stage begins with the identification of concepts and ultimately leads to the discovery of categories. Concepts are mental labels assigned by the researcher to events, incidents, and phenomena, whereas categories are more abstract and general concepts that are formed through grouping related concepts. In this study, the analysis of data obtained from 20 in-depth interviews during the open coding stage led to the identification of 625 open codes and 99 subcategories. In the axial coding stage, the researcher establishes new relationships among the categories. This stage is carried out using a paradigmatic model that includes causal conditions, central phenomenon, context, intervening conditions, strategies, and consequences. Causal conditions refer to the events and factors that lead to the emergence or development of a phenomenon. The central phenomenon is the event or incident for which strategies are devised to manage or control it and is recognized as the core of the process. Context refers to the environment and conditions in which the phenomenon occurs, while intervening conditions can either facilitate or restrict the implementation of strategies. Strategies include the actions and approaches adopted to manage and control the phenomenon, and finally, consequences are the outcomes resulting from the actions taken to address or manage the phenomenon.

**Table 3.** Axial and Selective Codes – Challenges of FinTech Business Development

Main Category	Selective Code	Axial Code
Causal Conditions	Investment Infrastructure	Financial resources and investment Cash flow management
	Leadership in the development and management of emerging technologies	Management of technological complexities and optimization of mobile user experience API platform, Green technology, Augmented reality technology, Artificial intelligence technology
	Challenges in accelerating technological transformation and digitization	Accelerating technological transformation and enhancing innovation challenges Continuous technology renewal and advancement, Digitization
	Workforce and human resource challenges	Skilled workforce, Financial imbalance, Human resource management, Preferences of younger generations and millennials, Lack of commitment and job abandonment
	Challenges in managing cultural and ethnic diversity	Revising cultural and ethnic policies, Intercultural communication, Multicultural programs, Communication management
	Cultural challenges and cultural hegemony	Cultural barriers, Hegemony of popular culture
	Systemic and structural challenges	Challenges in sustainable adoption and adaptation, Financial challenges and strategies for sustainable financing
Challenges and strategies for innovation and change management in organizations	Financial challenges and strategies, Crisis management, Public relations and media, Risk management, Strategy formulation and goal alignment, Strategic vision for blockchain	

		implementation, Integration of traditional processes, Promoting cultural adaptability in societal thinking
	Competitive challenges in financial and cultural markets	Fluidity of socio-cultural capital, Traditional market culture, Market and marketing analysis, Gaining larger share of financial market, Competitive challenges and lack of agility in the market
	Challenges related to education and awareness	Scientific synergy, Diversity in machine learning, Social capital
	Synergy in the FinTech ecosystem	Empowering the FinTech ecosystem, Need for familiarity with the ecosystem
	Data integration and advanced analytics	Data management integration, Functionality of data analysis
Contextual Conditions	Integrated management and development of advanced technology infrastructure	Infrastructure and access facilitation to advanced technologies, Fusion of technology and traditional markets, Technology life cycle management, Technology management
	Financial management and cost optimization	Financial management, Financial transparency, Cost reduction
	Operational infrastructure and sustainability in FinTech	Operational risk, Innovation and R&D, Lack of proven business models, Transparency gaps in the supply chain
Intervening Conditions	International challenges and global market interaction	Internationalization challenges, Resistance to international standardization
	Legal and regulatory challenges	Blockchain regulatory complexity, Legal pressure, Regulatory laws and policies, Weak legislation
	Country's political status	International sanctions
	Government support challenges	Government support
	Religious prejudices and stereotypes	Religious conflicts
Interactions / Strategies	Trust and security	Lack of data security, Cloud security concerns
	Modern marketing and advertising strategies	Use of advertising campaigns, Engagement with local markets, Digital advertising platforms
	Customer Experience Strategy (CXS)	Branding, Innovative marketing strategies and sustainable customer relationship development, Customer loyalty, Poor customer feedback
	R&D in Financial Technology Innovation (FTR&D)	Digital innovation, Innovation and R&D, Product development
	Corporate responsibility and innovation toward sustainable development	Corporate social responsibility, Social innovation, Sustainable development, Environmental sustainability
	Synergy and networking in business development	Networking and collaboration, Strategic partnerships
	Cultivating a culture of adaptability	Regulatory compliance, Conservative national financial management
Consequences	Smart technologies in management and supervision	Application of smart technologies in management and monitoring, Customer satisfaction, Competitiveness
	Transformation of banking systems and efficiency of modern technologies	Trust in traditional banking, Ensuring technological efficiency through cloud computing systems implementation
	Public trust and acceptance	Customer engagement, Customer-centric approach
	Sustainability of business culture	Intrapreneurship, Innovation culture
	Digital security and cyber resilience	Cybersecurity, Data security, Cybersecurity prevention and resilience
	Time management	Time saving and time management

The final stage in the data analysis process is dedicated to theorizing. At this point, the theory is conceptualized as a framework composed of a set of categories and meaningful relationships among them, with the aim of providing a comprehensive explanation of the phenomenon under investigation. Constructing the theory requires the selection of a core category that serves as the central axis and integrative element for all other categories. This core category must be sufficiently cohesive and inclusive to encapsulate the remaining concepts in a structured manner—much like the sun that organizes the planets around it. The relationships between the core category and the other categories are established through a paradigmatic framework, which includes six key components: causal conditions, central phenomenon, contextual conditions, intervening conditions, strategies, and consequences. This framework enables the researcher to synthesize the findings from the open and axial coding phases and to construct a well-structured and purposeful explanation of the studied phenomenon. Accordingly, drawing on the data derived from the preceding coding stages, the conceptual model of business development challenges in knowledge-based companies (with a particular focus on the FinTech sector) is outlined below within the structure of the six-element paradigm.

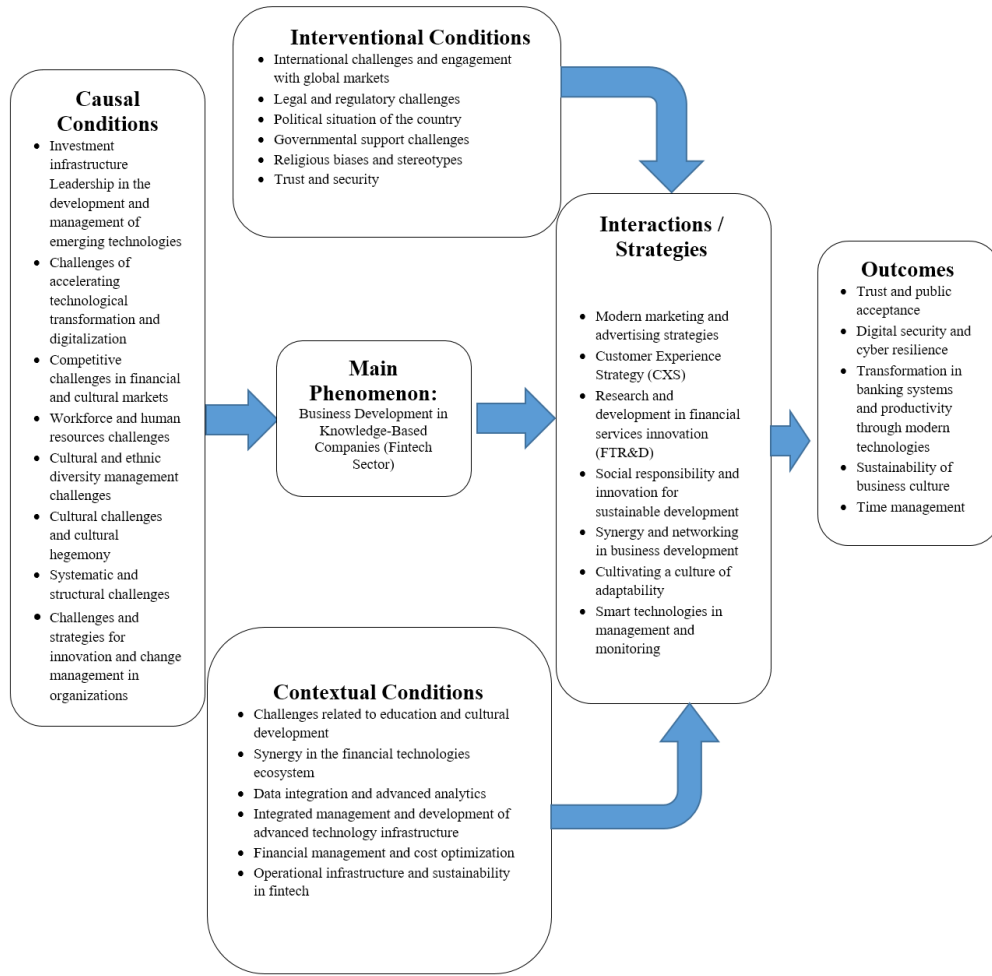


Figure 1. Paradigm Model of the Axial Coding Results for Business Development Challenges in Knowledge-Based Companies

#### 4.1. Quantitative section

In the quantitative phase, the conceptual model derived from the grounded theory approach was further analyzed using Interpretive Structural Modeling (ISM) to determine the relationships among the identified components. At this stage, following the identification of business development challenges in knowledge-based companies (specifically in the FinTech sector), these variables were incorporated into the Structural Self-Interaction Matrix (SSIM) to map the internal relationships among them. Interpretive Structural Modeling (ISM) analysis, a questionnaire was initially designed and distributed among 20 domain experts. The responses collected from these experts were aggregated, and based on the combined results, the relationships between the variables were identified. Subsequently, a Reachability Matrix was constructed by converting the identified relationships into binary values (0 and 1), derived from the previously established structural relationships matrix.

Table 4. initial reachability matrix

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
CH1	1	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1
CH2	1	1	1	1	0	1	1	0	1	1	1	0	1	0	1	1	0	0	1	1	1
CH3	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1
CH4	0	0	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1
CH5	0	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	1
CH6	1	1	1	1	0	1	1	0	1	1	1	1	1	0	1	1	1	0	0	1	1
CH7	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1
CH8	1	1	0	0	1	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1
CH9	0	0	0	0	0	0	0	0	1	0	1	1	1	0	1	0	0	1	1	1	1
CH10	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	1	1	1	1
CH11	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1
CH12	0	1	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	1
CH13	0	0	0	0	0	1	1	0	0	0	0	0	1	1	1	1	0	1	1	1	1
CH14	0	1	0	0	0	0	0	0	1	1	1	0	0	1	1	1	1	1	0	0	1

CH15	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	0	1	
CH16	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	1	1	1	0	1	0	1	1
CH17	0	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	0	1	0	0	1	1	
CH18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	
CH19	0	0	0	1	1	1	1	0	0	0	1	1	0	1	1	1	1	0	1	0	1	1	
CH20	1	1	1	1	1	0	0	1	1	1	0	0	1	0	0	1	1	1	0	1	1	1	
CH21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	

Following the development of the initial reachability matrix for the indicators related to identifying the business development challenges in knowledge-based companies (within the FinTech sector), the principle of transitivity among variables was considered. Based on this principle, the final reachability matrix was constructed to ensure structural consistency among the relationships. According to this principle, if variable i is related to variable j, and variable j is related to variable k, then variable i is also considered to be related to variable k.

Table 5. initial reachability matrix

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Convergence	
CH1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH11	0	0	0	0	0	1	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	11
CH12	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19
CH13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH17	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH19	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	21
CH21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Dependency	19	19	19	19	18	20	20	18	19	19	20	19	20	20	20	20	19	20	20	20	20	21	

After determining the prerequisite sets, achievement sets, and common elements, the next step is to determine the level of the variables (elements). In the first table, the variable with the highest level is the one whose achievement set and common elements are completely identical. After identifying this variable or variables, they are removed from the table, and a new table is formed with the remaining variables. In the second table, similar to the first, the second-level variable is identified. This process continues until the level of all variables is determined. In the present study, this was done in Table 5, resulting in the identification of the levels of the variables.

Table 6. Determination of Levels

Challenges	Level	Challenges	Level
Investment infrastructure	3	Data integration and advanced analytics	3
Leadership in the development and management of emerging technologies	3	Integrated management and development of advanced technology infrastructure	2
Challenges of accelerating technological transformation and digitalization	3	Financial management and cost optimization	2
Competitive challenges in financial and cultural markets	3	Operational infrastructure and sustainability in fintech	2
Workforce and human resources challenges	4	International challenges and engagement with global markets	2
Cultural and ethnic diversity management challenges	2	Legal and regulatory challenges	3
Cultural challenges and cultural hegemony	2	Political situation of the country	2
Systematic and structural challenges	4	Governmental support challenges	2
Challenges and strategies for innovation and change management in organizations	3	Religious biases and stereotypes	2
Challenges related to education and cultural development	3	Trust and security	1
Synergy in the financial technologies ecosystem	2		

After determining the relationships and levels of the variables, they can be visualized as a model. For this purpose, the variables are arranged from top to bottom based on their level. In the present study, the variables are categorized into four levels. At the highest level lies the challenge of trust and security. At the bottom level of the model are the workforce and human resources challenges and systematic and structural challenges, which act as the foundational bedrock of the model.



Figure 2. Variable Leveling

Subsequently, in order to identify the degree of driving power and dependence power of the business development challenges in knowledge-based companies, the MICMAC analysis has been used. To perform this analysis, it is necessary to extract the numerical values of the driving power (influence) and dependence (prerequisite) indices for each of the business development challenges in knowledge-based companies. In this study, the MICMAC method was used to analyze and classify the challenges of business development in knowledge-based companies. The objective of this analysis is to examine the driving power (influence) and dependence (prerequisite status) of the variables and to categorize them based on these two indicators. Accordingly, the variables are classified into four main categories: The first category includes independent variables, which have high driving power but low dependence on other variables. These variables serve as the foundation of the model and must be the focus at the beginning of any policymaking and planning. In this study, the challenges of "human resources and workforce" and "systematic and structural issues" fall into this category and are considered the foundational elements of the business development system in knowledge-based companies. The second category includes linkage variables, which possess both high driving power and high dependence. These variables are dynamic in nature, as any change in them can affect other variables, and through system feedback, they themselves may be altered again. In the present study, most of the variables fall into this category. Examples include challenges such as "investment infrastructure," "leadership in the development and management of emerging technologies," "challenges of accelerating technological and digital transformation," "financial management and cost optimization," "cultural challenges and cultural hegemony," "international challenges," and "the political situation of the country," among others. This reflects the interconnectedness and multilayered interactions among various challenges, as well as the complexity of the knowledge-based business ecosystem. The third category consists of dependent variables, which have low driving power but high dependence on other variables. These variables are highly influenced by developments in other areas and have limited ability to affect other elements of the system. In this study, the variable "trust and security" falls into this category, indicating that this component, as an outcome or consequence, is shaped by the influence of other variables. Additionally, the variable "synergy in the financial technology ecosystem" is also in this group, suggesting that achieving this synergy is contingent upon the organization and development of other parts of the ecosystem. It is noteworthy that none of the variables fall into the fourth category, namely autonomous variables, which have low driving power and low dependence. This indicates a strong interrelationship among the variables and high coherence in the conceptual model of the study. It means that all identified challenges play a significant or dependent role in the structure of business development, and none can be examined in isolation. In conclusion, the MICMAC analysis in this study shows that the challenges of business development in knowledge-based companies are deeply interconnected. Intervention in one area can have wide-ranging consequences on other areas. Therefore, the design of policy interventions and development programs must consider the systematic and multi-level relationships among these.

## 5. Conclusions

The present study simultaneously utilizes qualitative and quantitative approaches to identify the challenges of business development in knowledge-based companies in the fintech sector, providing a comprehensive view of the problems and opportunities in this complex field. The research aims to analyze the challenges, solutions, and the structural relationships between them, offering a thorough investigation from various dimensions. The results obtained are not only significant for policymakers and managers of knowledge-based companies but can also serve as a reliable reference in future research. This research seeks to highlight the synergies among various challenges and existing solutions. In the following, the findings will be discussed, and the relationships between the factors will be analyzed, followed by recommendations for the development of this field. One of the strengths of this study is the identification of challenges in three levels: "causal conditions," "contextual conditions," and "intervening conditions," providing a systemic approach to analyzing the issues in this sector. This classification reveals that challenges in the fintech industry do not appear in isolation; rather, there exists a complex network of intertwined factors that mutually influence each other. For example, the challenges related to technological infrastructure, identified under causal conditions, not only directly affect the efficiency of systems but also indirectly impact issues like cybersecurity, international interactions, and even customer trust. This highlights the importance of integrated and comprehensive approaches when addressing challenges, as focusing solely on a specific challenge might not resolve other issues and could, in some cases, exacerbate them. For instance, solving technical and infrastructural issues without considering cultural and psychological matters might lead to the failure of innovative projects, as users may not accept new technologies due to a lack of trust or awareness. Causal conditions, as primary and fundamental factors, directly impact the essential infrastructure and prerequisites for sustainable development in the fintech industry. These conditions determine whether the necessary environment for the growth and advancement of active companies in this field is provided or not. In this regard, identifying challenges across various areas such as investment infrastructure, leadership in the development and management of emerging technologies, accelerating technological transformation and digitization, intense competition in financial and cultural markets, human resources, cultural and ethnic diversity, and organizational structures and innovation strategies, can play a vital role in understanding and improving the existing conditions. One of the main challenges in this area is investment infrastructure, recognized as a core element in the growth and development of fintech companies. Effective and timely investments in infrastructure, especially in information and communication technologies (ICT), enable organizations to stand against competitors and progress in innovation. This requires significant investments in research and development, particularly in innovative fields such as blockchain, artificial intelligence, digital payments, and other advanced technologies. On the other hand, in countries with weak investment infrastructures, fintech organizations face considerable challenges in attracting capital and securing the necessary resources for development, which can become a serious barrier to their progress and competitiveness. Leadership in the development and management of emerging technologies is another major challenge fintech organizations face. These technologies can include blockchain, artificial intelligence, big data analytics, and other advanced technologies that help organizations optimize their processes and reach new markets. In fact, organizations that are capable of leading in technological fields can create significant competitive advantages for themselves. However, this leadership is not easily attainable and requires organizations to allocate sufficient resources for the research and development of these technologies while also possessing the necessary management capabilities to control and optimize them. One of the main issues in this regard is the inability of organizations to identify and capitalize on opportunities in emerging technologies. This problem becomes especially challenging for organizations with limited financial and human resources. Challenges related to accelerating technological transformation and digitization are also significant issues that fintech organizations face. The rapid pace of technological changes, particularly in the fintech industry, has forced organizations to increase their ability to adapt to these changes in order to survive. This digital transformation usually involves fundamental changes in business processes, revenue models, market strategies, and even organizational cultural attitudes. Many fintech organizations, due to their inability to accelerate their digital transformation, quickly fall behind their competitors. These challenges are especially evident in the intense competition within financial and cultural markets. Fintech organizations today face fierce competition from traditional banks, large financial institutions, and even technology companies. This competition usually revolves around areas such as pricing of financial services, offering innovative services, customer experience, and security. In this regard, focusing on innovation in customer experience and developing digital services based on new technologies can help fintech companies remain competitive in the market. Challenges related to the workforce and human resources are also among the major problems in the fintech sector. The shortage of specialized human resources in the fields of technology and information is one of the largest challenges faced by fintech companies. Due to the rapid pace of change in the technology world and the increasing

demand for technical expertise, fintech organizations must work to attract and re-tain specialized human resources. This need for specialized personnel becomes a serious barrier, especially in countries with limited access to educational and academic resources, which hinders the growth and progress of fintech companies. This issue is particularly challenging in developing countries where cultural awareness and educational initiatives in this area are still inadequate. Cultural challenges and the dominance of cultural norms are also significant issues that can have a considerable impact on the adoption and development of fintech in various countries. Cultural beliefs, values, and social norms strongly influence the acceptance of new technologies and innovative business models. Therefore, fintech companies must take these differences into account and develop strategies tailored to each specific culture. Especially in fintech organizations that expand their operations internationally, cultural and ethnic diversity can become a challenge in managing human resources, marketing, and customer service. Organizations must be able to effectively engage with cultural, linguistic, and ethnic differences in various environments and design appropriate programs for each market. Finally, organizational systemic challenges and challenges related to innovation management and organizational change strategies are also recognized as other influencing factors. Structural and systemic complexities can become obstacles to innovation and process improvement. Organizations must develop the ability to adapt to structural changes and technological innovations in order to effectively operate in a competitive market. In conclusion, this research demonstrates that fintech organizations need to adopt integrated and comprehensive approaches to address challenges and capitalize on opportunities. The challenges in the fintech industry are not limited to technical and infrastructural issues but also include social, cultural, human, and systemic factors. The results suggest that attention to investment infrastructure, strengthening workforce skills, advancing emerging technologies, enhancing customer experience, and managing organizational culture can effectively contribute to the growth and sustainability of fintech companies. Therefore, to succeed in this industry, organizations must be able to simultaneously address all of these dimensions and implement appropriate policies to face challenges and take advantage of opportunities.

## 6. Managerial Insights

The findings of this study highlight several key insights for managers of knowledge-based fintech companies. First, managerial challenges, weak infrastructures, and ineffective policies represent critical barriers that must be proactively addressed. Managers should prioritize building flexible organizational structures, strengthening operational infrastructures, and cultivating a culture of adaptability to ensure sustainable business growth. Second, customer experience emerged as a central driver of fintech business development. Managers are advised to design customer-centric strategies, leverage digital platforms to enhance user experience, and adopt open innovation practices to remain competitive in a rapidly changing market environment. Third, cross-sectoral collaboration and strategic partnerships are crucial for overcoming environmental pressures and resource limitations. By fostering collaboration with universities, research centers, and regulatory bodies, managers can accelerate innovation and create shared value. Finally, the interpretive structural modeling results emphasize the hierarchical role of enabling factors. Managers should recognize that investing in fundamental drivers such as adaptability culture, operational sustainability, and infrastructure improvement will ultimately lead to enhanced competitiveness, increased market share, and improved productivity. Overall, the study provides a roadmap for fintech managers to align their strategic actions with developmental challenges and transform obstacles into opportunities for sustainable business growth.

## References

- Arahkesh Selmasi, Mohammad. (2020). Financial technology (FinTech). 8th International Conference on Research in Management, Economics, and Development, Tbilisi, Georgia. Retrieved from <https://civilica.com/doc/1136415>
- Asar, Shekrollah; Jalalpour, Sheila; Ayubi, Fatemeh; Rahmani, Mohammadreza, & Rezaian, Mohsen. (2016). PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses. *Rafsanjan University of Medical Sciences*, 15(1), 63-80.
- Asawanuwat, T., Journal, S. P., & Review, B. (2019). Digital Disruption Revisited, (January), 1-2.
- Bellavitis, C., Fisch, C., & Momtaz, P. P. (2023). The rise of decentralized autonomous organizations (DAOs): A first empirical glimpse. *Venture Capital*, 25(2), 187-203.
- Cai, C. W. (2018). Disruption of financial intermediation by FinTech: A review on crowdfunding and blockchain. *Accounting & Finance*, 58(4), 965-992. Doi: <https://doi.org/10.1111/acfi.12405>.
- Chen, M. A., Wu, Q., & Yang, B. (2023). How Valuable Is FinTech Innovation?. *The Review of Financial Studies*, 32(5), 2062-2106. Doi:10.1093/rfs/hhy130.
- Chesbrough, H., & Rosenbloom, R. S. (2002). The role of the business model in capturing value from innovation: Evidence from Xerox Corporation's technology spin-off companies. *Industrial and Corporate Change*, 11(3), 529-555. <https://doi.org/10.1093/icc/11.3.529>.
- Conz, E., Magnani, G., Zucchella, A., & De Massis, A. (2023). Responding to unexpected crises: The roles of slack resources and entrepreneurial attitude to build resilience. *Small Business Economics*.

- Cook, D. J., Sackett, D. L., & Spitzer, W. O. (1995). Methodologic guidelines for systematic reviews of randomized control trials in health care from the Potsdam Consultation on Meta-Analysis. *J Clin Epidemiol*, 48, 167-171.
- Das, S. R. (2019). The future of fintech. *Financial Management*, 48(4), 981-1007. Doi: <https://doi.org/10.1111/fima.12297>.
- Dhar, V., & Stein, R. M. (2016). MIT Sloan School of Management FinTech Platforms and Strategy. *FinTech Platforms and Strategy*, 0-19.
- Dhar, V., & Stein, R. M. (2017). FinTech platforms and strategy. *Communications of the ACM*, 60(10), 32-35. <https://doi.org/10.1145/3132726>.
- Gai, K., Qiu, M., & Sun, X. (2018). A survey on FinTech. *Journal of Network and Computer Applications*, 103(January 2017), 262-273. <https://doi.org/10.1016/j.jnca.2017.10.011>.
- Ghazinoory, S., Dastranj, N., Saghafi, F., Kulshreshtha, A., & Hasanzadeh, A. (2017). Technology roadmapping architecture based on technological learning: Case study of social banking in Iran. *Technological Forecasting and Social Change*, 122, 231-242. <https://doi.org/10.1016/j.techfore.2015.12.018>.
- Global FinTech Report. (2024, Feb 28). Global Venture Capital Investment in Fintech Industry Set Record in 2017, Driven by Surge in India, US and UK, Accenture Analysis Finds. Retrieved from <https://newsroom.accenture.com/news/global-venture-capital-investment-in-fintech-industry-set-record-in-2017-driven-by-surge-in-india-us-and-uk-accenture-analysis-finds.htm>.
- Goldstein, I., Jiang, W., & Karolyi, G. A. (2021). To FinTech and Beyond. *The Review of Financial Studies*, 32(5), 1647-1661. Doi:10.1093/rfs/hhy130.
- Maghni, Haidar; Nashei Far, Vahid & Nategh, Tahmineh. (2019). How the expansion of financial technologies affects the improvement of financial service performance. *Financial Economics Quarterly*, 13(49), 183-212.
- Meshdi Abdal, Maryam; Samari, Davood; Abbasi, Ebrahim, & Ashrafi, Majid. (2019). Strategic analysis of entrepreneurship based on FinTech in the banking sector. *Financial Engineering and Securities Management*, 10(41), 393-412.
- Mirazi, Farnaz. (2019). FinTech and its position in the future financial markets. 3rd International Conference on Management, Industrial Engineering, Economics, and Accounting, Sofia, Bulgaria. Retrieved from <https://civilica.com/doc/933348>
- Mohammadi, Sedeghah, & Fattahzadeh, Hanieh. (2023). Identifying effective indicators in the use of blockchain technology in the pharmaceutical supply chain (using a meta-analysis method for the years 2010-2022).
- Moradi, Shiva; Nadari, Nader, & Delangizan, Sohrab. (2020). Investigating the development process of FinTech startups in Iran; with emphasis on factors and obstacles. *Entrepreneurship Development*, 13(1), 121-140.
- Nasrati Qazvini Nejad, Mahmoud; Monajem, Sara & Khaleji, Majid. (2017). Reviewing innovations in the financial system with a focus on financial technologies. National Conference on Management, Entrepreneurship, and Communication Skills, Qazvin, Iran.
- Ohadi, Fereydoun & Naseri, Majid. (2018). Exploring business models of implementing FinTechs and startups in the financial and banking sector. National Conference on Management and E-Business with a Focus on Resistance Economy, Mashhad, Iran. Retrieved from <https://civilica.com/doc/802369>
- Payandeh, Reza; Shahbazi, Meysam; Manteghi, Manoochehr, & Karimi, Touraj. (2019). Cooperation between banks and FinTech: A systematic review of the scientific literature. *Management Research in Iran*, 23(4), 130-171.
- Pylevari, Golzar, & Selmasi, Hossein. (2022). A model for evaluating the impact of blockchain technology (blockchain supply chain) on supply chain performance using fuzzy inference systems in the automotive industry. *Strategic Management in Industrial Systems Quarterly (Former Industrial Management)*, 16(55), 50-66.
- Qaemi, Mohammadreza; Dehghan Dehnavi, Mohammadali, & Moradi, Narjes Sadat. (2017). Analyzing the status of banking startups in the field of new banking services (A case study of Iran's banking system). *Journal of Islamic Economics and Banking*, 20, 119-139.
- Rafiee, Mohammad, & Nezaryan, Zahra. (2023). The impact of blockchain technology on the role of consumers in the electricity supply chain in the legal systems of Iran and the European Union. *International Legal Research*, 15(57), 197-220.
- Rohani Rad, Shayan. (2020). FinTech: A discourse on the global and Iranian perspectives. *Science and Technology Policy Letter*, 10(1), 85-93.
- Shafagh, Ahad & Abdollahi Dezfulejad, Leila. (2017). Exploring opportunities and threats of FinTech (FINTECH) for Iran's banking system. *Studies in Economics, Financial Management, and Accounting*, 3(2/1), 202-210.
- Shahvisi, Taher, & Khairallah, Mohammad. (2021). A model for improving the financial performance of banks based on new financial technologies. *Financial Accounting Knowledge*, 7(4), 57-96.
- Yahyaee, Mohammad. (2023). Evaluation of the drivers affecting the use of blockchain technology in the rice supply chain. *Agricultural Economics and Market*, 1(2), 89-100.