

Fuzzy Cognitive Map for the factors of the Banking Services Supply Chain Improvement

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Abstract: The banking services supply chain is considered one of the vital pillars in improving quality and increasing customer satisfaction. Identifying and articulating the factors that affect this supply chain plays an important role in enhancing banks' performance and achieving their strategic objectives. The complexities inherent in the banking industry have made the scientific examination of the various dimensions of the supply chain even more necessary. In this regard, the present study identifies and determines the causal relationships among the factors of the banking services supply chain. This study adopts a mixed (qual-quant) design. To collect data, we used interviews, consisting of a field stage (semi-structured interviews with experts to clarify the factors influencing the supply chain for the improvement of banking services). For this purpose, using purposive sampling, 9 exploratory interviews were analyzed. The population for the quantitative phase consisted of mid-level managers and senior deputies at Karafarin Bank, and accordingly 10 Karafarin Bank experts were selected. Given the importance of the financial and operational sustainability of the supply chain in improving banking services, focusing on components such as transparency, robustness, and productivity helps increase investor confidence and facilitates regulatory processes. Increases in revenues, reductions in costs, and operational risk play important roles in organizational viability and in enhancing the bank's speed of response. Improving these components ensures the sustainability of the supply chain and preserves profitability. Overall, moving toward a sustainable supply chain leads to increased competitiveness and long-term success for banks.

Keywords: Supply chain, service innovation and development, organizational management and human resources, market and customer relations, and financial and operational sustainability of the supply chain.

Introduction

In recent years, the banking industry has faced extensive transformations in the field of information technology and the growing needs of customers (Alzoubi et al., 2022). To enhance competitiveness and increase customer satisfaction levels, improving banking services has become one of the fundamental priorities for banks (Shahyari et al., 2021). In this context, the banking services supply chain, as a set of interconnected processes including resource provision, service processing, and delivery to customers, plays a significant role in increasing efficiency and service quality (Banker & Hirt, 2024). As customer needs become more complex and competition intensifies, banks are compelled to review and improve their supply chain management to provide services that meet customer expectations (Noor et al., 2024). Customers are the lifeblood of every industry and business. Retaining these customers is one of the most important tasks of any economic enterprise, especially banks. The specific needs of customers and increasing competition in the banking services market have driven banks towards creating structures that can flexibly respond to these needs. Obviously, one of the important points is that moving towards these new structures and designing new services not only meets customer needs but also expands competition in banking operations and increases the likelihood of survival in the market (Madani, 2018). In recent years, the banking sector has sought to increase the value of its services to its customers.

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Studies show that the focus should be on valuable customer services; because banks must understand that their services are not sufficient for customers. They are only seen as banks, not as providers of the comprehensive value necessary from the customer's perspective (Komulainen et al., 2018). In recent decades, the enhancement of banking services has been introduced by banks as one of the key tools for increasing customer satisfaction and gaining sustainable competitive advantage (Maleki et al., 2022). One of the novel approaches in this field is the examination and optimization of the banking services supply chain, which plays a fundamental role in the speed, quality, and efficiency of banking service delivery (Barari et al., 2022). The banking services supply chain includes all processes, resources, and technologies involved in the creation and delivery of a banking service from the starting point to delivery to the customer (Soleimani & Ahmadi, 2021; Chen et al., 2021). Reviews have shown that challenges such as lack of coordination between different bank units, inefficiency of information systems, and traditional processes in the service supply chain leads to reduced service speed and decline in the quality of final services to the customer (Singh et al., 2021). Furthermore, the lack of informational integration among different branches and channels of the bank paves the way for errors, reduced transparency, and resource waste (Ghasemi et al., 2022).

Studies, including research by Chen et al. (2021) and Singh et al. (2021), have emphasized that employing modern technologies such as artificial intelligence and blockchain in the banking services supply chain can lead to significant improvements in service delivery speed, customer satisfaction, and cost reduction. Maleki et al. (2022) proved the impact of service supply chain strategy on improving the quality of banking services and increasing customer loyalty; although they pointed out challenges such as employee resistance to change and the lack of technological infrastructure. Inefficiencies in the human resource distribution system, inappropriate resource allocation, and suboptimal use of information technology have been introduced as serious obstacles to enhancing the banking services supply chain (Ghasemi et al., 2022; Soleimani & Ahmadi, 2021). These deficiencies have led to slow information flow, long customer waits, and reduced bank flexibility in responding quickly to market changes (Sundararajan et al., 2024). Studies have shown that the key success factor in banking lies in managing customer relationships (Hung et al., 2019); but the end customer in today's market is determined by the success or failure of supply chain management practices, and competition is focused on delivering value to the customer (Choudhury et al., 2018). To achieve better results in business, it is necessary for all managers to be involved in managing the service supply chain to be able to deliver required customer services on time (Anggraini et al., 2018); therefore, developing supply chain management models leads to the development of service activities and process coordination, performance improvement through process integration, and enhanced relationships; in other words, one of the approaches used by companies to gain a competitive advantage in the insecure and competitive environment of the present era is supply chain management (Balouei et al., 2018). The service supply chain includes several broad entities such as service providers, sub-service providers, or resources needed to design and deliver services to customers, all working together to produce value (Choudhury et al., 2020).

Supply chain management was introduced to maintain intense competition between companies for customer satisfaction, where it efficiently performs the process of planning, implementing, and controlling operations (Choudhury et al., 2018). Supply chain management practices significantly contribute to the growth and performance of the firm. Service industries recognize the competitive advantage arising from creating superior supplier networks because supply chain management is one of the effective operational strategies for increasing business competition (Ali Akbari et al., 2018). The primary mission of supply chain management is to create and capture value. Supply chain management solutions have been developed and deployed to create value for anyone who interacts with a company's products and services (Yucesan, 2016). Today, the role of the supply chain in improving banking services has become one of the important and practical topics in the field of management and banking. The banking services supply chain goes beyond the physical movement of goods and includes all processes related to the provision of financial services, fund transfers, information technology support, customer relationship management, and inter-organizational coordination. With increased competition among banks and the emergence of electronic banking, the importance of timely and efficient provision

of resources, information, and services has increased more than ever. Thus, the supply chain emerges as the lifeblood of bank performance in enhancing customer satisfaction, reducing costs, accelerating processes, and improving service quality. Addressing the issue of the banking services supply chain is a response to challenges such as slow service delivery, errors, customer dissatisfaction, and increased operational costs in banks. Today, customers expect to receive banking services seamlessly, quickly, and accurately; this is only achievable with an efficient and coordinated supply chain system. On the other hand, with the globalization of trade and the growth of new technologies such as financial technology (FinTech), banks need a fundamental review of their supply chain processes. Examining and improving this chain can lead to the creation of added value, sustainable competitive advantage, and the achievement of lasting customer satisfaction. This research is an effort to fill the existing knowledge gap in this field and provide practical solutions to bank managers for improving service levels through the implementation of modern supply chain management principles and techniques. From the researcher's perspective, what makes this topic prominent is its broad and tangible impact on improving the customer experience, increasing profitability, and enhancing the competitive position of banks in today's turbulent markets. Therefore, the research questions are as follows:

- What are the factors affecting the supply chain for improving banking services?
- What are the causal relationships between the factors affecting the supply chain for improving banking services?

Theoretical Foundations of the Research Supply Chain

A supply chain is a set of activities, resources, information, and processes that enable organizations to transform raw materials into final products and deliver these products to end consumers. This chain typically includes suppliers of raw materials, manufacturers, distributors, wholesalers, retailers, and consumers (Gu et al., 2024). Supply Chain Management (SCM), aiming to increase efficiency, reduce costs, improve quality, and enhance customer satisfaction, seeks to integrate and coordinate all components of this chain (Unhelkar et al., 2022). The supply chain has three main flows: material flow, information flow, and financial flow (Chauhan et al., 2021). The material flow continues from the beginning of the chain to the consumption of products and can include return and recycling. The information flow facilitates communication between different players in the chain and is considered a key factor in the integration and collaboration of members (Juan et al., 2022). The financial flow is dedicated to the transfer of funds among different members and plays a vital role in the financial sustainability of the chain. Today, with the expansion of technology and the globalization of markets, supply chains have become very complex and extensive. Competition occurs not only between companies but also between supply chains (Garcia et al., 2023); therefore, organizations can become more competitive in the market by improving their supply chain performance. Information technology plays a pivotal role in this area, and tools such as Enterprise Resource Planning (ERP) systems, Customer Relationship Management (CRM), and the Internet of Things (IoT) help increase transparency and communication among members (Amirian et al., 2023).

Supply chain management requires strategic, tactical, and operational decision-making in areas such as facility location, inventory management, transportation, supplier selection, production planning, and distribution (Zheng et al., 2022). According to Shirazi et al. (2024), successful implementation of the supply chain depends on the existence of collaboration, trust, transparency, and information sharing among members. Today, sustainability and resilience in supply chains have gained special importance. Modern supply chain management approaches, in addition to economic indicators, address environmental and social issues (Baah et al., 2022). A sustainable supply chain strives to reduce the negative environmental impacts of activities and also considers the social responsibilities of the organization (Tortorella et al., 2024). Also, disruptions such as the COVID-19 pandemic, sanctions, climate change, and market fluctuations have highlighted the resilience and flexibility of supply chains (Han et al., 2020). By timely identification of risks and planning to face challenges, organizations can ensure their sustainability. Preventive measures such as supplier diversification, creating safety stock, and using big data help increase the resilience of chains (Ebrahimpour et al., 2023). Close collaboration,

data and information sharing, process integration, and automation facilitate supply chain management and increase its effectiveness (Karimi Zarchei et al., 2020). Furthermore, the digitalization of the supply chain in recent years has been one of the dominant trends, which, with the help of technologies such as blockchain, machine learning, and big data, has significantly increased transparency, traceability, and process speed (Al Humdan et al., 2020). In our country [Iran], attention to concepts related to the supply chain, especially in the oil, automotive, steel, and food industries, has increased. Domestic researchers, while citing global studies, emphasize the necessity of localizing solutions, paying attention to organizational culture, and Iran's industrial structures. For example, in large industrial projects, proper supplier selection and risk management play a fundamental role in the success of the entire chain (Salimi et al., 2023). The supply chain is a dynamic and multidimensional concept that, in addition to operational processes, also includes strategic, technological, financial, environmental, and human aspects. Organizations that can leverage modern technologies, institutionalize collaboration and trust throughout the chain, and adopt a sustainable and resilient approach will certainly have a higher competitive advantage in current and future markets (Jha et al., 2022; Waqas et al., 2023).

Service Supply Chain

The service supply chain, as one of the novel concepts in operations management, has received widespread attention in recent years. The main goal of this concept is to enhance the efficiency and effectiveness of service delivery processes through the coordination and integration of required activities, from the stage of sourcing primary resources to the delivery of the service to the end customer. Unlike the product supply chain, which focuses more on the flow of materials, parts, and physical products, the service supply chain places its main focus on the flow of information, knowledge, skills, and intangible resources required for providing quality services (Nagariya et al., 2022). In fact, the service supply chain is a set of interconnected processes and players that work in coordination to meet customer needs from a service perspective. In this regard, one of the distinguishing features of the service supply chain from the goods supply chain is the intangible nature of the service and the impossibility of stocking it. This characteristic makes service supply chain management have specific complexities compared to the product supply chain. Timing importance, quality of customer interaction, ability to adapt to instantaneous needs, and attention to customer expectations from a value creation perspective are considered key requirements of service supply chain management (Rezaeipandari et al., 2018). In the service supply chain, there are generally three main types of flows: information flow, people flow, and intangible resource flow. The information flow facilitates coordination between service providers and customers, the people flow means the movement of human resources or customers in the process of receiving the service, and the flow of intangible resources includes the transfer of skills, experiences, and knowledge among chain members (Bentalha, 2023).

One of the key topics in the service supply chain is the role of information technology and digital tools. With the emergence of new technologies such as the Internet of Things (IoT), artificial intelligence, and blockchain, numerous opportunities have been provided for improving traceability, increasing transparency, and personalizing services. These tools not only increase the speed and accuracy of service delivery but also provide the possibility of analyzing customer data and continuously adapting processes to changing market needs (Lin et al., 2021). Also, due to the interactive nature and direct involvement of the customer, the service supply chain is very important from the customer experience perspective. Improving customer experience and gaining their satisfaction leads to enhanced customer loyalty and, ultimately, increased organizational profitability. Therefore, organizations try to identify key customer touchpoints and analyze critical moments of interaction with them to implement continuous improvement solutions in their supply chain (Bamakan et al., 2021). Integration and continuous collaboration among chain members, especially in the service sector, are of greater importance, because success or failure in each link of the chain can have a direct impact on the quality of the final service and customer satisfaction. For example, in the airline industry, lack of coordination between fuel suppliers, airport services, check-in, and security not only disrupts the passenger experience but can also lead to increased costs and reduced efficiency (Ukko et al., 2020). Furthermore, sustainability and social responsibility are also important axes in the service supply chain. Issues related to the environment, social justice, human resource management, and supporting customer rights are increasingly involved

in service supply chain management standards. Many studies have shown that organizations with a social responsibility approach in the supply chain, in addition to reducing operational risks, also gain a sustainable competitive advantage (Zarei et al., 2024).

Banking Services Supply Chain

The concept of the banking services supply chain has changed dramatically in recent decades due to the digitalization of the banking system and the expansion of competition among banks. The banking services supply chain actually refers to a set of processes, institutions, technologies, and relationships among service providers, banks, customers, and other stakeholders aimed at the optimal and effective delivery of banking services to end customers. In this approach, the focus is not only on providing basic products and services such as bank accounts and facilities, but also value-added services such as electronic banking, asset management, financial advice, and payment platforms are observed within the framework of the supply chain (Zaman et al., 2023). Unlike the goods supply chain, which emphasizes more on the transportation and physical identity of goods, the banking services supply chain highlights the intangible nature of services, the role of information technology, customer relationship management, and the existence of simultaneous service processes. Banks are forced to cooperate with FinTech companies, technology infrastructure providers, credit rating companies, and even regulatory bodies to be able to meet the changing and growing needs of customers (Majumder et al., 2022). Fierce competition in the global banking industry has led banks towards implementing more agile processes, automation, smartization, and digitalization of the service supply chain. So much so that the creation of open banking and integrated payment systems has played an important role in accelerating data flow and increasing the transparency of the service supply chain in recent years (Choi, 2023). Simultaneously, customers, as the endpoint and key part of the service supply chain, play an active role in defining needs and guiding the development of products and services. To enhance the customer experience, banks have focused their attention on analyzing customer data and customizing services based on data. For example, machine learning-based recommendations and advisory tools have improved customer interaction and created value in the banking service chain (Lu et al., 2024).

The banking services supply chain also includes a set of supporting activities such as risk management, cybersecurity, digital identity verification, and compliance management with regulations. Security threats and regulatory requirements have forced banks to integrate security mechanisms and increase compatibility with international standards throughout the supply chain (Hung et al., 2020). At the operational level, successful implementation of the service supply chain in banking requires the existence of coordinating mechanisms between internal units (such as IT, operations, marketing, human resources) and external suppliers. This coordination is facilitated by the use of technologies such as cloud computing, blockchain, and artificial intelligence and enhances the agility of the chain. Also, in developing countries and specifically in Iran's banking industry, realizing the banking services supply chain faces challenges such as infrastructure issues, legal and cultural limitations, and also resistance to technological changes. However, domestic research shows that the implementation of intelligent supply chain management models and the optimal use of FinTech capacities can enhance the responsiveness of banks (Khoshnevis et al., 2023). To improve the efficiency of the banking system, experts believe that it is desirable for banks to view their processes and activities within the framework of a supply chain and apply relevant supply chain management measures to them. Based on this, Sun and his colleagues developed the framework of the banking services supply chain according to the processes of deposit and facility provision (Emon et al., 2024).

Research Background

In a study, Bigdeli et al. (2024) ranked the methods for promoting the humanitarian supply chain within the banking framework. The research method was described as a grey system using grey numbers, grey equations, and grey matrices. The statistical population of this study included elites and expert managers of the country's banks aware of the research field. The results showed that the first rank was related to the component of resilience development in crises, the second rank was creating a leadership personality for banks, the third rank was having suitable infrastructure, and the fourth rank was the factors of the bank's quick response to the external environment. Also, in the factor of creating a leadership personality

for banks, stabilizing programs and coordination among other players were the most important factors. In another study, Babadi Akasheh et al. (2022) designed the pattern of the banking service value chain. To cover the study's objective, the qualitative content analysis method was used. The results of the qualitative part of this research provided a theoretical model that encompasses value-adding activities at the level of the banking industry and helps the existing gap in theoretical foundations. The results of the quantitative part showed that Mellat Bank has a relatively favorable status in the presented value chain.

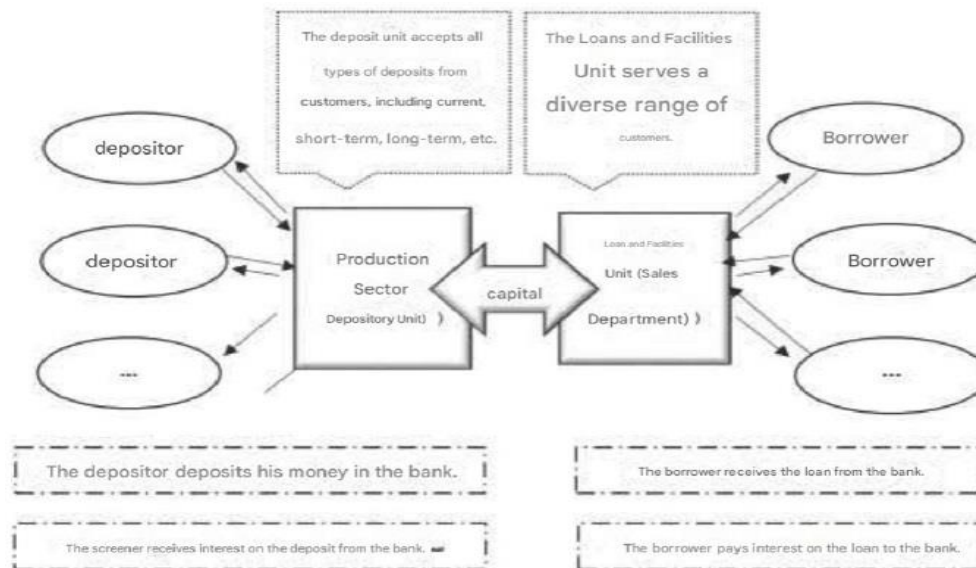


Figure (1): Banking Supply Chain (Sun et al., 2017)

In another study, Edunjobi et al. (2024) addressed the integrated banking supply chain model for Fast-Moving Consumer Goods (FMCG) in emerging markets. This model, by integrating banking services with supply chain operations, enables FMCG businesses to optimize working capital, reduce financing costs, and improve cash flow management, ultimately increasing their competitiveness and sustainability in rapidly evolving markets. Also, Wang et al. (2023) addressed a new risk control method for supply chain finance for commercial banks with big data. The supply chain finance business of commercial banks is mainly divided into three modes: financing through receivables, financing through inventory, and financing through prepayment. In a similar study, Majumder and Habib (2022) addressed supply chain management in the banking industry. The results of this study provide new avenues for research in financial supply chains and banking industries. Therefore, this research opens more frontiers for future prospective researchers in this field. Yang et al. (2022) addressed the hybrid financing scheme in the capital-constrained supply chain: bank credit and e-commerce platform financing. Numerical examples show that the retailer's order quantity and expected profit increase with the bank loan ratio. In another study, Cao et al. (2022) addressed optimizing payment schemes in a decentralized supply chain: quality investment and bank credit. Research results in the manufacturer game show that the optimal payment scheme from the perspective of the supply chain, manufacturer, or retailer is not uniquely determined, but generally tends towards the deferred payment scheme.

Shahabi et al. (2021) modeled the impact of the Fourth Industrial Revolution on the banking services supply chain using the system dynamics approach and fuzzy DEMATEL technique. The results indicate that connecting new actors to the banking services supply chain, collaboration between organizations, systematic sharing of customer information among partners, investment in the bank's IT sector, and development of digital banking infrastructure by the central bank, respectively, have the most impact, and trust through perceived usefulness and supply chain sustainability have the most impactability in the model of the impact of the Fourth Industrial Revolution on the development of digital banking. In another study, Shahbandarzadeh et al. (2021) presented a model for evaluating the performance of the

supply chain of National Bank branches under a two-stage process using data envelopment analysis. The indicators examined for evaluating branch performance were categorized into two stages. Input indicators for the first stage of evaluation included: branch area, number of employees, initial capital, and operational costs related to the branches. Also, the output indicators of this stage, which are considered as input for the second stage, included: the number of accounts and the total deposit amount in the bank. Finally, the indicators of branch profit, branch income, and facility amount were categorized as the output of the second stage.

Table (1): Summary of Research Background

Researchers	Topic	Result
Bigdeli et al. (2024)	Ranking methods for promoting the humanitarian supply chain within the banking framework	In the factor of resilience development in crises, the continuity of psychological support and counseling for survivors showed the highest score.
Babadi Akasheh et al. (2022)	Designing the pattern of the banking service value chain	The results of the quantitative part showed that Mellat Bank has a relatively favorable status in the presented value chain.
Shahabi et al. (2021)	Modeling the impact of the Fourth Industrial Revolution on the banking services supply chain using system dynamics and fuzzy DEMATEL	Trust through perceived usefulness and supply chain sustainability have the most impactability in the model of the impact of the Fourth Industrial Revolution on the development of digital banking.
Shahbandarzadeh et al. (2021)	Presenting a model for evaluating the performance of the supply chain of National Bank branches under a two-stage process using data envelopment analysis	Finally, the indicators of branch profit, branch income, and facility amount were categorized as the output of the second stage.
Edunjobi et al. (2024)	Integrated banking supply chain model for Fast-Moving Consumer Goods (FMCG) in emerging markets	Emphasizes the importance of tailored financial services, such as trade finance, working capital loans, inventory financing, and supply chain finance, in meeting the unique needs of FMCG businesses in emerging markets.
Majumder and Habib (2022)	Supply chain management in the banking industry	The banking industry from a supply chain management perspective demanded more detailed study. Although there is very little scientific research in the banking industry, the authors intend to perform a supply chain management model in the banking industry.
Yang et al. (2022)	Hybrid financing scheme in the capital-constrained supply chain: bank credit and e-commerce platform financing	Numerical examples show that the retailer's order quantity and expected profit increase with the bank loan ratio.
Cao et al. (2022)	Optimizing payment schemes in a decentralized supply chain: quality investment and bank credit	To increase the bank interest rate for the manufacturer's loan, the supply chain and retailer tend to choose the deferred payment scheme, but the manufacturer tends to choose the prepayment scheme.

As Table (1) shows, despite significant progress in improving the banking services supply chain, there are still numerous research gaps in this field that require further investigation and research. One of the most important gaps is the lack of comprehensive and integrated models for evaluating and improving the performance of the banking services supply chain that can cover the interaction between different bank sectors. Furthermore, insufficient attention to the role of modern technologies such as blockchain and artificial intelligence in improving supply chain efficiency is another existing gap.

Research Method

The purpose of this study is to identify and explain the causal relationships of the factors of the supply chain for improving banking services, which is developmental-applied in terms of purpose, and in terms

of data type, the research is a combined mixed method (qualitative-quantitative). In the qualitative part, the thematic analysis approach was used by employing semi-structured interviews to build the model and utilizing the opinions of experts. Therefore, the research population of this study includes university faculty members who have books and articles in the field of supply chain development and also experts in the field of banking. Also, criteria will be considered for participants in the research, which are (Creswell, 2012):

1. Relevant scientific and research background (having a history of teaching, research, or publication of valid scientific articles in the field of banking, financial systems, and related studies on banks);
2. Job and academic rank (having a minimum academic rank of associate professor or assistant professor in fields related to banking, economics, financial management, or similar fields);
3. Executive and consulting experience in the banking industry (having a history of senior collaboration with banks, reputable financial institutions, or playing a consultant role in banking and financial projects);
4. Awareness and analysis of current banking issues (such as digital banking, new regulations, FinTech, new banking risks).

But sampling from the research population in the strategy of this research will be based on the theoretical sampling principle. To sample experts with the mentioned characteristics and criteria for participation in the interview process, non-probability purposive sampling was used; in other words, an attempt was made initially to collect data through interviews by selecting several targeted samples. Using this method, the research sample for the stage will be selected up to the point of information saturation, which includes 9 people, as done in Table (2).

Table (2): Interviewees' Profile

Experts	Executive and Research Background	Education	Count
Academic Experts	Faculty Members	PhD	4
	Banking Domain Researchers	PhD	1
Executive Experts	University Section Managers	Master's and PhD	2
	Banking Section Managers	Master's and PhD	2

In the quantitative part, the fuzzy cognitive map method was used due to the causal relationships between the factors of the supply chain for improving banking services. This method provides a comprehensive understanding of the characteristics of the factors of the supply chain for improving banking services with each other. The fuzzy cognitive map method seems to yield stronger results for decision-making and system improvement. The statistical population in the quantitative part included mid-level managers and senior deputies of Karafarin Bank. Accordingly, 10 experts from Karafarin Bank were selected. In this research, to achieve the initial validity of the interview questions, the researcher first carefully reviewed the theoretical foundations related to the research topic in a simple and detailed manner, and the interviews were conducted. Based on the integration of theoretical foundations and also data, it was calculated. Also, in designing the interview questions, the recommendations of experts (including supervisors, consultants, and some experts) were used. At the same time, to assess the validity of reporting and analysis of the data obtained from the interviews, the criteria of credibility and confirmability were used.

Table (3): Calculation of Test-Retest Reliability (Stability Index)

No.	Interview Title/Law	Total Number of Codes	Number of Agreements	Number of Disagreements	Test-Retest Reliability Percentage
1	Interview 1	6	4	2	66.6%
2	Interview 2	8	5	3	62.5%
3	Interview 3	8	6	2	75%
4	Interview 5	7	6	1	85%
5	Interview 7	9	7	2	77.7%

6	Interview 8	9	7	2	77.7%
Total		47	36	12	74.6%

(Note: The table shows the reliability calculation for 6 interviews. The total number of codes over a 15-day interval is 47, total agreements are 36, disagreements are 12, leading to a test-retest reliability of 74.6%. Since this is above 70%, the coding reliability is confirmed) *.

Research Findings

The first part of data analysis was related to identifying the factors of the supply chain for improving banking services using the thematic analysis approach. The coding steps in this research can be divided into 4 stages. In the first stage, the key concepts of the interviews are transcribed and "open codes (descriptive codes)" are extracted from them. In the second stage, the codes are created under the category of "basic themes" which are more general than open codes. In the third stage, the codes are categorized into "organizing themes". These codes have more abstract meanings than the basic theme. In the last stage, similar organizing themes are placed in a more general category called "global themes".

Table (4): Sample of the Open Coding Process on the Expressive Statements of the Interviewees

Code	Interviewee Statements	ID
Facilitation of Regulations	One of the most important challenges of the banking services supply chain is the complexity and strictness of laws and regulations that slow down the service delivery process. He also emphasized that "facilitating laws related to the banking supply chain will increase the speed and quality of service delivery to customers and enhance the efficiency of the entire chain."	B1
Modern Services	To design a supply chain model to improve banking services, attention to the integration of modern technologies and digitalization of processes is mandatory; these actions will increase efficiency and faster response to customer needs in the banking supply chain section." He also emphasized: "Providing modern services, such as electronic banking and smart payments, must be considered as an inseparable part of the banking supply chain to create a better experience for customers and stakeholders."	B2
Transparency in the Supply Chain	Creating transparent information systems in the banking supply chain can create better control over resource circulation and financial service delivery processes and provide the possibility of real-time monitoring of the performance of different parts of the supply chain for bank managers.	B3
Customer Participation	In the process of designing the banking services supply chain model, attracting active customer participation and receiving their continuous feedback can increase the efficiency and effectiveness of the supply chain." He also added: "Increasing the level of customer participation in different links of the banking supply chain, especially in the design and delivery of new services, plays a key role in improving quality and customer satisfaction."	B4
Supply Chain Sustainability	The sustainability of the banking supply chain requires the integration of processes and the use of modern technologies so that the bank can provide financial services continuously, efficiently, and with minimal operational risk." He further emphasized that "attention to the sustainability of the banking supply chain not only improves the quality of services to customers but also plays an important role in increasing the resilience of the banking system against environmental disruptions."	B5
Human Resource Dynamism	Given the dynamics of the competitive environment of banks, specialized and trained human resources play an important role in increasing the productivity and quality of the banking services supply chain, and continuous changes in human resources can affect the performance of this entire chain." Also, another expert emphasized "Human resource dynamism as a key variable in the banking supply chain must be managed with skill development programs and motivational systems to ensure responsiveness to customer needs and continuous improvement of services provided in this chain."	B6
Inter-organizational Collaboration	In designing the banking services supply chain model, effective collaboration and interaction between different sectors of financial organizations, especially between banks and other financial service providers, plays a fundamental role in facilitating and improving banking service supply processes.	B7

Development of Digital Banking Tools	One of the main challenges in the banking supply chain is the slowness and inefficiency in data transfer and financial processes, therefore, the development of digital banking tools can play a fundamental role in increasing speed, transparency, and improving service quality in the entire banking supply chain.	C1
Flexibility in Response	In designing the banking services supply chain model, flexibility in responding to changes in customer needs and market conditions plays a key role in maintaining the competitiveness of banks, and banks must strengthen the ability to adapt quickly in the banking supply chain by leveraging technology tools and improving internal processes.	C2
Supply Chain Sustainability	In the banking supply chain model, attention to operational and environmental sustainability through optimal resource management and process transparency is considered a key factor in the success and long-term survival of banks.	C3
Customer Expectations	The banking services supply chain can only function optimally when customer expectations are at the center of the supply and service delivery processes, because quick and accurate adaptation to customer demands leads to enhanced satisfaction and loyalty." "Continuous identification and analysis of customer expectations, as one of the key variables in the banking supply chain model, plays an important role in improving the quality and effectiveness of services."	C4
Competitiveness	According to my experience in the field of banking supply chain management, competitiveness as a key variable can increase efficiency, save costs, and enhance the quality of services provided and plays an important role in improving the performance of the banking supply chain."	C5

As mentioned, in this section, only technical indicators were relied upon, and due to the lack of managerial indicators, experts were consulted. 9 interviews were collected and coded. In the 9th interview, no new basic theme was created, and the previous basic themes were repeated. To reach theoretical saturation, two more interviews were collected; to ensure that no new basic theme was created. In other words, from interviews 8-9, no new basic theme was extracted from the interview texts.

Table (5): Theoretical Saturation of Codes Derived from Interviews

Row	Interview	Total Basic Themes Produced	Number of New Basic Themes
1	A	7	7
2	B	7	7
3	C	5	5
4	D	5	4
5	E	4	3
6	F	5	3
7	G	5	4
8	H	7	3
9	I	5	1
Total		37	

(This table lists interviews A through I, showing the total basic themes produced and new basic themes for each. The sum total of basic themes produced across all interviews is 37.)

Based on this, the variables were categorized into 4 dimensions in Table (6).

Table (6): Dimensions and Components of the Supply Chain for Improving Banking Services

Variables	Dimensions
Innovation and Service Development	Development of Digital Banking Tools Modern Services Innovation Strategy Formulation Supply Chain Improvement Utilization of Knowledge Processes and Procedures
Organizational Management and Human Resources	Human Resource Dynamism Leadership Style

	Committed Supply Chain Specialists Professional Performance Organizational Performance Research Performance Multiple Decision-Making Centers Weak Coordination Flexibility in Response Inter-organizational Collaboration
Market and Customer Relations	Customer Expectations Customer Understanding Customer Participation Customer-Brand Interaction Brand Identity Articulating Brand Goals Competitiveness Improved Satisfaction

In the second part of data analysis, the fuzzy cognitive map was used for the causal relationships between the factors of the supply chain for improving banking services. For this purpose, 10 experts responded to the impact of each factor on the others based on a 5-point Likert scale, and then linguistic fuzzy options were defined for them. Then the linguistic fuzzy options were defuzzified. Then the threshold of the average opinions was considered to determine the intensity of the impact, the power of relationships and causal relationships, and to remove redundant relationships. Subsequently, Equation 2 was used to normalize the vectors, and the final matrix of the factors of the supply chain for improving banking services was obtained.

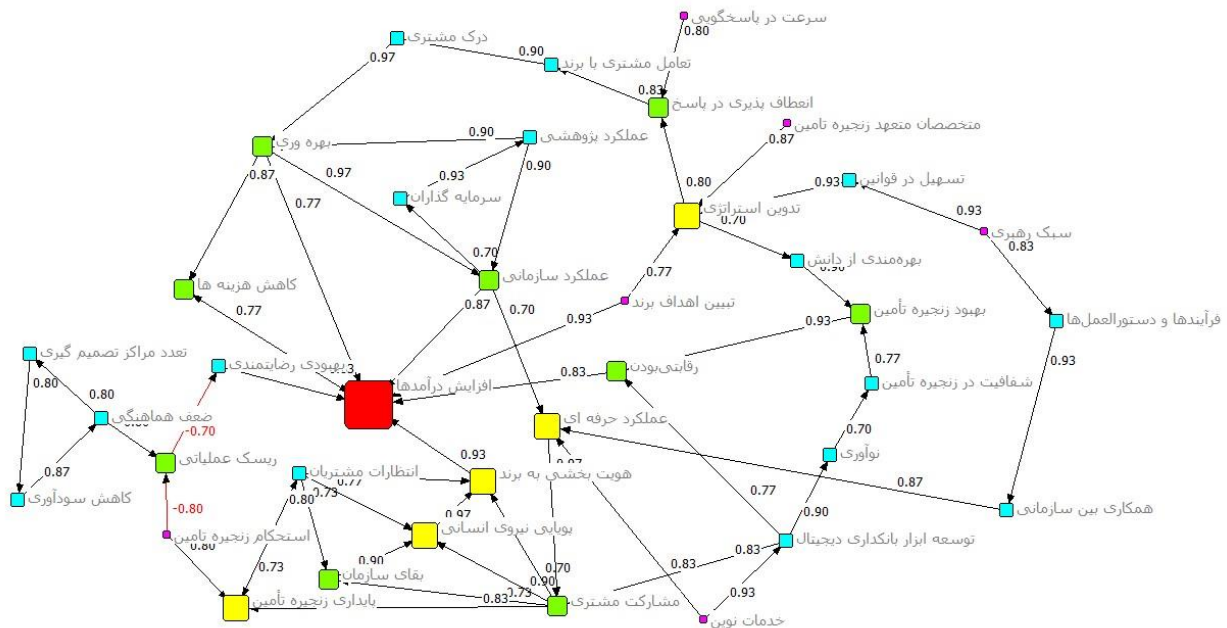


Figure (2): Causal Relationships and Node Sizes Based on the Impact Reception Power of the Components of the Supply Chain Model for Improving Banking Services

Furthermore, it shows the causal relationships and the size of the nodes based on the betweenness centrality of the components of the supply chain model for improving banking services, which indicates the communication power of the components. In other words, these components have the most connections with other components, and the information flow is transmitted mainly through these components, meaning that a change in power in these components causes a change in the entire system. The betweenness centrality power of the model components is specified in color and prominently in Figure (2). Based on this, the organizational performance component is at the center of communication

between components and its power is greater than other components. After that, respectively, are professional performance, customer participation, and productivity. Figure (2) also shows the order of the communication power or betweenness of the components.

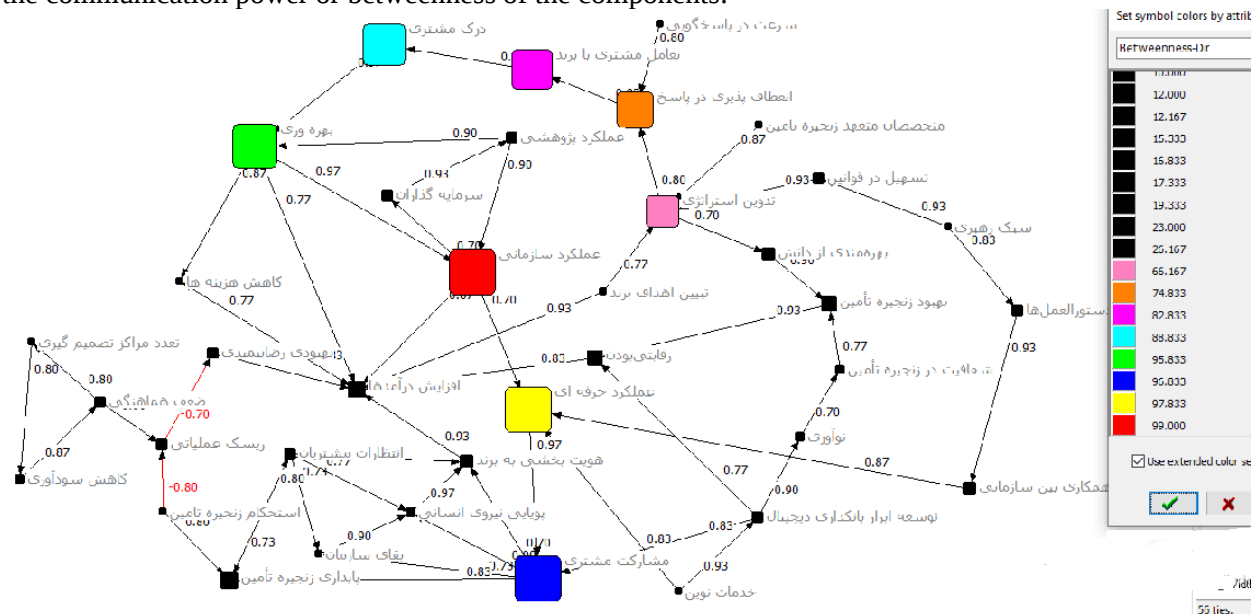


Figure (3): Causal Relationships and Node Sizes Based on the Betweenness of the Components of the Supply Chain Model for Improving Banking Services

Conclusion

The purpose of this research was to explain the factors affecting the supply chain for improving banking services. The results of thematic analysis using interviews with experts conducted in the qualitative part showed that innovation and service development, organizational management and human resources, market and customer relations, and financial and operational sustainability of the supply chain were factors affecting the supply chain for improving banking services. Innovation and development of banking services are recognized as the main engine for improving the banking services supply chain. According to previous studies, such as the research of Bigdeli et al. (2024), Shahabi et al. (2021), and Shahbandarzadeh et al. (2021), the development of digital banking tools has been able to facilitate traditional processes and increase transparency. Modern banking services such as mobile banking and internet banking have accelerated the service delivery process and increased customer satisfaction, and this has also been confirmed in the research of Edunjobi et al. (2024). Innovation in providing products and services, as well as formulating strategies aligned with the competitive market, helps banks make their supply chain more flexible and responsive to market and customer needs. Previous studies, especially the research of Majumder and Habib (2022), have shown that innovation and proper strategy formulation have a direct relationship with increasing efficiency, reducing costs, and improving service quality in the banking supply chain. Another important component is the utilization of knowledge and technology, which increases the ability to predict demand, manage risk, and optimally allocate resources in the supply chain. These results are in line with the findings of Asadi et al. (2022), who highlight the role of knowledge-centricity in the smartization of banks' supply chains. Also, the implementation of standardized processes and procedures based on modern technologies increases the level of coordination and reduces errors in banking operations. This has also been observed in the study of Nazari et al. (2019). In general, by comparing current and past studies, it can be concluded that innovation and service development are not only important factors in improving the banking services supply chain but also have a significant relationship with productivity, cost reduction, customer satisfaction, and bank competitiveness. Furthermore, the continuous development of knowledge and technology along with innovative strategies increases the chances of success for banks in the turbulent and changing economic space. It is concluded that banks that value innovation, service development, and effective use of knowledge and technology will be able to continuously improve their service supply chain and will perform better compared to banks lacking this approach.

In the quantitative part, which used the fuzzy cognitive map for the causal relationships between the factors of the supply chain for improving banking services, the findings of the fuzzy cognitive map showed that customer understanding with the highest output weight has the greatest effect on productivity, and this productivity in turn strengthens organizational performance. Productivity directly leads to improved organizational performance and consequently enhances profitability, and this loop reinforces efficiency. Investors, with a strong impact on research performance, can strengthen knowledge development and innovation in the banking system and create added value. Modern services with a high effect on professional performance accelerate the implementation of new technologies and enhance service quality. Transparency in the supply chain with an effect of 0.767 facilitates supply chain improvement and increases operational efficiency. Utilizing the knowledge of leading banks strongly contributes to supply chain improvement and overall efficiency and creates a competitive advantage. Facilitation of regulations with a key role in strategy formulation aligns strategic decisions and increases the speed of response. Leadership style by strengthening processes and facilitating regulations creates significant improvement and increases decision-making coordination. Weak coordination between units can significantly negatively impact customer understanding and supply chain improvement and reduce efficiency. Operational risk with a negative effect of -0.7 on facilitating regulations indicates that risk management is essential for maintaining profitability and should not be neglected. Increased revenues through the path of investors and knowledge utilization can strengthen profitability and sustainability and support the improvement of banking services. Cost reduction with a positive effect on specialists committed to the supply chain increases efficiency, but to maintain the robustness of the supply chain, it must be accompanied by improved coordination. Since the data of this research were collected through interviews with experts, the sample size was limited and the results cannot be generalized to all experts or all banks. Also, given that the banking industry is changing rapidly and the factors affecting the banking services supply chain may change over time, the findings of this research may need revision after a while and have less temporal stability. Subsequently, given that the factors affecting the supply chain for improving banking services were identified in this research; future researchers can use the system dynamics approach to simulate scenarios of the variables.

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