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RESEARCH ARTICLE **Open Access**

Investigating the Role of Social Media in Digital Supply Chain Resilience with a Hybrid Approach

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Abstract
Uncertainty and critical conditions have become one of the most important challenges in the world today. In order to achieve superiority in economic competition, the supply chain must be designed in such a way that it has the necessary resilience in critical situations. One of the things that can be considered in this regard is the role of social media in the resilience of the supply chain. Considering the impact that social media has on business processes and considering the rapid and significant advances in information and communication technology, the use of social media in risk situations can be very effective. This research examines the role of social media in the resilience of the digital supply chain with a hybrid approach. This research has been done in an applied manner and through the hybrid approach. The data of this research has been collected from the library method and articles related to the research topic have been used in reliable scientific databases. The results of this research include 118 open codes, 43 core codes and 13 main categories. The 13 selected codes of this research are placed in the form of five general categories of causal conditions, contextual conditions, intervening conditions, strategies and consequences. Causal conditions include 2 selective codes, 8 concepts and 21 open codes. The contextual conditions include 3 selected codes, 10 concepts and 25 open codes. Intervening conditions include 2 optional codes, 7 concepts and 21 open codes. The strategies include 2 selected codes, 7 concepts and 19 open codes. The results include 4 selected codes, 11 concepts and 32 open codes.
Keywords: *Resilient supply chain, Social media, Hybrid method, Crisis management*

Introduction

Social media can be defined as a basic way to communicate through which users can create online communities and share thoughts, feelings, information, messages and other content forms in the form of use different sources, including text, photos, and videos (Karimi & Khajeheian, 2022: 260). In general, it can be said that today the role of social media and its impact on business and commercial relations is clearer than ever. With the emergence of social developments regarding global phenomena, this role-playing has shown itself more. One of the areas affected by this issue is the digital supply chain. The level of resilience of the digital supply chain using the social media platform can be affected through the accurate identification of these

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components, which ultimately leads to the formation of the role of these components in the model of the resilience of the digital supply chain (Monazzam Ghale Jughi et al., 2022: 119).

What social media does for businessmen and marketers is to provide the best and most effective platform to express their goals. They can easily communicate with users and customers. The availability of low-cost tools provides more discretion in marketing their programs so that they can combine appropriate technology with social ethics (Marolt et al., 2022: 364). Now, due to the new developments in the field of information technology, and the emergence of attractive virtual spaces such as social networks, the field has been prepared for the promotion of goods and services of producers (Safikhani, 2022: 140). With the advancement of Internet technology, companies use social networking sites to promote and spread information about their brand. Social networks have changed traditional marketing communications. Internet users are gradually forming commercial communications, which were traditionally formed by marketers (Bruce et al., 2022: 173).

In an environment where supply chain companies have always faced increasing disturbances and have struggled with challenges in maintaining their operations; several capabilities have been identified that have helped companies effectively overcome these situations (Passarelli et al., 2023: 1309). These abilities are often known as dynamic abilities to respond to dynamic environmental conditions in order to effectively meet the needs of customers. Resilience is considered as a dynamic ability that can help a company to maintain its operations in the event of a disruption. The system is to return to the initial state or more favorable than the past after the occurrence of a disturbance (Hajian Heidary & Mirzaaliyan, 2022: 101)

One of the main methods of identifying risks and predicting future problems and providing appropriate solutions for them is to have a detailed understanding of the supply chain. Most of the big companies that supply products have a vague vision about their primary and secondary suppliers; and many of them are not familiar with their suppliers in a deep and fundamental way. Accelerating digitalization has made it possible for organizations to evaluate the needs of their customers throughout the value chain (from the raw material production stage to the final stage of sending to the customer) and try to meet these needs.

Even though the benefits of using social analysis have are widely accepted at both academic and industry/services context, there is still a lack of solid frameworks that allow decision-makers to connect the usage and obtained results of social network analysis – mainly both information and knowledge flows and derived results- with supply chain management objectives and goals.

Social network analysis (SNA) methods have been used in many researches to study the structure of societies and to identify important entities in a society. If supply chains are modeled as a network, then SNA methods can be useful tools for analysis.

According to the importance of the mentioned things, it can be considered the necessity of conducting this research in view of the gaps in past research in the five main advantages of using social media in the supply chain.

1- Creating knowledge networks
2- Balance speed and thinking
3- Portable vaults of information
4- Substitution of cooperation with the forum
5- Building a platform for innovation

And all these cases will be presented by reviewing previous studies and creating a complete model by using interviews and questionnaires.

This research is of a developmental and applied type, and Meta synthesis method is used to analyze the factors. This research can be used by all managers and experts of private and government manufacturing organizations and industries who are interested in using the supply chain in critical situations. In the second part of this research, the theoretical framework and background of the research will be discussed. The third part deals with the research method. The fourth part includes the data analysis and the fifth part will give conclusions and suggestions for future research.

Review of Theoretical Framework and Research Background

Supply Chain

In the 90s, many organizations saw improvement in business process improvement. Meanwhile, leading companies sought to break down organizational boundaries and create inter-organizational processes beyond Michael Porter's value chain, a topic discussed in the 1990s. Supply chain analysts, in contrast to "traditional supply chain" or "internal supply chain", proposed the concept of "integrated supply chain" (Sangbor et al., 2022:7). Integrated supply chain integrates supply chain processes in different businesses and seeks to manage it as a single entity, focusing on inventory, transportation, resource availability, and location of production sites. In traditional supply chains, marketing and sales, distribution and delivery, planning, production and purchasing were carried out in separate organizations with independent and sometimes conflicting goals and approaches (Katsaliaki et al., 2022: 982). Also, according to the belief of many researchers and experts, today the competition is shifted from the company level to the competition between their supply chains and an efficient and agile supply chain is considered as a very important and decisive competitive advantage in the field of competition. In this regard, many researchers believe that as the competition is extended from the level of companies to the level of their supply chain, quality and quality management should also be expanded from the level of companies to the level of their supply chain; So that supply chain quality management can help a company coordinate the implementation of all activities uniformly to ultimately improve its performance in the supply chain (Tavakkol et al., 2023: 99).

Digital Supply Chain

Supply chain management is a significant process, because optimized production chains lead to lower costs and greater speed in the production cycle. However, the traditional supply chain does not have the special features that are required in today's and tomorrow's conditions. The traditional supply chain consists of a set of completely discrete and separate steps. Converting a traditional supply chain to a digital supply chain solves these limitations so that the chain becomes an integrated system that functions flawlessly. A digital supply chain is not about whether products or services are physical or digital, but rather about how the supply chain is managed. Global retailers such as Amazon and Alibaba have invested heavily in drones and robots to transport and deliver goods. The traditional supply chain relies on a combination of electronic processes and paper-based documents. Organizational structures are often characterized by functional and geographical silos that do not tend to openly share information, leading to minimal performance (Rahchamani et al., 2022: 17). On the other hand, the digital supply chain has the ability to create expanded information, greater collaboration and communication across digital platforms, increasing reliability, agility and effectiveness. A digital supply chain is composed of subsystems (e.g. software, hardware, communication networks) that support interaction between globally

distributed organizations and coordinate the activities of supply chain partners. These activities include buying, preparing, storing, moving and selling a product. Digitization has the potential to optimize supply chains through technology by creating more valuable, accessible and cost-effective services. Accordingly, to create new supply chain opportunities through digital technologies, a different perspective is needed. Organizations must use their supply chain as a digital supply network that unites not only the physical flow of products and services, but also talent, positions, information and finances. In an abstract sense, people and data, as well as materials, products, and resources must move together throughout the enterprise in a developed manner (Marzban et al., 2022: 113).

The Use of Social Media in the Supply Chain

The development of interactive technologies in the last two decades has affected all aspects of people's lives, especially young people. Social media has become an essential part of them and most of them are members of one or more social media. Social media has dramatically changed the way organizations interact and communicate with customers. Marketing communications, such as advertising and word-of-mouth marketing, are easily accomplished using social media and sharing images, videos, and audio. Also, the interaction between the government and citizens has been affected by social media (Hajikarimi, 2022: 66). Social media includes social networks and professional networking sites, Internet social networks are sites or groups of sites that provide an opportunity for users to share their interests, thoughts and activities with others and others in these thoughts and Activities should be shared with them (Asadi et al., 2022: 169). Currently, social media have been widely used to increase social sustainability in operations and supply chain management. Usually, the use of social media, just like other innovations for social sustainability of the supply chain, is influenced by the key success factors that govern every aspect of the decisions and processes of the company and its supply chain (Alefpour Tarakameh et al., 2022: 959).

Resilient Supply Chain

Today's business environment has created a high level of uncertainty and chaotic behavior in supply chains. These chaotic behaviors are the result of factors such as globalization, increasing the level of outsourcing of activities, increasing demand fluctuations, reducing the life cycle of products, a sharp decrease in inventory reserves and decreasing the number of suppliers of companies (Von Berlepsch et al., 2022: 131). . In addition to the mentioned cases, supply chains are facing major challenges and threats such as natural disasters such as floods, earthquakes, storms, fires, cyber-attacks, embargoes, disruptions in the supply, production and distribution system, etc. The concept of supply chain resilience expresses a multidimensional phenomenon (Himabindu et al., 2022: 54). The following definition is expressed based on the use of various interdisciplinary perspectives: the adaptability of the supply chain in order to prepare for unexpected events, respond to disruptions and recover from them by maintaining the continuity of operations at the desired level of communication and control over structure and performance. Majumder & Habib, 2022: 14). Also, another comprehensive definition of resilience is: identifying potential sources of risk and implementing appropriate strategies through a coordinated approach among supply chain members in order to reduce supply chain vulnerability. Supply chain resilience is defined in terms of the following characteristics: flexibility, speed, visibility (Giovanni et al., 2022: 381).

Research Background

In this section, the background of previous researches related to the research topic is discussed. These studies are listed in Table 1.

Table 1.
Background of previous researches

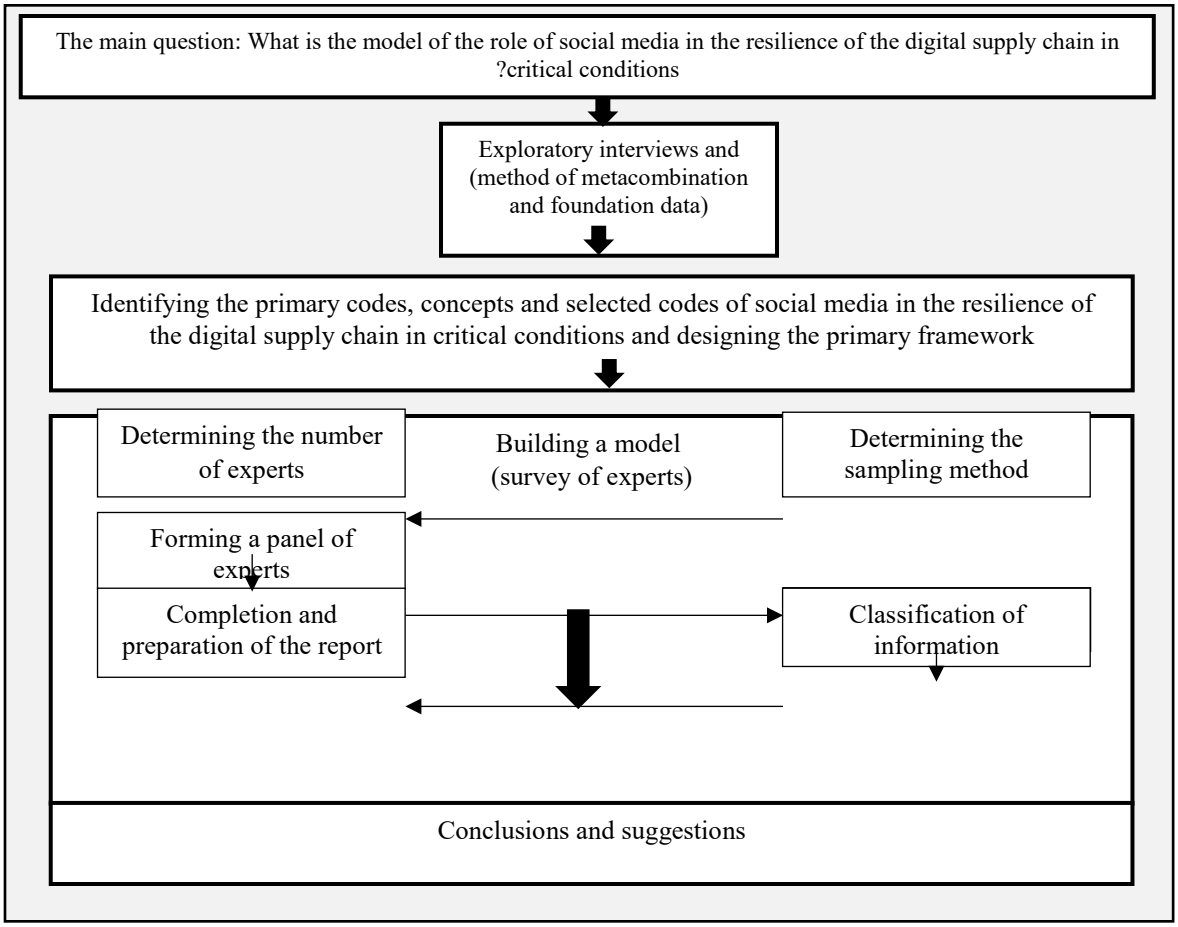
Abesh Loui Aghdam et al. (2023)	In this research, a model for the effectiveness of marketing communication in social networks presented for the first time in the retail industry in Iran.
Ahmadpour et al. (2023)	The purpose of this article is to evaluate the structural model of the performance of the sustainable supply chain of the service sector (experimental witness: Social Security Organization of the country).
Nozari et al. (2022)	In this article, he challenges of implementing a supply chain 4.0 (digital supply chain) have been investigated and prioritized using a non-linear hierarchical analysis method.
Farahbakhsh & Samuei (2022)	In this research, two goals of minimizing relief costs and service time, which are respectively based on economic and social criteria, are considered to determine the distribution locations, the optimal route of sending hospitals, and the amount of service capacity of hospitals at the time of an accident.
Tozlu et al., (2022)	In this article design and development of the virtual supply chain network platform for crisis response has been discussed. In this research, a four-stage system of strategic product production is proposed to ensure crisis response.
Kahkonen & Patrucco (2022)	It is suggested in this research that supply flexibility, absorption, response and investment should be prioritized in the supply chain to respond to global crises and disruptions and to recover from it.
Majumder & Habib (2022)	In this research, through the analysis of case studies and interviews with more than 500 stakeholders, many structural and administrative complexities and risks of disruption following the use of traditional supply chain infrastructure for emergency disaster scenarios have been identified and analyzed.
Ehsani & Mehrmanesh (2021)	The purpose of this study was to design and validate a suitable model for identifying and ranking effective factors and key indicators related to the performance of the organization in the supply chain of Saipa Company in Iran.
Alidoost et al. (2020)	In this research, A multi-objective mathematical model for the drug supply chain in unexpected events is proposed to help strategic decisions during the occurrence of unexpected events such as floods and earthquakes.
Mohammad Hosseini and Mousavi (2019)	This article examined the nature and characteristics of EPC projects with special attention to project procurement management. In this research, an advanced framework is proposed by considering the concepts of supply chain management and critical chain project management, using the theory of constraints.

Research Methodology

The method of the current research is fundamental-applied in terms of the purpose, qualitative in terms of data type, exploratory; Delphi method is also used in this research. In the design of the model of the role of social media in the resilience of the digital supply chain in critical conditions, a meta-composite method has been used. Metasynthesis is done to integrate multiple studies to create comprehensive and interpretive findings. Metasynthesis is focused on qualitative studies, it refers to the translation of qualitative studies to each other and deep understanding of the researcher.

In this research, the seven-step metacompositing method was used and using the metacomposition method, the articles in the field of social media were evaluated in the resilience of the digital supply chain in critical

conditions, and the relevant dimensions and codes were extracted using the foundation data method, and finally the media model Social is presented in digital supply chain resilience in critical conditions. Figure 1 shows the research process.



The concept of hypercombination

Collecting a group of qualitative studies, analyzing their findings, discovering the essential points in them and combining and transforming them into a more general alternative is called metasynthesis. In other words, the synthesis of qualitative studies is the unification of a group of qualitative studies in order to discover the basic points and translate them into a single final product, this final product expresses the primary results of the studies in the form of a new concept. The new concept and interpretation of the subject under investigation is presented in the final product emerging from metacomposition in such a way that the result of the primary researches can be searched in it at the same time. It should be noted that this method is in its infancy and currently there is no comprehensive guide for it. For example, there are still disagreements about what part of primary studies is considered data for metasynthesis, whether the abstract and title are also considered part of the data, or only the text of the article should be used, and also about the criteria for inclusion and exclusion of studies in metasynthesis. (Refaie Shirpak et al., 2010).

Necessity of hybridization

Every day, the importance of decision-making based on research and scientific evidence and findings is increasing. Therefore,

there is a need for a method that can provide an organized review of qualitative research and present the results of similar groups of such research in a more comprehensive interpretation. As Steyer and Peterson pointed out, the importance of metacomposition is that this method provides a more comprehensive knowledge and a deeper understanding of the phenomenon under investigation and helps to make decisions based on scientific evidence and research findings (Refaie Shirpak et al., 2010).

Statistical Society

The statistical population of the research in the verification of the factors extracted in the metacombination method included experts, university professors and experts and specialists of the digital supply chain and social media and top managers of Mapna Company who had the required information for the research. There are 10 people. The characteristics of research experts include the following:

- ✓ The relevance of experts' work experience with the resilience category of digital supply chain and social media;
- ✓ Existence of experts from Mapna's senior management positions;
- ✓ The presence of academic experts with relevant academic education against professional experts;
- ✓ Theoretical mastery, practical experience, willingness and ability to participate in research and access.

Data collection tool

In this research, in order to collect information and extract factors in the first qualitative part, referring to the articles taken from eight reliable databases, ScienceDirect, Web of Science, Google Scholar, Scopus, Emerald, CIVILICA, Magiran, SID is considered and one of the main tools used in this It is research. This action is the basis of preparing the initial model and extracting the components and dimensions related to the model of the role of social media in the resilience of the digital supply chain in critical conditions.

Data Analysis

Foundation data theory is one of the research strategies through which the theory is formed based on the main concepts obtained from the data. That is, the theory formation process in this strategy is moving from part to whole.

In the theory analysis process, textual data are coded. Information coding consists of three steps: open coding, axial coding, and selective coding. Open coding takes place in two stages: primary coding and secondary coding. Primary coding can be done by line-by-line, phrase-by-phrase, or paragraph-by-paragraph coding of the data. A concept or code is attached to each of them. In secondary coding, by comparing concepts, similar and common items are placed in a single category; therefore, the mass 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 connected. The data obtained from the research were analyzed by NVIVO software version 11.

Description, analysis and analysis of data is one of the important steps in any research process. For this purpose, the codes extracted from the qualitative part of determining the status are prioritized and the validity of the model is examined. The data obtained from the research were analyzed by SPSS version 23 and SMART PLS software. Table 2 shows the demographic characteristics of the research experts.

Table 2.
Demographic characteristics of research experts

Expert number	Gender	Education level	Work experience (Age)	Expertise
1	Male	MA	24	Marketing
2	Male	Ph.D	16	Information Technology
3	Male	Ph.D	23	Marketing
4	Female	Ph.D	22	Business Management
5	Male	Ph.D	17	Media management
6	Female	Ph.D	24	Marketing
7	Male	Ph.D	19	Management
8	Female	MA	22	Marketing
9	Male	Ph.D	25	Communication management
10	Male	Ph.D	27	Marketing

Steps of hybridization method

In this research, in the qualitative section, in order to identify the factors of the steps of metacombination method, the aim of this section is to answer the following question: What are the factors affecting the role of social media in the resilience of the digital supply chain in critical conditions?

Step 1: defining the research question

Defining the research question In order to set the research question, the first step for researchers is to focus on what to study. In the current research, the main question is "What is the role of social media in the resilience of the digital supply chain in critical conditions?" is investigated, which is set by considering the parameters listed in Table 3.

Table 3.
Research questions

Question parameters	Question	Answer the question
What	What are the factors affecting the role of social media in the resilience of the digital supply chain in critical conditions?	Model design framework of the role of social media in digital supply chain resilience in critical conditions
Who	What is the studied community of the design model of the role of social media in the resilience of the digital supply chain in critical conditions?	Various works in the form of researches, articles, theses.
When	What is the time frame of the research?	All related works between 2000 and the end of 2021
How	How are the research data collected?	Examining the content of works, identifying codes

Step 2: identifying and retrieving studies

In this research, five non-Iranian databases ScienceDirect, Web of Science, Google Scholar, Scopus, Emerald, and three Iranian databases CIVILICA Magiran and SID were searched in order to identify and collect different studies, as a result of this search and by entering the inclusion criteria of about 163 studies were found for review. The keywords searched in this research are shown in Table 4.

Table 4.
Searched terms

Keywords	
Supply chain resilience	Digital supply chain
Digital supply chain in a critical situation	Social media and digital supply chain

Step 3: Determining the criteria for entering and exiting the study (determining sources, sample size)

In order to select the appropriate sources, the following procedure was followed: first, the keyword supply chain was searched in each of the databases, but considering that this word is a general word and most of the sources found included topics unrelated to the subject of this research, so this word is a compound word. The resilience of the supply chain was limited and since the digital supply chain was considered, the word resilience of the digital supply chain in critical conditions was also considered when searching for resources in the bases. It should be noted that the total number of articles found considering the input criteria is 163 studies (Persian and English), after reviewing all of them and considering the output criteria from the point of view of content criteria or lack of access, finally the results extracted from 19 The study (14 English studies and 5 Persian studies) was reviewed and analyzed. In the following, suitable entry and exit criteria are considered in order to find comprehensive studies related to the research topic in order to review them, according to Figure 2 in this research.

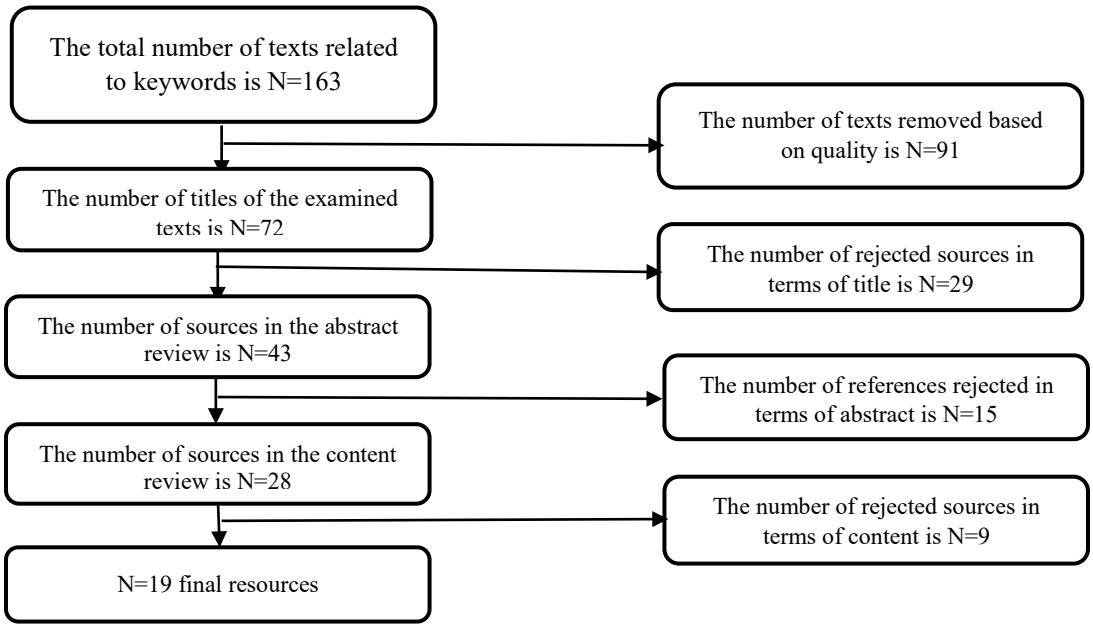


Figure 2. *Final source selection algorithm*

Step 4: extracting the findings and evaluating the quality of each study the final identified codes according to the selected articles are listed in Table 5.

Table 5.
Classification of identified codes

Open codes	Axial codes (concepts)	Selective codes	Sources
•Data exchange with suppliers electronically • Outsourcing	New suppliers	Diverse supply chain network design	Koi et al. (2018), Singh et al. (2018), Hena et al. (2011)
•Clarity of inventory level with integrated system •Analysis, reporting and strategy creation •Reduction of human errors	Smart storage		Khodabakhsh et al. (2017)
•Focusing on demand management and supply and production planning based on it •Accelerating logistics planning	Integrated planning and implementation		Sadeghi and Seifi (2019), Singh et al. (2018), Jones et al. (2014)
•Integrated supply with high cooperation capabilities •Creating a business network and having a common vision •Improving relations with supply chain partners	Integration of partners		Hena et al. (2011), Khodabakhsh et al. (2017)
•Reliability in the supply chain and prevention of rework •Product differentiation and change in production method • Provide optimal quality	Smart production		Jones et al. (2014), Azar and Khorrami (2019)
•Quick reconfiguration of the system •Reducing supply time •The speed of tracking products in the supply chain	Quick reaction	Agility	Nasiri et al. (2020), Khodabakhsh et al. (2017)
•Quick reconfiguration of the system •Reducing supply time • The speed of tracking products in the supply chain		Empowerment	Rajesh and Ravi (2015), Azar and Khorrami (2019)
•Having a spirit of success •Maintain competitive advantage •Increasing responsiveness		Focus on leadership time	Hena et al. (2011), Xiao et al. (2012)

Open codes	Axial codes (concepts)	Selective codes	Sources
•Sharing producer information •Sharing distributor information •Sharing customer information	Sharing information using social media	Strategic reserve	Carvalho et al. (2012), Sadeghi and Seifi (2019), Hena et al. (2011)
•Digital information exchange •Focus on innovation and sustainability •Exploration, training and strategy development	Sharing knowledge		Singh et al. (2018), Jones et al. (2014)
•Reducing the waiting time until product delivery •Time prioritization of the implementation of the company's development plans • Decentralized storage to shorten delivery times	Delay strategy management		Khodabakhsh et al. (2017), Chao et al. (2020)
•Controlling the risk of weak control in the project •Knowing the quality level desired by the customer • Value optimization	Project management system		Rajesh and Ravi (2015), Nasiri et al. (2020)
•Interoperability •Deployment of new technologies Examining reactions to digital advertisements •Examining moving environments	Online and instant marketing with social media	Collaboration and outsourcing	Jones et al. (2014), Carvalho et al. (2012).
•Publication of reports related to the company's social responsibility • Promote success stories	Media coverage		Reilly and Heenan (2014), Jafaranejad et al. (2019)
•Creating a stronger network between different business processes with digital technologies •Sharing risk and revenue	Creating a business network and having a common vision		Sadeghi and Seifi (2019), Chao et al. (2020)
•Avoiding the abuse of the crisis for short-term profits • Increasing the readiness of the entire digital supply chain	Creation and development of precautionary storage		Nasiri et al. (2020), Khodabakhsh et al. (2017)

Open codes	Axial codes (concepts)	Selective codes	Sources
•Forming a supply chain joint action team to deal with the crisis •Development of product portfolio with rapid innovation based on customer needs •Reaction to disturbances and recovery from them	Anticipation and preparation	Crisis Management	Azar and Khorrami (2019), Rajesh and Ravi (2015)
•Optimizing processes •Increasing the quality of automation processes •Connection between people and content	Content analysis		Singh et al. (2018), Khodabakhsh et al. (2017)
•Collecting data from different sources •Reconfiguration of resources	Create multi-purpose resources	Flexible sourcing	Queiroz et al. (2019)
•Flexibility of new services •Identifying alternative suppliers	Supply network flexibility		Queiroz et al. (2019)
•Ambiguity tolerance •Easy interaction through the digital supply chain •Controlling environmental concerns	Adaptability		Chao et al. (2020), Lee (2018)
•Net profit and cost per operating hour •Managing cash flow and ensuring financial discipline •Sufficient budget and proper financing	Power and financial ability	Liquidity cycle	Queiroz et al. (2019), Xiao et al. (2012)
•Department of monitoring contracts and payments •Obtaining digital feedback •Resilient digital liquidity cycle	Supplying and providing financial services on social media platforms		O'Leary (2011), Rajesh and Ravi (2015)
•Financial/non-financial support to supply chain partners •Financial transparency	Indirect investment		Queiroz et al. (2019), Lee (2018)
•Vocabulary based sentiment analysis •Analysis of collective emotions •Using social media to create demand for goods and services	Sentiment analysis, issue detection and market intelligence gathering		Xiao et al. (2012), Jafaranejad et al. (2019)

Open codes	Axial codes (concepts)	Selective codes	Sources
•Innovative measures to deal with the drop in demand •Measuring demand and up-to-date sales information • Modularization	Shaping sales and demand	Anticipating changes in the market	Nasiri et al. (2020), Salimi Zavieh and Shams (2021)
•Finding new demand channels •Benefits of innovative business models	Simplicity and standardization of products		Rajesh and Ravi (2015), Lee (2018)
•Improving cooperation among employees •Trust among employees •Employing multi-skilled workforce	Competence of employees	Proper support	Bechsis et al. (2018), Jafaranejad et al. (2019)
•Flexibility in ordering •Redesign of demand planning processes •Sending promotional materials (such as discounts) to customers •Provide user tutorials, tips and instructions	Approaching the consumer		Reilly and Heenan (2014), Carvalho et al. (2012)
•Loyal suppliers •Excess capacity and backup suppliers •Flexible contract setting	Assessing suppliers' capabilities		Rajesh and Ravi (2015), Xiao et al. (2012)
•Timely delivery •Ensure safe delivery •Communicating continuously with customers through different channels	Customer support		Salimi Zavieh and Shams (2021), Azar and Khorrami (2019)
•Having capabilities to overcome demand risk •Identify risks and monitor supply chain information	Risk management culture	Technology risk taking	Chao et al. (2020), Jafar Nejad et al. (2019)
•Optimum mining of the best experiences and international actions •Constant monitoring of marketing actions of local	Regulatory requirements, local and global		O'Leary (2011), Rajesh and Ravi (2015)
•Fixing the weakness of high-speed and secure telecommunication lines in the country •Expansion of telecommunication platforms	The need to maintain security standards		Bechsis et al. (2018),

Open codes	Axial codes (concepts)	Selective codes	Sources
•Choosing the right entry strategy •Attention to organizational maturity •The direction of innovation in the organization	Entering social media in a purposeful way		Koirooz et al. (2019), Salimi Zavieh and Shams (2021)
•Protection of user privacy •Removal of restrictive laws •Development of new models and products to avoid work scale drop	Reducing vulnerability	Technology integration	Lee (2018), Chao et al. (2020)
•High accuracy and accuracy of the main production data and information •Existence of backup copies of data •Making internal systems and processes smarter	Smart algorithms		Lee (2018), Salimi Zavieh and Shams (2021)
•Integration of communication channels and benefiting from a suitable channel management system •Appropriate variety of communication channels •Receive feedback from the customer	Communication channels and virtual connection to the customer	Changing customer communication patterns	Bechsis et al. (2018), O'Leary (2011), Salimi Zavieh and Shams (2021), Koi et al. (2018)
•Extracting customer opinions for better customer insight •Deeper connections with data provided by consumers •Increased revenue, improved company margins and strong customer relationships	Growing variety of communication channels		O'Leary (2011), Queiroz et al. (2019)
•Costumer loyalty •Improve security for the customer •High flexibility in attracting customers	Using social media to rank customers		Rajesh and Ravi (2015), Jafaranjad et al. (2019)
•Using up-to-date design and construction architecture and methodology •Use of delivery notifications •Appropriate service and customer satisfaction	Smart products		Jiao et al. (2012), Salimi Zavieh and Shams (2021)

Open codes	Axial codes (concepts)	Selective codes	Sources
•Controlling the delay in senior managers' decision-making •Having a central control system •Increasing the speed of information transfer	Optimal decision making	Improving market intelligence and better understanding of demand	Lee (2018), Singh et al. (2018)
•High processing power and suitable for deployed servers •The existence of a virtual infrastructure development plan •Using new generation servers and taking advantage of all computer capabilities	Computer processing power		Bechsis et al. (2018), Queiroz et al. (2019),

Finally, 118 open codes, 43 axial codes and 13 main categories have been extracted. The 13 selected codes of the research are placed in the form of five general categories of causal conditions, contextual conditions, intervening conditions, strategies and consequences. Causal conditions include 2 selective codes, 8 concepts and 21 open codes. The contextual conditions include 3 selected codes, 10 concepts and 25 open codes. Intervening conditions include 2 optional codes, 7 concepts and 21 open codes. The strategies include 2 selected codes, 7 concepts and 19 open codes. The results include 4 selected codes, 11 concepts and 32 open codes, which are the components of the paradigm model of the role of social media in the resilience of the digital supply chain in critical conditions.

4.5. Check the quality of the results Kappa index was used to measure the reliability of the designed model. In this way, another person (one of the elites of this field) without knowing how to integrate the codes and concepts created by the researcher, has tried to categorize the codes into concepts. Then, the concepts presented by the researcher have been compared with the concepts presented by this person. Finally, according to the number of similar concepts created and different concepts created, the Kappa index was calculated. As can be seen in Table 6, the researcher has created 13 categories and other people have created 13 categories, of which 11 categories are common.

Table 6.
Status of conversion of codes into concepts by the researcher and another person

Researcher's opinion				
Yes	No	Total		
A=10	B=2	12	Yes	Another person's opinion
C=1	D=0	1	No	
11	2	13	Total	

Reliability

In this research, the internal validity was checked by presenting the obtained results to the examinees (participants in the research). So that if they also confirm the findings; you can be more sure about the validity of the research. Therefore, in order to increase the internal validity, after extracting the factors from the theoretical foundations of the research, the model obtained from that stage was presented to the people, and this work was done after the extraction of the factors so that the extraction of the factors was done without any preconceptions and orientation. In the field of external validity or transferability, it was tried to increase the possibility of transferring

concepts to other environments by considering the expertise and organizational position of each of the experts in the expert assessment process and considering this issue in their selection. In this research, in order to determine the validity of the quantitative part of the questionnaire on the role of social media in the resilience of the digital supply chain in critical conditions, content validity has been used. To measure the content validity of the questionnaire, the opinions of 5 of the same experts who participated in the construction of the model using the Delphi method were used. Thus, by sending the questionnaire to them, they were requested to give their opinions regarding the questions of the questionnaire and their compatibility with the research questions using the options completely inappropriate, inappropriate, relatively appropriate, appropriate, and completely appropriate. They have a numerical value equal to 0%, 25%, 50%, 75%, 100% respectively. Table 7 shows the validity of the questionnaire on the role of social media in the resilience of the digital supply chain in critical situations.

Table 7.
Validity of the questionnaire on the role of social media in the resilience of the digital supply chain in critical conditions

Social media in digital supply chain resilience	X	F	P_X	X. P_X
Completely inappropriate	0	0	0.000	0.000
Inappropriate	0.25	0	0.000	0.000
Relatively appropriate	0.5	60	0.102	0.051
Appropriate	0.75	209	0.354	0.266
Completely appropriate	1	321	0.544	0.544
Total			0.861	

The validity of the questionnaire (the role of social media in the resilience of the digital supply chain in critical conditions) has been calculated as (86.1%).

Reliability

In qualitative research, four methods are used to ensure reliability:

- ✓ Using structured processes of convergent interviews;
- ✓ Organize structured processes for recording, recording and interpreting data
- ✓ Having at least two people to conduct interviews separately but parallel to each other;
- ✓ Comparing the findings of two or more researchers Retest reliability method was used to measure reliability in this research, which refers to the consistency of data classification over time.

This index can be calculated when a coder has coded a text in two different times. To calculate the reliability of the test, some texts are selected as samples from among the extracted texts and each of them is re-coded in a short and specific time interval; Then, the specified codes are compared in two time intervals for each of the texts, and the stability index is calculated for that research through the amount of agreements and non-agreements in the two stages of coding. In each of the texts, codes that are similar in two time intervals are identified as agreement and non-similar codes as non-agreement (Holsti, 1969).

$$\text{Reliability} = \frac{\text{Number of agreements} \times 2}{\text{Total number of codes}}$$

In this research, in order to determine the reliability of the quantitative part of the questionnaire on the role of social media in the resilience of the digital supply chain in critical conditions, internal reliability has been used. In order to examine the internal reliability in a

preliminary study on 25 people from a statistical sample, the internal reliability of the questionnaire on the role of social media in the resilience of the digital supply chain in critical conditions was calculated using Cronbach's alpha and considering that Cronbach's alpha values are higher than (0.7) is placed. Internal reliability of all dimensions was confirmed. The value of these statistics shows that the questionnaires have high reliability.

Figure 3 shows the model of the role of social media in the resilience of the digital supply chain in critical conditions based on the data theory of foundation and metacomposition.

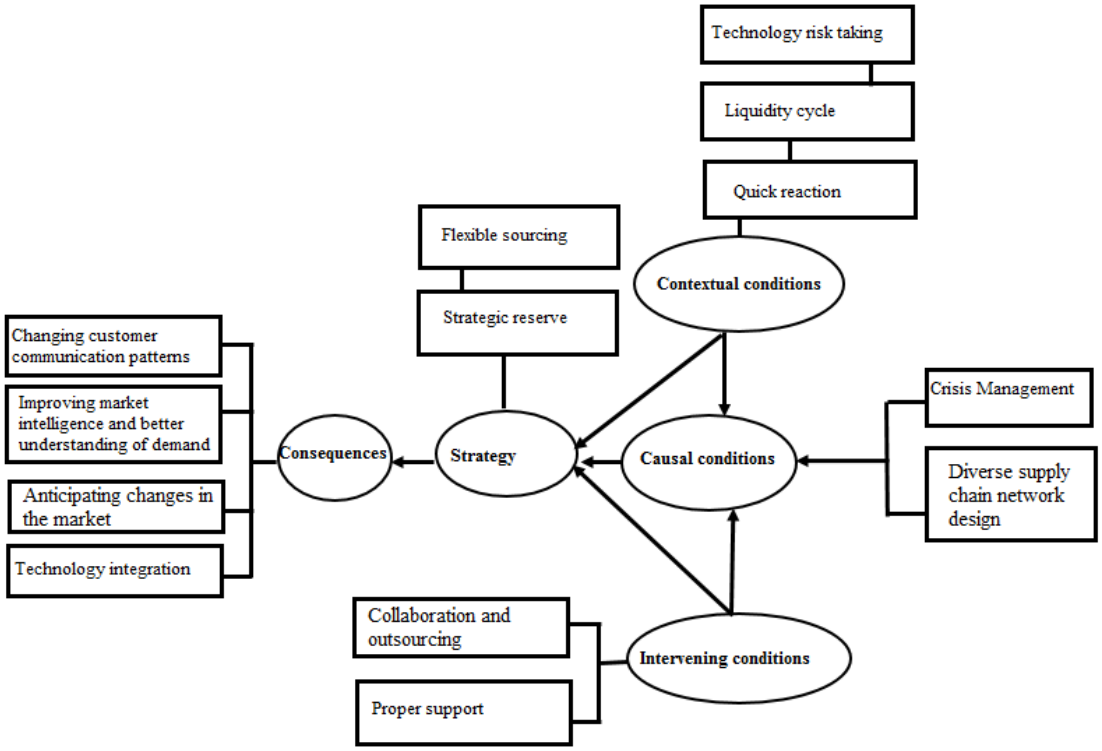


Figure 3. *The model of the role of social media in the resilience of the digital supply chain in critical conditions based on the data theory of foundation and metacomposition*

Conclusion

In this research, the role of social media in the resilience of the digital supply chain was investigated with a hybrid approach. Social media has created a revolution in almost all areas of business and in some cases has caused changes in the basic interactions between companies and their customers. Outside of business, people have quickly embraced and adapted to social media. Social media is one of the biggest opportunities that companies in various industries have to communicate directly with consumers. With the development of information technology, increasing customer expectations and their sensitivity to environmental issues, globalization of the economy and other modern competitive priorities, the business environment is in dynamic and highly competitive conditions. Therefore, in order to deal with such changes, organizations are forced to reconsider their operations, alliances, companies and strategies and think of solutions in order to respond and quickly adapt to the upcoming challenges. Resilience, as one of the newest solutions that can guarantee the stability of all levels of the supply chain, has received more and more attention from managers, decision makers and researchers. Accordingly, in this research, the role of social

media in the resilience of the digital supply chain was investigated. In the process of this research, the metacombination method was used for this purpose. The total number of articles found, considering the input criteria, was 163 studies (Persian and English), after reviewing all of them and considering the output criteria from the perspective of content criteria or lack of access, finally the results were extracted from 19 studies (14 studies English and 5 Persian studies) were reviewed and analyzed. According to the results of the review of the selected articles, finally 118 open codes, 43 axial codes and 13 main categories have been extracted. Causal conditions include 2 selective codes, 8 concepts and 21 open codes. The contextual conditions include 3 selected codes, 10 concepts and 25 open codes. Intervening conditions include 2 optional codes, 7 concepts and 21 open codes. The strategies include 2 selected codes, 7 concepts and 19 open codes. The results include 4 selected codes, 11 concepts and 32 open codes.

One of the results obtained in this research is that social media are increasingly considered as effective tools for active participation of citizens in decision-making, policy-making and information processes at social and political levels. This type of attitude towards these media originates from their special features that provide a platform for sharing information and inclusive participation and facilitate online communication between public organizations and citizens. According to these conditions, this research can be an important step towards expanding the application of supply chains based on social media.

The presented results show a meaningful relationship between causal conditions and intervening conditions with intervening conditions, considering the positiveness of the path coefficient, these relationships are incremental (direct). This means that with the increase and improvement in the causal conditions, background conditions and intervening conditions improve and increase. Also, the results show a significant relationship between background conditions and intervening conditions with strategies. Due to the positiveness of the path coefficient, this relationship is of an incremental (direct) type. Also, there is a significant and incremental relationship between strategies and outcomes.

In this section, the results of this research are compared with the research mentioned in the background of the research.

The results of this research have similarities with the results of the research (Tozlu et al, 2022) in terms of causal conditions and crisis management, and of course, this research is superior to the research (Tozlu et al, 2022) in terms of designing a diverse supply chain network.

The results of this research have similarities with the results of the research (Hajian Heidary, & Mirzaaliyan, 2022) in terms of flexibility and flexible sourcing and appropriate support, and also this research is superior to the research (Bruce et al., 2022) considering the strategic storage strategy.

In terms of results, this research has similarities with the research (Von Berlepsch et al, 2022) in terms of crisis management, but this research is superior to the research (Marolt et al, 2022) in terms of technology risk-taking and quick response.

Suggestions for future research

- The connection of the supply chain with smart products and especially the Internet of Things can be investigated;
- The supply chain should be examined under the fourth generation of the industry and considering the crises and challenges of this industry;
- Other analytical methods should be used to identify factors affecting the resilience of the supply chain.
- The role of social media in the absence of conditions and their impact on the resilience of the supply chain should be investigated.

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