International Journal of Knowledge Processing Studies
(KPS)
Homepage: http://kps.artahub.ir/

ORIGINAL RESEARCH ARTICLE

Supply Chain Performance Management Modeling Based on Information Dashboards in Private Banks

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ARTICLE INFO

Article History:
Received: 2023-02-26
Revised: 2023-04-24
Accepted: 2023-07-22
Published Online: 2024-06-01

Keywords: Performance Dynamics, Supply Chain Management, Information Dashboard, Banking Industry.

Number of Reference: 43
Number of Figures: 2
Number of Tables: 6

DOI: ***10.22034/kps.2023.383298.1095***
DOR: ***20.1001.1.27834611.2024.4.1.1.5***

ABSTRACT

The purpose of this research is to model supply chain performance management based on information dashboards in private banks. The data was derived from in-depth and semi-structured interviews with 12 managers from five private banks in the country. The interviews were conducted using purposeful sampling and continued until theoretical saturation was reached. The validity of the research data was checked and confirmed by consulting with the participants and external auditors. Data analysis was conducted using the Strauss and Corbin model, employing open, axial, and selective coding in the Atlas TI8 software. Modeling Supply Chain Performance Management in Private Banks Using an Information Dashboard to succeed in developing and transforming their business model, companies must accurately identify the factors that impact the supply chain of banking services in the fourth industrial revolution and digital revolution. They must also successfully transition to the new technological era. A supply chain refers to the flow of materials, information, funds received from customers, and services from suppliers of raw materials through factories and warehouses to final customers. It includes organizations and processes that create goods, information, and services and deliver them to intended consumers.

►**Citation:** Bigdelim F., Dalvi Esfahani, M, & Saeed Aghasi (2024). Supply Chain Performance Management Modeling Based on Information Dashboards in Private Banks. *International Journal of Knowledge Processing Studies (KPS)*, 4(2): 1-19. Doi: 10.22034/kps.2023.383298.1095

1. Introduction

Supply chains are highly complex business networks that necessitate global data management, shared knowledge, and optimization. Moreover, the global business landscape is constantly and rapidly changing due to the continuous updating of data and information. Uncertainty, increased competition, shorter cycle times, more demanding customers, and pressure to reduce costs are just a few characteristics of the 21st-century business environment. Measuring, tracking, and managing the performance of supply chain processes based on accurate and transparent statistics and information has become crucial. Performance management is concerned with the implementation of processes, methods, criteria, and technologies to establish a reliable database. This database is used to ensure a consistent relationship between supply chain strategy, planning, execution, and control.

The Internet, information technology (IT), and electronic communication have not only created vast opportunities in the competitive business environment but also brought about significant changes in business activities (Minculete et al., 2022). Dashboard-based supply chain management focuses on the customer (Tseng et al., 2021). Reliability, responsiveness, stability, flexibility, cost reduction, and process efficiency are the outcomes of a dynamic supply chain (Banker, 2022). Supply chain management, based on information dashboards, relies on dynamic networks in which the parent company coordinates and controls a network of selected partners. This approach typically involves extensive use of digital technology in various business processes, including production, logistics, supply planning, and product design (McArthur et al., 2020). Supply chain management based on an information dashboard has been shown to reduce response time, operational costs, service costs, and sales costs (Mahroof et al., 2022). Additionally, it has been found that customer loyalty increases contract efficiency, product availability, and flexibility (Dong et al., 2012). With the development of new technologies in the activities and operations of companies, the concept of the supply chain has evolved from its simple form to a more complex concept known as the electronic supply chain. The supply chain based on an information dashboard is one of the important and practical components of a company's business. The integration of the supply chain and its management is one of the important goals in business. A frequently debated topic is the relationship between internal and external integration. A group of authors supports the idea that internal (intra-organizational) integration is almost a prerequisite for supply chain management integration (Cantini et al., 2022).

Despite the significant growth of services compared to production in recent years, there has been limited utilization of "electronic service supply chain management," particularly in the banking industry. Today, banks are seeking influence in order to gain a competitive advantage and provide better services to customers. Achieving a sustainable competitive advantage through responsiveness, efficiency, and lower costs is the operational goal of the electronic service supply chain (Nagariya et al., 2020).

Electronic supply chain financial resource management includes a set of solutions that optimize cash flow and enable banks to extend payment terms to their suppliers (Bogdan et al., 2018). On the other hand, banks oversee one of the largest, most complex, and most secure supply chains in the world, handling the transportation and storage of cash to thousands of locations every day (Guilherme, 2021). The cost of operating these electronic supply chains is increased by expenses related to the equipment and services required for processing and distributing cash within the banking network, which includes the central bank, branches,

ATMs, and ultimately, customers. These costs are high and are due to two factors. The main reason is the growing demand for liquidity and the increasing use of more advanced technology throughout the expanding supply chain (Pakurár et al., 2019).

Several pieces of evidence have shown that the electronic service supply chain includes elements such as outsourcing, IT services, service competition, customer service, and performance evaluation (Pyun et al., 2021). In Iran's banking system, numerous studies have been conducted in various areas. However, it is evident that there are only a few studies on the supply chain of the banking industry in this region (Tavana et al., 2022). In general, it can be stated that there is a greater amount of research conducted in the supply chain sector of manufacturing industries compared to the service sector. In fact, what is remarkable about this is the limited research in the field of service supply chain management (SSCM). Despite the service sector accounting for a significant share of the global economy, it is still neglected from this point of view (Shahin, 2010).

The banking industry's supply chain necessitates that member branches possess tools to assess the overall performance of the supply chain information in order to meet the requirements of the end customer. In addition, it is necessary to be able to evaluate the relative share of each member bank branch in the supply chain using real data and accurate information. This requires a performance measurement system that can not only operate at multiple levels but also link or integrate the efforts of these levels to achieve supply chain goals. Compared to the past, the banking industry in the country, particularly private banks, has a greater need for the integration of electronic supply chain concepts, the establishment of electronic logistics processes, and the implementation of these principles throughout all stages of service provision. (Garai et al., 2020). By utilizing commercial documents, companies can promote transparency in commercial operations and prevent document forgery. They can also benefit from the use of promissory notes as a means of financing instead of relying solely on cash facilities. This is achieved by allocating credit, which reduces the need for immediate liquidity by providing the necessary credit in the field. It will lead to increased employment and production, improved exchange clarification, better monitoring of consumption, utilization of credit capacity to support production, and ultimately a reduction in inflationary effects in the country.

It should be acknowledged that with the growing competition among banks in Iran, if the country's major banks fail to develop specific strategies to compete with each other, they will gradually lose resources, facilities, commitments, and ultimately profits. This will also result in a decrease in their market share across all operational departments. However, it is important to note that the supply chain of the country's banking industry, which greatly impacts customer satisfaction, has been established and continued without much consideration for its significant effects on the beneficiaries. Therefore, continuous reforms with a focus on specific features are necessary. It is the dominant player in that industry.

It should be acknowledged that the advancements in the country's banking sector, such as the establishment of private banks, the privatization of some of the largest banks, and the improved accessibility of certain services, have significantly raised customer expectations. However, it is important to note that some of these expectations are not being met as they should be, which poses a challenge in this industry. In fact, one of the main issues and problems in the structure of the country's banking network in recent years is the presence of inadequate mechanisms in the supply chain processes of banking services.

Therefore, in order to achieve agility and adaptability in the supply chain of the private banking industry, it is necessary to utilize information technology and smart tools that facilitate knowledge sharing and the establishment of an information database for supply chain operations. In order to remain competitive, banks should utilize electronic and smart technologies and tools to develop an information dashboard that enables them to effectively manage their business operations and make accurate predictions about the future. The combination of intelligence and information dashboards can enhance the efficiency and responsiveness of the banking industry's supply chain. This can be achieved by implementing an optimized decision-making process that relies on monitoring key performance indicators, ultimately leading to cost reduction. In addition, these systems should enable more predictable performance management by providing actionable information to the appropriate decision-makers. Therefore, this research aims to answer the question: What is the supply chain performance management model based on information dashboards in private banks?

2. Literature Review

Supply Chain Information Dashboard

A supply chain dashboard is a reporting tool used to track key performance indicators (KPIs) and metrics of the supply chain in a single display or interface. Supply chain dashboards track inventory levels, logistics management, and warehouse operations. Supply chain management is defined as the management of thousands of interconnected components. It is difficult to imagine how one can be effective in management and procurement without a strong understanding of supply chain key performance indicators (KPIs) and metrics. A supply chain dashboard provides managers with an at-a-glance view of the bank's performance in this field, based on data mining, enabling decision-makers to effectively manage all the components involved. In this dashboard, the status of the supply chain is reviewed in real-time, along with the risks of delivery delays. In the supply chain, the status of orders is monitored, including those that are completed, pending, deleted, or suspected of fraud. The system also tracks the timeliness of shipments, whether they are on-time, late, advanced, or canceled, based on the method of order delivery (e.g., first class). Additionally, the system covers risks associated with orders that are not completed and late deliveries. The risks associated with delivery delays are also being investigated. In this study, the risk of late delivery was analyzed for different groups of customers, including consumers, companies, and individuals who work from home. The study also examined the specific locations where late deliveries occurred, the departments that experienced the most delays, and the managers responsible for the latest deliveries. An example of a management dashboard is shown in the figure.

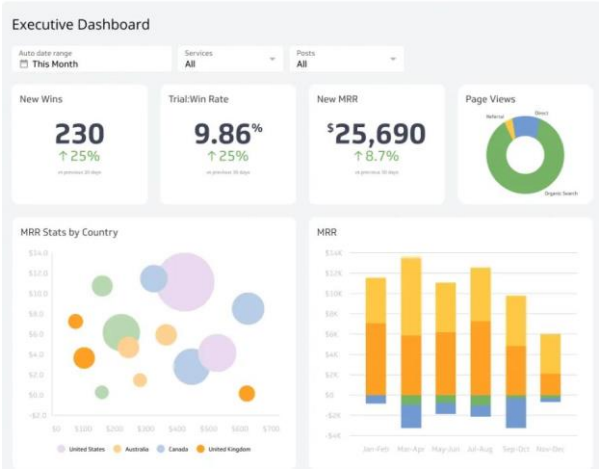

Figure 1. *Example of supply chain management dashboard*

Based on the relevance of information dashboards for management, the importance and position of information has become a crucial consideration for supply chain decision-makers and is one of the primary concerns for organizations in supply chain management. The lack of proper circulation and correct transfer of information causes uncertainty and coordination issues between different parts of the supply chain. As a result, it leads to a lack of effectiveness and efficiency in the processes, making their management more difficult. The issue of coordination in activities is very important. This point is also relevant in the discussion of information management within the chain, management of information systems, and

information transfer. Coordinated and appropriate information management between partners leads to improved speed, accuracy, quality, and other aspects. Correct information management will lead to improved coordination in the chain. Revised 2: In general, effective information management plays a crucial role in various sectors of the supply chain. Some of these sectors include logistics management (such as transfer and relocation), processing and accessing logistics information to integrate transportation, ordering, and manufacturing processes, managing order changes, production scheduling, logistics programs, and warehousing operations. It also involves exchanging and processing data between partners, such as technical information and orders, as well as collecting and analyzing information to evaluate the sourcing process, select and develop suppliers, and gather supply and demand information to predict market trends and future conditions. Ultimately, it aims to create and enhance relationships between partners. Reason 2: The revised version improves the clarity and readability of the text by rephrasing and organizing the information in a more coherent manner. It also enhances the vocabulary and technical accuracy to accurately convey the concepts related to supply chain information management. It goes without saying that information management and supply chain information systems can have a significant impact on various internal decisions within different segments of the supply chain. This highlights the significant importance of this component in supply chain management.

Electronic Supply Chain

Intelligent agents have the potential to significantly improve supply chain performance. The use of intelligent agents in the supply chain increases the flexibility of the chain and enhances the ability to respond to changes in each component of the chain (Wang et al., 2022). This has positive effects on order processing time, human processing time, and inventory levels. There is often a shortage of inventory. Agents can play a role on behalf of supply chain members by utilizing their independence and decision-making power (Irfan et al., 2022). Govil and Proth (2002) stated that the importance of information and knowledge is such that they named the current era after it (Dissanayake et al., 2018). In the age of information, economic life and competitiveness must be supported by knowledge and information. The most crucial way to achieve this is by embracing new technology. Today, in every business, it is necessary to learn how to work electronically and benefit from its advantages and positive features. The development of telecommunications and Internet communications, along with the use of computers and telecommunications in the field of information, has transformed economic relations between individuals, companies, and governments. It has shifted away from traditional modes of document exchange and led to the adoption of electronic information systems (Chen et al., 2022). Therefore, in order to maintain the market, share of every economic enterprise and the country's share in the global market, as well as to enhance these shares, it is crucial to utilize information and communication technology (ICT) in all aspects, particularly in the economic activities of the country. This includes implementing ICT within enterprises and throughout the supply chains. Commercial supply chain management standards have significantly advanced in the international arena (Ho et al., 2022). The supply chain is a network of organizations connected through the flow of materials, information, and financial communications. These organizations or companies can include those that produce raw materials, parts, and products, as well as those that provide services such as distribution, warehousing, wholesale, and retail. Supply chain performance management guides strategy formulation and plays a key role in strategy implementation and monitoring (Kazmi & Ahmed, 2021). Therefore, a timely and accurate assessment of the entire supply chain is a prerequisite for successful performance (Mondol, 2021). Accordingly, companies need tools to evaluate the performance of their supply chain in order to meet the needs of the final customer (Lee et al., 2022).

The ultimate goal of any supply chain is to maximize profitability for all members and achieve the highest possible profit. But it is impossible to achieve this goal except by providing it at the right time, in the right place, in the required quantity, and with the appropriate product model. In other words, the operational goal of every supply chain is to maximize profit by delivering the right products, in the right size, at the right time, and in the right place. Based on this, the operational goal and competitive pricing are necessary conditions for achieving profitability, which is the ultimate goal of the supply chain (Nunes et al., 2020).

Extensive research has been conducted, which indicates that integrated supply chain management can maximize the profitability of the entire chain. However, while a fully integrated supply chain management, in terms of actions and decisions, offers maximum benefits and leads to optimal performance of the entire system, it is important to note that this optimal solution may not always be the best option for all chain members. Because the member organizations of a supply chain management typically have an independent economic nature and tend to act solely to maximize their own profits, their actions may not necessarily lead to the optimization of the entire chain's profitability (Frederico, 2019).

Some companies attempt to gain control of their supply chain through vertical integration, which involves owning and integrating all the various components along the supply chain. This includes procuring materials and services, as well as delivering the final product and providing customer service. But even with this type of organizational structure, different activities and operational units may be uncoordinated. The organizational structure of the company should focus on coordinating various activities to achieve the overall goals of the company (Wieland, 2021).

It can be said that customer-perceived value (CPV) in supply chains depends on the value created by the suppliers in that chain. Therefore, it is crucial to have a mutual understanding of the functional dimensions of the supply chain in order to create value and develop appropriate strategies within the organization. This understanding is essential for meeting the expected value of customers. The three dimensions of measuring and monitoring the perceived value of CPV include features, performance, and importance. Flexibility, responsiveness, and reliability are also key features of customer perceived value in superior organizations (Patel, 2018).

Much research has been conducted on supply chain performance. Estampe et al. (2013) sought to develop a unified framework for evaluating supply chain performance across various supply chain models. These researchers believed that supply chain management creates value for the respective organization, its customers, and stakeholders through mutual interaction. In the research, the authors investigated various existing models used to evaluate supply chains. They highlighted the unique characteristics of each model and discussed their implementation. Kousiouris et al. (2019) proposed integrating Internet of Things (IoT) management systems and artificial intelligence (AI) to enhance supply chain management through the use of innovative technologies. He et al. (2020), using game theory modeling, presented a cost-sharing mechanism in a cooperative service supply chain to enhance both profitability and service levels. Pakurár et al. (2019) stated that internal and external supply chain integration, as well as internal control, significantly affect financial performance. The influence of the studied factors on financial performance decreases in the following order: internal integration, supplier integration, customer integration, and internal control.

Mohaghar and Abbasi (2021), in an article titled "Designing and Explaining the Sustainability Model of the Banking Service Supply Chain: A Case Study of Bank Mellat," stated that despite the significant importance and influence of banks in the growth and development of society, research related to the sustainability of the banking service supply chain is limited. After receiving approval from experts, they presented the final model, which includes six main dimensions: causal, intervening, contextual conditions, sustainability strategies and

policies, processes and actions, and results and consequences. In addition, Shahabi et al. (2021) demonstrated that with the advent of the fourth industrial revolution, banks are now incorporating new players like fintech into their service supply chain. This integration is accompanied by factors such as the systematic sharing of information across the entire supply chain. Inter-organizational cooperation, stability, transparency, flexibility, and personalization of services will increase. This will lead to a transformation of financial, informational, and service flows in the supply chain of banking services. On the other hand, the main challenge faced by Iranian banks in adopting digital banking is the limited utilization of artificial intelligence to automate all processes, which hinders the potential for increased flexibility and speed in response.

Based on today's research, it is impossible to discuss the supply chain information dashboard without addressing the broader issue of Industry 4.0 development. Supply chains utilize information systems to accomplish their objectives. These goals include increasing profits, reducing costs, enhancing customer satisfaction, and sharing information. Information systems can also integrate demand planning, raw material demand forecasting, order processing, inventory allocation, order fulfillment, transportation services, receiving and issuing invoices, and payment. This new paradigm creates a fresh ecosystem centered around communication. It enables communication between different functional areas within a bank and between different banks. Indeed, organizations are changing their strategies to become more transparent in their business practices, including in supply chain management. Digitization offers significant benefits for the banking supply chain, including improved information availability, optimized logistics practices, real-time data collection, more efficient inventory management, and increased transparency. Therefore, due to the lack of an electronic service supply chain in the banking industry, this issue will be further investigated. Therefore, one of the most important tasks of information systems is to create an information dashboard, which is a crucial factor for the success of any supply chain system. This task requires coordination and collaboration between supply chain partners.

3. Methodology

The current research was conducted using the qualitative-inductive method, specifically employing the Strauss-Corbin grounded theory approach and semi-structured interviews. The main structure of data analysis in the Strauss-Corbin method is based on three primary coding methods: open coding, axial coding, and selective coding. The first stage of data analysis and interpretation is the grounded theory of open coding, where the data is broken down into its smallest units (Glaser & Strauss, 2017). Open coding occurs in two stages: primary coding and secondary coding. Primary coding can be done by coding the data line-by-line, phrase-by-phrase, or paragraph-by-paragraph. A concept or code is associated with each of them. In secondary coding, similar and common items are grouped together in a single category by comparing concepts. As a result, the amount of data (codes - concepts) is reduced to a specific and limited number of major categories. Then these categories are placed next to each other and are related (Goulding, 2002). For open coding, all interviews were checked in the Atlas TI 8 software and the desired concepts were extracted. The participants in this research are subject matter experts, including managers and experts from private banks. In this research, 12 individuals were interviewed, as indicated in Table 1, in order to achieve theoretical saturation. The researcher found that the information received is repetitive and will not provide any additional insights (Given, 2008).

Table1. *demographic characteristics of the participants*

Age	Gender	Position	Work experience	Field and level of study		Row
48	Man	head of the field	25	25	Economy	1

43	Man	office boss	23	23	Management of bank branches	2
49	Man	head of the field	26	26	Economy	3
40	Female	Banking expert	19	19	Economy	4
48	Man	Head of the distinguished branch	29	29	Management of bank branches	5
42	Man	Deputy Director	20	20	civil engineering	6
46	Man	head of the field	27	27	Accounting	7
47	Man	Head of the General Department of the Bank	27	27	Management	8
49	Man	Deputy General Administration of the Bank	25	25	Management	9
49	Man	Manager of banking affairs	29	29	Business Management	10
43	Man	Head of Branch	20	20	Industrial Management	11
50	Man	District affairs manager	29	29	Accounting	12

4. Findings

To address research questions related to service supply chain performance management in private banks, tables (2) to (6) present central and open coding factors for different sections, including causal factors and intervening context.

Causal conditions are incidents or events that lead to the occurrence or development of a phenomenon. In this research, the core codes of intensifying competition, inefficiency of the supply chain, and challenges of the banking system have been identified based on the participants' point of view. These codes have been linked to another broader code called causal conditions.

- *Causal conditions*

Table 2. *Axial coding of qualitative data (causal conditions)*

Open coding	Secondary coding	Axial coding
Competition among private banks	Domestic competition	Intensification of competition
Expanding the connection between domestic monetary and financial markets		
Trying to attract new customers		
Competition with state banks		
Competition with foreign banks	Competitive Advantage	
Complex and dynamic environments		
Extensive developments in banking operations and services		
Maintaining and strengthening your competitive advantage in different markets		
High level of quality and competitiveness in global markets		
The entry of new players in the international financial markets		
Increasing the acceptance of standards for providing different services	Raised expectations	
Level and speed of changes		
Rapid flow of information between customers and suppliers		
Incongruent investment		
The ever-increasing development of communication		
A sense of unfairness and injustice		
Increasing demand for new services		
Customizing customer requests in private banks		
Expect innovation in providing services		
Vulnerabilities of the supply chain in the banking services sector	Weakness of the supply chain	Supply chain inefficiencies

Production-oriented supply chain models in the service sector		
Agreement of supply chain partners		
Lack of innovative services		
Statism		
Evaluation higher than the actual level		
Fluctuation of supply and demand along the chain		
Reducing the power of competition in the banking service chain		
Lack of communication between suppliers and customers	Weak communication and information	
Counter error		
Easing assessment error		
Failure to establish communication with the outside environment without an intermediary		
halo effect		
Management of information systems		
Personal orientation		
Personal prejudices		
Inability to establish effective relationships with bank providers		
Multiplicity of banking decision centers		
Optimal use of capacity and resources	supply of resources	Challenges of the banking system Axial coding Intensification of competition Supply chain inefficiencies
Non-optimal distribution of bank resources		
Increase in government debts to banks		
Increasing the investment ratio in the bank		
Weakness in changing service capacity		
Laws governing banks	Rules and structure	
Lack of proper performance evaluation		
Banking bureaucratic restrictions		
Bank sanctions		
Complexity due to strong relationships between key variables		
The recession that dominates many of the country's economic activities		
Increasing the amount of bank overdraft facility		
Slowness and lack of speed of action in decisions		
Lack of multifaceted banking evaluation system		
The presence and activity of unauthorized credit institutions		
Decrease in fee income	Financial performance	
A sharp increase in the cost of money		
Non-current claims of banks		
The low level of base capital of banks		
The corporatization of banks and the vicious cycle of credit distribution		
Proprietary property and non-current claims		
Reducing the ability to grant bank facilities		
Income generation and liquidity management of banks		
Banks' inability to manage liquidity deficit		
Asymmetry of bank and customer information	communication system	
The vicious cycle of the customer relationship system		
Problems of service quality evaluation systems		
Limitations of the communication system within the bank		
Transportation and storage of cash	Cash management	
Liquidity distribution in the banking network		
Increased demand for liquidity		

- *Contextual conditions*

The background or context refers to a unique set of characteristics that define the phenomenon under consideration, including the location and events associated with it. The context encompasses the specific conditions in which action and reaction strategies occur.

Table 3. *Axial coding of qualitative data (contextual conditions)*

Open coding	Secondary coding	Axial coding
The resources needed to meet the diverse demands of customers	Variety	Service quality management
Appropriate flexibility indicators for supply chain		
Demand management during service delivery		
Availability of services for different orders		
The speed of providing banking facilities and services	Speed	
The possibility of providing services on modern banking technology platforms		
Shortness of the path to obtain facilities for the customer	ease	
Access to banking services		
Ease of receiving services		
Continuous improvement of quality and productivity	Reliability	
Tangibility of banking services		
Saving and optimal use of resources		
Virtual organization and new model of remote work	Technology	Facilitating elements
Use of more sophisticated technology throughout the supply chain		
Recognizing potential capacities	Risk	
invest return rate		
Examining and evaluating market signals	Process management	Action management
Individual evaluation of employees' performance		
Provide feedback to employees		
Allocation of rewards and job promotion		
Adjusting the amount of demand for the principled and optimal allocation of resources		
Research and survey	Complaints management	
Guaranteeing satisfaction and handling complaints of the evaluation system		
New program design	Allocation planning	
The existence of ancillary services		
Ability to communicate effectively with customers	demand management	
The ability to simplify the process of ordering services		
Ability to estimate demand		
Classification and prioritization of key customers		
Forward flow of tangible service reinforcement		
Knowledge of program objectives	Management based on goals	
Modifying and improving goals		
Sharing and aggregating the goals of key stakeholders		

- *Intervening conditions*

Structural conditions belong to a phenomenon and affect action and reaction strategies. They facilitate or constrain strategies within a specific context.

Table 4. *Axial coding of qualitative data (intervening conditions)*

Open coding	Secondary coding	Axial coding

Dynamic price optimization	Content modification	Appropriate corrective actions
Interest rate determination mechanism		
Receiving sufficient and continuous feedback from various sources		
Coordination in the supply chain	Process reforms	
self-evaluation		
Complexities of supply chain automation		
Strengthen parallel markets	Market demand	Organizational strategies
Market segmentation and customer relationship management		
Demand estimation and information sharing		
Supplier relationship management	services management	
Service delivery management		
Capacity and skill management		
Sustainable achievement of goals	Sustainability of supply	
Sustainability of customer relationships		
Adequate bonds and guarantees		
Sourcing funds		
Inability to save and absorb based on the simultaneous production and consumption of services	Call service capabilities	Challenges of banking services
Difficulty resubmitting		
Intensive operation		
Intangible aspects		
The cost of recovering banking services	Features of banking services	
Flexibility in service		
Service life		
Perishability of services		

- *Strategies*

Strategies are based on actions and reactions to control, manage, and provide feedback on the phenomenon under investigation. Strategies are purposeful; they are made for a reason. There are always intervention conditions that either facilitate or limit strategies.

Table 5. *Axial coding of qualitative data (strategic conditions)*

Open coding	Secondary coding	Axial coding
Formation of mutual trust between customers and private banks	Development of social capital	Development strategy
Information sharing between customers and financiers		
Customization of the supply network according to the needs of customers		
Creating easy customer access to banking services		
Development and improvement of program policies and guidelines	Development of systems thinking	
Creating and providing useful information for different stages of decisions		
Development of new managerial and executive competencies		
Achieving common goals and facilitating communication		
Development of ownership and integration of all components of the supply chain		
Reducing uncertainty and risk in the supply chain		
Development of integrated support management thinking		
Supply chain development using modern technology		

Review and evaluate supply channels for process effectiveness	Technology Development	
Designing the members' supply chain network		
Decision-making based on the most up-to-date information technologies		
Using new technology to increase communication channels for customers		
Partnership of suppliers and customers in supply chain design	Sharing of benefits	Partnership strategy
To share up-to-date information regarding the status of the customer's order with partners		
Shared decision-making about rewards and compensation		
Helping people judge and improve multiple values	Shared transparency	
The possibility of comparing performance indicators of private banks		
Exchange of economic values between banks		
Determining the position of the private bank in the value chain		
Having appropriate comprehensiveness and transparency		
An objective standard to compensate for effort and service		
High focus on collaborative facilities	Public policy	
Designing a scheduled and targeted program		
Development of electronic banking and remote services		
Presence in the stock market and transparency of financial information		
Accurate description of expectations and performance expectations		
Segmentation of customers based on their needs	Discover new markets	Discovery strategy
Tacit knowledge of strategic information		
Finding new resources to consolidate supply chain resources		
Providing new services		
Revision of the distribution network of new banking services		
Support for new technological services		
Identification of fluid style suppliers, distributors and providers	Analysis and identification of resources	
Analysis of educational needs		
Supplier segmentation and relationship management		
Continuous improvement of performance indicators		
Revealing or predicting defects and disadvantages of the program		
Identify multiple supplier relationships		
Identifying and determining financial and support resources		
Recognition of institutions and familiarity with facilities		
Effective management of resources in order to reduce the cost of purchasing services	cost management	Focus strategy
Reducing banking costs with the competition of private banks		
Reducing the consequences of unprincipled or unintentional decisions		
Control performance indicators		
Minimizing the operating cost of the entire supply chain		
Investment in supply chain processes		
Direct connection of indicators to strategies		

Adopting a professional approach and avoiding personal encounters	Revision of evaluation indicators	
Clarity of information gathering index and calculation methods		
Evaluation and assessment of combined scenarios		
Management of service supply chains		
Support functions in the service supply chain		
Clarity of the goal of each performance indicator		
Team skills		
Increasing the level of awareness of the work and performance of employees	Ultrastructural evaluations	
Multidimensional assessment		
Reviewing the structural architecture of the banking system		
Reducing the gap with international standards		

- *Consequences*

The results that emerge as a result of strategies. Consequences are the outcomes of actions and reactions. Consequences cannot always be predicted and may not align with people's intentions. Consequences can manifest as incidents and events, either in a negative form or implied, and can occur in the present or future. It is also possible that what is considered an outcome at one point in time may become a part of conditions and factors at another point in time.

Table 6. *Axial coding of qualitative data (results)*

Open coding	**Secondary coding**	**Axial coding**
Reducing dissatisfaction and complaints	Improving the evaluation mechanism	Reforming the performance evaluation system
Effective evaluation of managerial performance		
Performance evaluation of professional growth		
Transfer of culture	Cultivation	
Gaining success in the field of competition in the information age		
Continuous improvement in the organization		
Extending your payment terms to suppliers	Financial interests	Financial-administrative function
Profitability, growth and market value		
Reward allocation		
Growth and development of programs	development	
Deciding on promotion		
Increasing and developing the skills of managers		
Employee satisfaction and productivity	Stakeholder satisfaction	Performance improvement and innovation
Customer satisfaction with the services provided		
Management based on goals		
Functional classifications	Improve performance	
Observable social behavior		
Aptitude diagnosis		
Improve documentation		
Improve communication		
Independent economic nature of the supply chain	supply chain operation	Supply chain development
Integration of supply chain activities		
Achieving a competitive advantage		
Cash flow optimization	Development of banking ability	
Supply chain dynamics		
Expansion of ability		

Figure 2 shows the selective coding paradigm and in other words the model of the qualitative research process.

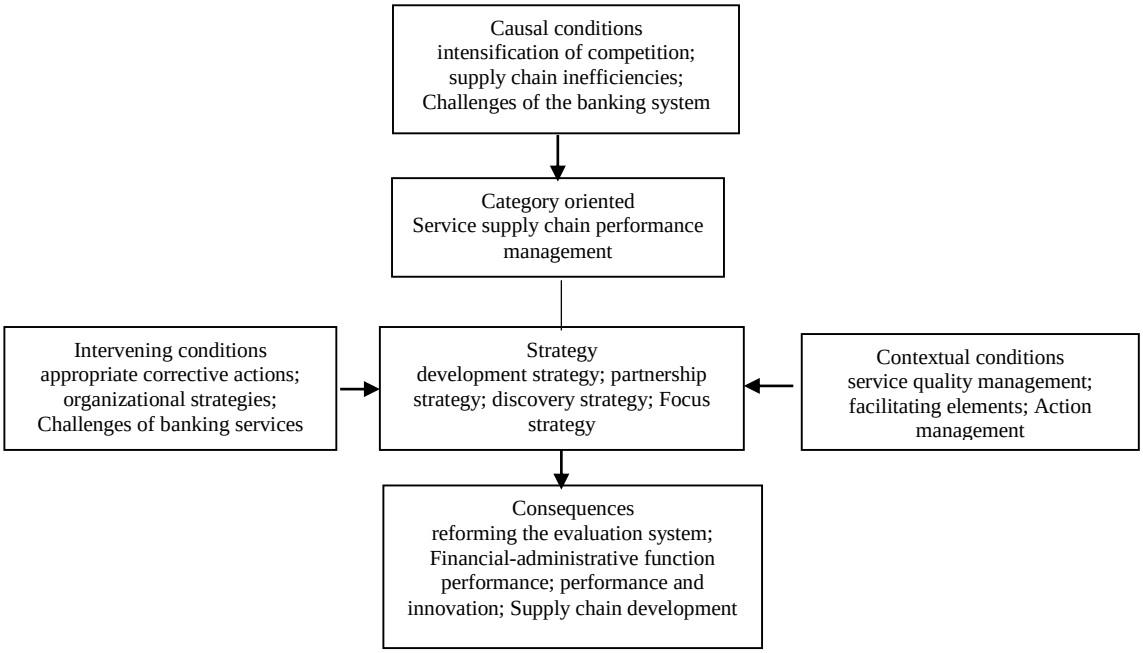

Figure 2. *Proposed research model*

5. Discussion

The present research was done with the main purpose of explanation of application of business intelligence in managing knowledge assets based on the co-word analysis of scientific productions related to "management of knowledge assets and business intelligence" in the web of science database by using the techniques of co-occurrence analysis, social network analysis, hierarchical clustering and strategic diagram. In this regard, 929 related scientific productions from 1994 to 2022 were downloaded based on the search strategy compiled from the web of science database and analyzed using various scientometric and visualization software.

The findings showed the upward trend of the combination of business intelligence and knowledge management in terms of the publication and impact of scientific productions. So that in total, the average annual growth rate of publication of productions and citations was 28 and 8.9 percent, respectively .The bibliometric research of de las Heras-Rosas and Herrera (2021) also showed that the interest in the topic of competitive intelligence is relatively new and the published works have been on the rise. Also, in López-Robles's research (2018), the amount of literature covered by the journal "Studies of Intelligence in Business" has shown a noticeable increase in the past years .In general, the findings of the current research and related backgrounds show that the approaches of organization and business intelligence to improve organizational performance in the current competitive world have been significant in studies and have become a topical trend in the era of emerging technologies.

In relation to the most important keywords of studies related to knowledge management and business intelligence, the present research showed that, after the main keywords searched in the web of science database, the keywords "big data, data mining and data warehouse", "big data, management and system" and "design science, industry 4.0 and discovery" respectively, had the highest frequency, links and citations .Also, in the

scientific productions, the term business intelligence in connection with terms such as knowledge management, data mining, data warehouse, big data and knowledge discovery have the highest co-occurrence. In the research of Liang and Liu (2018), "data mining", "social media" and "information system" were keywords with high frequency, but "cloud computing", "data warehouse" and "knowledge management" after 2016 were more emphasized .The main topics frequently used in López-Robles' (2018) were also business intelligence, big data, competitive intelligence, information management and social network. This was despite the fact that in the research of Zou et al. (2019), "cloud computing" was most related to the topic of business intelligence. In the field of competitive intelligence, de las Heras-Rosas and Herrera (2021) showed that the topics of innovation and position recognition (orientation) were at the top of the topics.

In the present study, after co-word analyzing of 2848 keywords, 8 clusters containing 138 keywords were identified. Clusters formed focused on topics such as business intelligence infrastructure and requirements, organizational innovation management and strategy using knowledge asset management and sharing, business intelligence processes and tools, application and benefits of business intelligence, organizational issues and factors affecting business intelligence, intelligentization of information systems , the common foundations of business intelligence and knowledge management and the role of technology in organizational efficiency .As the themes of the clusters show, some studies have focused exclusively on business intelligence regardless of its direct role in organizational knowledge management; Meanwhile, some studies have directly focused on both issues and concepts related to them and have examined their relationship from different aspects .On the other hand, the formed clusters somehow show the different dimensions of business intelligence implementation in line with organizational knowledge management, which managers and decision makers need to pay attention to them. Undoubtedly, dimensions and components such as attention to infrastructure, innovation and technology strategies, as well as attention to existing issues are very important issues that have been adequately addressed in studies.

A review of the keywords of the scientific products and the formed clusters shows that business intelligence is one of the most effective tools and approaches in the recent era to manage organizational assets. In fact, if today's modern businesses accept knowledge management and seek to implement it in their organizational context, they cannot ignore the generated data as one of the important knowledge assets, and then their analysis, and in general, the use of business intelligence in the various organizations processes.

In other words, today, which is parallel to the era of the fourth industrial revolution, and according to some experts, it is even moving to the fifth industrial revolution, business intelligence should be one of the areas of interest in organizational management, especially knowledge management, in order to improve organizational performance and gain a competitive advantage .Therefore, considering the high co-occurrence of knowledge management-business intelligence pair, there is a relationship between the implementation of knowledge management processes in business environments and the amount of use of business intelligence. The studies of Najafi Yazdi (2013), Ranjbar, Heydari and Rafiei (2013) and Balouyi and Khosrozadeh Sarasti (2017) also showed that there is a positive and significant relationship between knowledge management processes and business intelligence with organizational performance. Meanwhile, the studies of Soleimani and Atefat Dost (2018), Shokri and Ghazizadeh

(2019) and Abusweilem and Abualoush (2019) show the significant effect of business intelligence and knowledge management on the key indicators of organizational performance and decision-making. On the other hand, Rastgar and Hakaki (2019) showed that the infrastructural capability of knowledge management affects business intelligence directly and indirectly through open innovation ;Also, Jedali and Jedali (1400) found that knowledge management through business intelligence had a positive effect on the innovative behavior of employees. Bouaoula et al., (2019) also emphasized that business intelligence is a valuable knowledge management tool that can help support the organization's competitiveness .A review of the findings of this research and other related research shows that knowledge management and business intelligence have an effect on each other directly or through other mediating variables, which will continue to be effective on other variables of organizational performance.

Also, in the current research, five clusters were formed from hierarchical clustering with the titles of business intelligence tools in knowledge asset management, business intelligence infrastructure and technologies, business process management through knowledge asset management, business intelligence essentials, and business intelligence in strategic planning .The clusters identified in this step were the result of the most frequent main keywords in the studied scientific productions; Undoubtedly, there is an overlap between these clusters and the clusters identified in the previous step; But the important and significant point of identifying the degree of maturity and development of the clusters. In the strategic diagram, the clusters of business intelligence tools in knowledge management, infrastructures and technologies of business intelligence and business process management from Through the management of knowledge assets are the mature clusters and were placed in the center of this research field.

6. Conclusion

By drawing the intellectual structure of knowledge in the scientific field of knowledge management and business intelligence, the present scientometric research provided an overview of the important and growing topics of this field as well as the existing thematic gaps .In fact, this research, while creating a comprehensive perspective by identifying the main topics and clusters discussed in the field of business intelligence and knowledge management, will be useful for those involved in the fields of research, education and organizational managers. In the following, based on the findings of this research, suggestions are presented in two sections: executive suggestions and suggestions for future research.

Executive Suggestion

Paying attention to the components, processes, mediating variables, tools and other important considerations in connection with the application of business intelligence in the management of knowledge assets based on the keywords and concepts identified in this study and then predicting and taking the necessary measures in relevant executive and research projects;

The attention of managers of organizations and businesses to provide the infrastructure needed to benefit from business intelligence and knowledge management, such as organizational innovation strategy, Internet of Things, data science, social networks, etc., based on the keywords and concepts identified in this study;

Expanding the scientific collaboration of researchers in related fields such as the fields of data science, information and knowledge science, smartening and knowledge management in order to strengthen the

interdisciplinary perspective and ultimately more effectiveness of scientific productions based on the identified specialized words related to the above research areas in this study.

Suggestion for future research

Analyzing the content and structure of the concepts and keyword of the scientific documents of the subfields and clusters resulting from the present study separately, with the aim of repairing the shortcomings of the tools and technologies required by research centers, especially in Iran;

Comparative analysis of the co-occurrence of related scientific productions based on the important keywords and concepts (with frequency, links and high impact) identified in this study, such as scientific productions related to data warehouse, knowledge discovery, data mining, big data, industry and 4.0 etc.

Comparative analysis of the co-occurrence of the keywords of scientific productions of knowledge management and business intelligence by different fields of science, such as the fields of computer science, management, business economics, information science, etc., according to the specialized keywords identified related to the above scientific fields in this study.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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