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Exploring the critical success factors of a resilient supply chain

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ABSTRACT

This study aims to identify and analyse critical success factors (CSFs) for an organisation aiming for a resilient supply chain. The methodology followed is the systematic analysis of big databases, such as Emerald, Science Direct, and Taylor & Francis, by using a specific set of keywords for filtering. The systematic literature review leads the author to the exploration of several CSFs, followed by their prioritisation by using principal component analysis. The paper highlighted eleven vital CSFs: top management commitment, development of an effective SCM strategy, logistics synchronisation, use of modern technologies, robust information and communication technology, information sharing with SC members, collaborative partnership, improved forecasting, trust development in SC partners, collaborative partnership, strategic partnership, development of reliable suppliers, continuous improvement in the preparedness and response practices, capacity building and training and staff development. The CSFs highlighted in the paper relate to all small and medium-sized enterprises (SMEs). This paper identifies the CSFs for developing a resilient supply chain that is comprehensive and has the potential to address uncertain circumstances. This work is the first of its kind on CSF assessment and categorisation in resilient supply chains.

KEY WORDS

resilient supply chains, critical success factors (CSFs), small and medium enterprises (SMEs), systematic literature review (SLR), principal component analysis (PCA)

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Introduction

The expanding recurrence and effect of sudden catastrophic events have driven analysts and experts to move from conventional hazard management techniques to deal with the resilient approach (Jüttner & Maklan, 2011; Pettit et al., 2013). Resilience empowers frameworks to adapt to the unforeseen (Vegt et al., 2015) and guarantee congruity of tasks and conveyance to conclusive clients (Christopher & Peck, 2004; Ponomarov & Holcomb, 2009; Stone & Rahimifard, 2018). Although resilience appears to connect all associations in a system, it has to be

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researched how each part adds to the general process, such as with regard to supply chains. The study aims to identify and analyse critical success factors (CSFs) for an organisation aiming for a resilient supply chain.

The methodology followed is a systematic analysis of big databases, such as Emerald, Science Direct, and Taylor & Francis, using a specific set of keywords for filtering. The systematic literature review leads the author to explore several CSFs, followed by their prioritisation by using principal component analysis. The study identifies comprehensive CSFs for developing a resilient supply chain and having the potential to address uncertain circumstances. This work is the first of its kind on CSF assessment and categorisation in resilient supply chains.

1. Literature review

1.1. Supply Chain Management (SCM)

The term "supply chain" refers to the effective collaboration of interconnected business enterprises (Christopher & Peck, 2004; Håkansson & Snehota, 1989).

According to Stock & Lambert (2000), supply chain management is "the integration of key business processes, from end-user through original suppliers, that provides products, services, and information that add value for customers". Supply chain management can be defined as the collaboration of upward and downward integration of organisations during different processes to maximise the value of the end product/service (Mentzer et al., 2001; Szpilko, 2017).

1.2. Risks

"Risk" and "uncertainty" are two key terms that have to be countered in a resilient system. The risk may be termed as an unplanned event, whereas uncertainty leads to situations where the implications are not completely known.

Discussing the most important risks, Hessam ZandHessami & Ava Savoji (2011) underlined environmental, financial, strategic, informative and communicative technology, technology and equipment, HR, and supply chain risks. They found environmental risks to be the most impactful and significant because of measures and guidelines imposed by the central administration.

There are two sorts of risks: internal and external. Internal dangers include late conveyances, the overabundance of stock, poor gauges, money-related threats, minor mishaps, man-made errors and blame in data innovation frameworks. External dangers begin outside the inventory network, for example, earthquakes, floods, tsunamis, wars, deficiency of crude materials, and financial irregularities (Jaeger, 2010; Mandal 2016).

As defined by Jabbour & Thomas (2015), a risk is "a conceivably horrendous accident that is by and large experienced, has an intense beginning, what's more, is time delimited; fiascos might be credited to regular, innovative, or human cause".

Vulnerability and other related terms like risks, uncertainty, and reliability were coined together to formulate supply chain risk management (Svensson, 2000). Resilience is a bridge between disaster risk management and sustainable communities (Mari

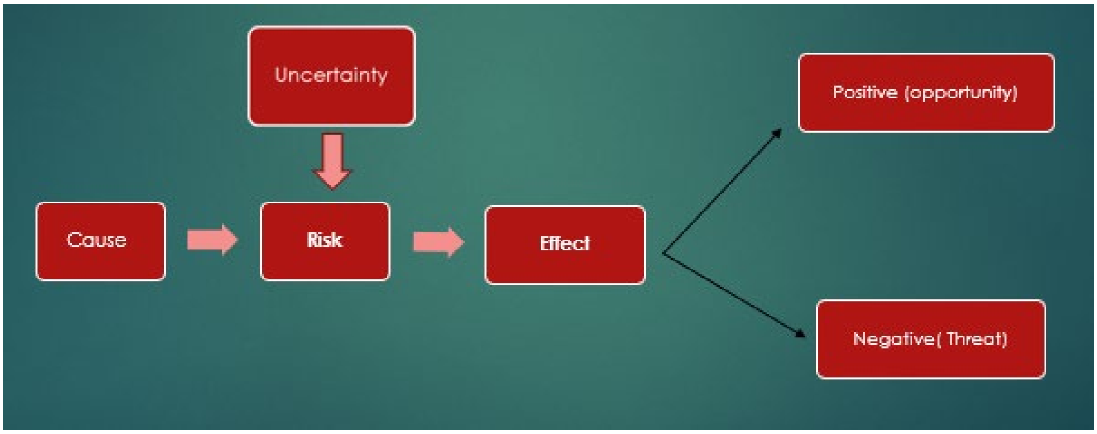

Fig. 1. Risk management model
Source: Korecký, 2012.

Tab. 1. Risk types

Risk	Internal	External	Author
Supply risk	√		Asad et al., 2019; Jüttner, 2005; Paul et al., 2016; Wagner & Bode, 2008
Process risk	√		Paul et al., 2016; Shahbaz et al., 2019; Wagner & Bode, 2008
Demand risk	√		Manuj, 2008; Paul et al., 2016; Rao & Goldsby, 2009
Logistic risk	√		Punniyamoorthy et al., 2013; Syamsyul Bin Rakiman et al., 2018; Thun & Hoenig, 2011; Wang et al., 2014; Zubair & Mufti, 2015
Collaboration risk	√		Pradesh, 2009; Syamsyul Bin Rakiman et al., 2018; Thun & Hoenig, 2011
Financial risk	√		Musa, 2014; Pradesh, 2009
Environment		√	Knemeyer et al., 2009; Wagner & Bode, 2008; Xu et al., 2020; Zsidisin et al., 2016

et al., 2014). Supply chains of organisations can be disturbed by a variety of human-made and natural events, for example, earthquakes, political unrest, fuel emergencies, epidemics, and dictatorships (Fiksel, 2006). Due to natural disasters, risks have always been the main issue in discussing supply chain management (Kbah, Erdil & Aqlan, 2020).

Different risk management models are discussed in the literature, and a widely popular one was proposed by Korecky, as shown in Fig. 1.

Multiple risk types are identified in Table 1 and are broadly categorised as internal or external risks.

1.3. Resilience

An average production network can fall short for many reasons, such as inaccessible raw materials or unreliable equipment; issues with product purity or business reputation; government regulations or unrest; value, theft, or pandemics. Such dangers can either harm an organisation, crush it or make it more grounded (Fiksel et al., 2005). Different definitions taken from the literature for the term "resilience" are given in Table 2.

1.4. Supply Chain Resilience (SCRES)

Supply chain resilience (SCRES) is another insufficiently explored topic. The above-stated events have prompted academia and SCM practitioners to minimise their damage by developing more resilient supply chains. Christopher & Peck (2004) and Sheffi et al. (2003) worked on the concept of SCRES and coined the earliest definitions of resilience. Soon after, considerable research was done by applying multiple techniques, such as case studies, questionnaire surveys, conceptual/theoretical work, modelling and visualising using alternative theoretical lenses.

Multiple resilience frameworks are discussed in the literature, one of which is given below in Fig. 2

1.5. Systematic literature review (SLR)

No academic research is complete without conducting a thorough literature review. Work performed by other scholars builds a fundamental base for advancing knowledge. A deep study of the existing literature helps to identify unexplored topics.

Tab. 2. Different definitions of resilience

Definition	Author
The capability to anticipate and overcome disruptions	Ambulkar et al., 2015; Gerhold et al., 2019; Pettit et al., 2010, 2013
"Strength is the capacity of a worldwide production network to revamp and convey its centre capacity ceaselessly, regardless of the effect of outside and additionally inner stuns to the framework"	Global Risks Report: World Economic Forum, 2011
"The capacity of a framework to come back to its unique [or desired] state after being upset"	Christopher & Peck, 2004
"The capacity to keep up yield near potential in the result of stuns"	Duval et al., 2011
"Resilience is commonly described as the ability to bounce back or overcome some form of adversity and thus experience positive outcomes despite an aversive event or situation"	ShaeLeigh Cynthia Vella, 2019
"Resistance refers to a material, member, or system's ability to safely sustain load"	Rosowsky, 2020

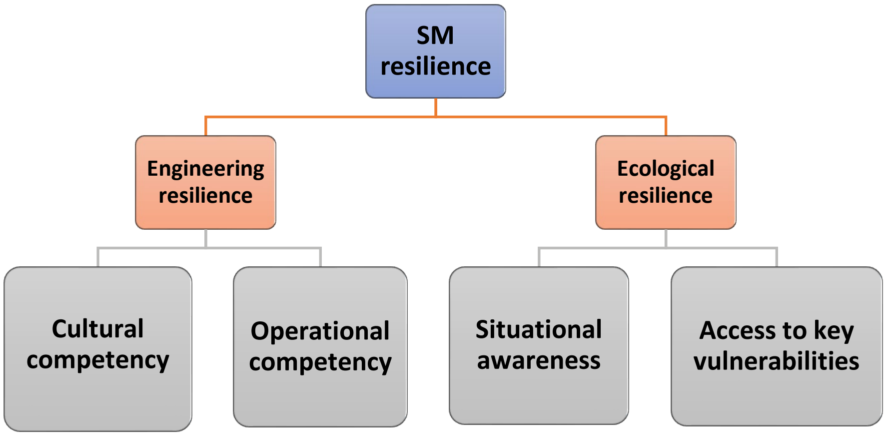

Fig. 2. Framework for SM Resilience
Source: Eltanwy, 2015.

Once identified, a gap can be used to test certain hypotheses and develop new theories or to identify any inconsistency or contradictions in the existing body of knowledge (Paré et al., 2015). In the past, a literature review was done in a traditional narrative manner and was later replaced by a systematic review, which is comprehensive and more reliable. One of the most sought-after methods for studying past research is a systematic literature review (SLR), as it tends to be transparent and eliminates possible biases (Tranfield et al., 2003). This article aims to conduct a systematic literature review on developing a comprehensive framework for resilient supply chains.

1.6. Critical Success Factor (CSF)

CSF theory originates in the works of Daniel (1961) and Rockart (1982). Daniel theorised that information systems must focus on "success factors" and argued that in most industries, there are "usually three to six factors that must be performed exceedingly well for a company to be successful". Rockart (1982) defined CSFs as performance factors determining where management attention should focus.

Awareness of CSFs can guide organisations in implementing a new management concept, methodology, technology, regulation etc. (Näslund, 2013). CSFs can be categorised as soft, e.g., behavioural, cultural, or management, and as hard, e.g., quantifiable or tools (Ismyrlis & Moschidis, 2013).

CSFs can direct an organisation's strategic planning, implementation of a plan, and achievement of high performance (Boynton & Zmud, 1987). Scholars and practitioners (Kwak & Anbari, 2004; Pinto, 1986; Rosacker et al., 2010) from project management and quality management fields have acknowledged the need to determine CSFs before implementing a project methodology.

CSFs are defined as "factors essential to the success of any program or technique, in the sense that, if objectives associated with the factors are not achieved, the application of the technique will perhaps fail catastrophically" (Setijono et al., 2012).

"CSFs are critical areas of activity that require focus to ensure competitive performance towards an organisation's strategic goals" (Liu et al., 2015). One of the major focuses of process management for business success is performance improvement. CSFs are the key to process management success. Identifying and categorising CSFs as per their importance assists in creating value and aids stakeholders in cutting down undesirable results in their endeavours (Almarri & Boussabaine, 2017).

1.7. Gap analysis

Resilience empowers frameworks to adapt to the unforeseen (Vegt et al., 2015) and guarantee congruity of tasks and conveyance to conclusive clients. Although resilience appears to connect all associations in a system, it has to be researched how each part adds to the general process, such as concerning supply chains.

The World Economic Forum (2013) uncovered that over 80 % of organisations are worried about the versatility of their inventory chains. As companies "leaned out their operations, they began to realise that the strategies they have been practising are not protecting them from failure in the face of increasingly volatile conditions" (Mason-Jones et al., 2000).

"The shrinkage of the supply chain due to increased outsourcing made the organisations dependent on suppliers, whereas the emphasis on Just-in-Time strategies and Six Sigma cut down on buffers and decreased flexibility" (Revilla & Jesus, 2017).

Businesses around the world try to make their supply chains resilient in response to natural or industrial "low-frequency, high-impact" (LFHI) risks. These LFHI risks cause an interruption in the downstream supplies and may result in the closure of production and distribution activities in various SCs (Hald & Kinra, 2019; Hosseini et al., 2019; Ivanov, 2020). COVID-19 has clearly shown how resilience is the single most important trait for supply chain performance.

Remko (2020) pointed out a dire need for more empirical models which can help industries to build more resilient supply chains. Ivanov (2020) stated that resilience is one of the prime factors for the development of viable supply chains.

Singh et al. (2021) also emphasised that the resilience of the public distribution system (PSD) for essential items, such as food grain supply, came smashing down in disastrous events, such as COVID-19, which signifies the need for research identifying a framework that would help industries to withstand such disasters in the future.

Belhadi et al. (2021) identified that a collaborative risk management strategy should be developed for all levels of a supply chain, and SOPs need to be prepared for outbreaks. A systematic literature review was conducted to determine the need for more studies to increase the theoretical base, which may lead to new theory building. Wieland (2021) opened more doors to the SCM and called for more advanced and adaptable frameworks for resilience.

Supply chain management research also emphasises the need to bridge the gap between research practices in supply chain risk management. As evident from the cited literature, a clear need exists for a refined empirical framework that is based on observed and measured phenomena rather than theory or belief for developing a resilient supply chain. It will be covered in this study.

2. Methodology

2.1. Systematic literature review (SLR)

Inclusion criterion. Topics of the selected articles ranged from those emphasising supply chain management, resilient supply chains, and making supply chains resilient. Only articles written in English were included.

Literature identification. The following keywords were used for the review: "resilient supply chains", "risks", "framework", and "critical success factors". For each of the articles listed first, their relevance was checked by reading the manuscript title. Based on the analysis of the title, provided the document seemed to discuss the concept of CSFs in the domain of resilience, it was to be taken into consideration. The full reference was recorded, including the author, year of publication and abstract of the article. Aiming to review the maximum literature available in the scholarly world, the research targeted articles published during 1995–2021, as the terms "supply chain" and "risks" appeared in the literature in 1995. This was done to identify literature gaps. Three databases were searched: Emerald, Science Direct, and Taylor & Francis (Tranfield et al., 2003). After initial screening, which included checking the title and abstract, 70 articles were found fit for the review. The SLR process is depicted in Fig. 1.

Screening for inclusion. The abstracts of the 70 articles which passed the inclusion criteria were read to decide on their relevance for the review. A total of 56 studies were considered relevant, and their full texts were used. Quality and eligibility assessment. The full articles were thoroughly read to examine their quality and how they could serve the study's objective. Technical reports were included for review too.

Iterations. A backward and forward search was also done to identify some review methods. Best practices were set by analysing articles that followed the same methodology. The articles concentrating on the CSFs adopted by different industries to enhance their supply chain performance were preferred. Overall, this led to forty-six articles in total.

2.2. Data extraction and analysis

All of the articles selected for the study were scanned considering two points: (1) the antecedents for constituting the framework and (2) the CSFs that were set to enhance the performance of the supply chain. The N-Vivo software was used for data extraction and coding.

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3. Discussion and analysis

Nam et al. (2020) derived indicators through literature for their study. The same procedure is applied,

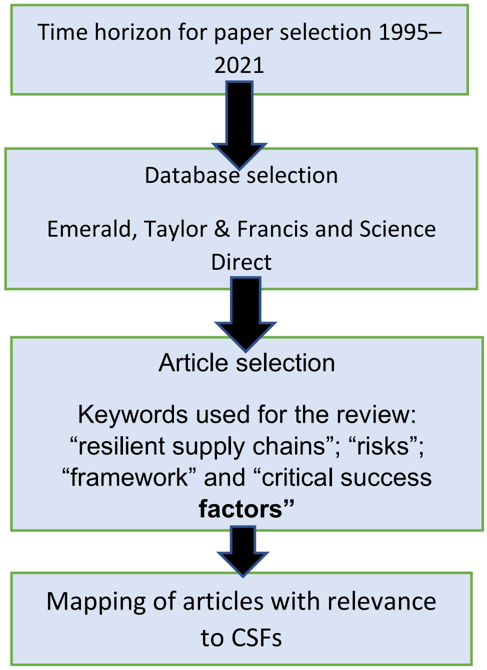

Fig. 3. Flow diagram of systematic literature review

and critical success factors for mitigating supply chain risks are extracted.

Multiple themes were developed using the N-Vivo software. The scholarly inclination toward these themes was recorded and tabulated in Table 4. The identified themes are mentioned in the following text. Fig. 4 and Table 3 exhibits various CSFs that were found in the literature search. The most popular was the use of modern technology, with a weight of 21 %.

3.1. Principal component analysis (PCA)

Work needs to be done on decreasing the number of variables to make the framework less complex by utilising techniques that reduce nonlinear dimensionality (Van Der Maaten et al., 2009).

In total, thirteen dimension-reduction techniques were identified in the literature. However, principal component analysis (PCA) performs better than others. As Van Der Maaten et al. (2009) con-

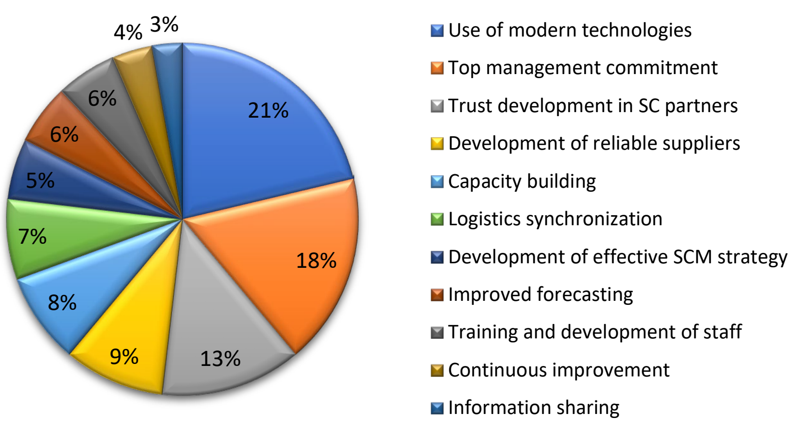

Fig. 4. Various CSFs used in resilient supply chains

Tab. 3. Critical Success Factors

CSF No.	Critical Success Factor
1	Top management commitment
2	Development of an effective SCM strategy
3	Logistics synchronisation
4	Use of modern technologies (robust information and communication technology)
5	Information sharing with SC members, collaborative partnership
6	Improved forecasting
7	Development of trust in SC partners, collaborative partnership, strategic partnership
8	Development of reliable suppliers (coordination and collaboration with other organisations
9	Continuous improvement in the preparedness and response practices (implementing the lesson learned from previous events)
11	Staff training and development
10	Capacity building (mock drill, training, house preparedness, first aid preparedness, etc.)

Tab. 4. Critical Success Factors for Resilient Supply Chain Risk Management

S. No.	Authors	1	2	3	4	5	6	7	8	9	10	11
1	Chowdhury et al., 2020								√			
2	Luo et al., 2018									√		
3	Mendoza-Fong et al., 2018				√							
4	Kausar et al., 2017								√			
5	Moktadir et al., 2017	√										
6	Kaneberg et al., 2016								√			
7	Yadav & Barve, 2015			√	√		√			√	√	
8	Ramanathan et al., 2014								√			
9	Zhou et al., 2014		√	√							√	
10	IAG Odisha, 2014*								√			
11	OSDMA, 2012; 2013; 2014*			√							√	
12	Ab Talib & Hamid, 2014	√			√	√		√				√
13	Lin et al., 2013	√	√		√				√			
14	Dinter, 2013	√			√	√						
15	Thakkar et al., 2013	√		√	√			√				√
16	UNEP, 2013*											√
18	Korecký, 2012											√
19	Mothilal et al., 2012				√				√			
20	Kim & Rhee, 2012				√	√	√	√				
21	Hoejmose et al., 2012	√										
22	Zhou et al., 2011		√	√	√		√					
23	Koh et al., 2011				√			√	√	√	√	
24	Oloruntoba, 2010		√				√		√		√	
25	Hu et al., 2010	√										
26	Sandberg & Abrahamsson, 2010	√										
27	Hu et al., 2009				√			√				
28	Nair et al., 2009				√							
29	Cullen & Taylor, 2009				√							
30	Pettit & Beresford, 2009	√	√	√	√		√	√		√	√	√
31	Rao Tummala et al., 2006				√			√				
32	Davidson, 2006		√				√		√			

33	Fawcett et al., 2006	√			√			√				√
34	Angappa Gunasekaran & Ngai, 2004	√			√							√
35	Soin, 2004	√			√							
36	Ngai et al., 2004				√			√				
37	Chen & Paulraj, 2004	√			√			√				
38	Gunasekaran & Ngai, 2003	√		√	√							
39	Cai & Jun, 2003	√										√
40	Power et al., 2001	√			√			√				√
41	Tate, 1995											
42	Chiu, 1995	√		√				√				
		19	**6**	**8**	**23**	**3**	**6**	**14**	**10**	**4**	**6**	**9**

* Inter-Agency Group (IAG) is a consortium of INGO & UN agencies, ensuring minimum humanitarian standards in disaster risk reduction and management.

cluded, PCA is considered one of the best techniques for dimension reduction compared to the existing nonlinear techniques. The pros of using PCA for categorising the CSFs are that it does not apply weights to all CSFs randomly but rather does the multivariate statistical study of the variables, which increases the data's robustness (Narula & Reddy, 2015). The PCA is an informative data technique that allows data structure to be revealed (Abdullah et al., 2020).

To ascertain if PCA can be applied to this data set, Kaiser–Meyer–Olkin (KMO) and Bartlett's test was conducted to confirm the data adequacy for PCA. The KMO result was .595 (greater than 0.5), the chi-square value — 127.873, and a significance value — 0.000 (lower than 0.05, i.e., a confidence level of 95%), as discussed in Table 5. The CSFs were distributed in four new groups, and each group's weight was calculated along with the weight of individual CSFs. These four new CSFs can now be computed for the range of data that will be researched. This will help in the calculation of the performance of the organisation.

Tab. 5. KMO and Bartlett's test

Kaiser–Meyer–Olkin measure of sampling adequacy	.595
Bartlett's test of sphericity approx. chi-square	127.876
df	55
sig	.000

3.2. Factor loadings

The factor loadings normally range from -1 to +1 and indicate how much explanation is given by each factor in defining a variable. The pattern of the loading was examined to determine the influence of factors on each variable. A strong influence was demonstrated by factors that have loads closer to -1 or +1, whereas loading values closer to 0 indicated that the factor had a weak influence on the variable. Though, some variables may have high loadings on more than one factor.

Loadings that are difficult to interpret are the un-rotated factor loading. When the factors are rotated, this makes the loading structure simpler and helps make the factors easier to interpret and become more distinguishable. Table 6 helps in the examination of the factor loadings.

A varimax rotation allows researchers to interpret values that are difficult when the factors are not rotated. Now, interpretation is easier, and the following things can be noted:

- Logistics synchronisation (.277), capacity building (.274), and continuous improvement in the preparedness and response practices (.256) are big positive loadings on factor 1, so the following factors elaborate continuous working towards the logistical network.
- Trust development in SC partners, collaborative partnership, strategic partnership (0.415), and use of modern technologies (.341) comprise the most loadings on factor 2, so the factor elaborates on the use of technology in developing collaboration among SC partners.
- Development of reliable suppliers (coordination and collaboration with other organisations
- (-0.349) and use of modern technologies (0.299) greatly impact the loadings on factor 3, so the factor elaborates on the use of technology to develop trustworthy suppliers.
- Top management commitment (0.456) and staff training and development (0.212) are big positive loadings on factor 4, so the factor elaborates on how top management helps develop their staff.

Tab. 6. Rotated component matrix – extraction method: principal component analysis; rotation method: varimax with Kaiser normalisation

	Raw			
	Component			
	1	2	3	4
Top management commitment	-.070	.029	.101	.456
Development of an effective SCM strategy	.244	-.053	-.094	.032
Logistics synchronisation	.277	-.043	.146	.072
Use of modern technologies (robust information and communication technology)	.047	.341	.299	-.096
Information sharing with SC members, collaborative partnership	-.020	.075	.029	.007
Improved forecasting	.256	.017	-.021	-.047
Trust development in SC partners, collaborative partnership, strategic partnership	.036	.415	-.003	.041
Development of reliable suppliers (coordination and collaboration with other organisations)	.034	-.072	-.349	-.105
Continuous improvement in the preparedness and response practices (implementing the lesson learned from previous events)	.155	.040	.010	-.028
Capacity building (mock drill, training, house preparedness, first aid preparedness, etc.)	.274	-.018	-.013	-.029
Staff training and development	.020	.230	-.011	.212

3.3. Communality

Communality can be described as the proportion of variability generated by each variable that is explained by the factors. The commonality value remains the same irrespective of the loading factors being rotated or unrotated.

A careful examination demonstrated that each variable had a significant role in explaining the factors. The closer a communality value to 1, the better the variable is explained by the factors, as evident from Table 7.

3.4. Variance

The variation in the data set is explained by each factor. The variance created by each factor is equal to the eigenvalue if unrotated loadings are used during the extraction method of principal component analysis. The summation of the variation, as explained by factors, remains unchanged, although the rotation of the loadings may change the distribution of the proportion of variations.

A careful examination of the variance of each factor demonstrated that the higher the value of the variance, the more influence it has on the variability of the data set.

Next, the question arose of how many factors should be extracted for the analysis. The PCA method without rotation uses the default number of factors as a preliminary assessment. Later, the important factors were defined as those having a variance value greater than a set value. Table 8 provides more information.

Tab. 7. Communalities – extraction method: principal component analysis

	Initial	Extraction
Top management commitment	1.000	.723
Development of an effective SCM strategy	1.000	.805
Logistics synchronisation	1.000	.663
Use of modern technologies (robust information and communication technology)	1.000	.685
Information sharing with SC members, collaborative partnership	1.000	.682
Improved forecasting	1.000	.799
Trust development in SC partners, collaborative partnership, strategic partnership	1.000	.566
Development of reliable suppliers (coordination and collaboration with other organisations)	1.000	.577
Continuous improvement in the preparedness and response practices (implementing the lesson learned from previous events)	1.000	.646
Capacity building (mock drill, training, house preparedness, first aid preparedness, etc.)	1.000	.740
Staff training and development	1.000	.485

Tab. 8. Total variance explained – extraction method: principal component analysis

Component	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
Raw						
1	.474	27.987	27.987	.474	27.987	27.987
2	.328	19.376	47.363	.32	19.376	47.363
3	.246	14.523	61.886	.246	14.523	61.886
4	.163	9.646	71.532	.163	9.646	71.532
5	.119	7.030	78.562			
6	.096	5.669	84.231			
7	.086	5.056	89.287			
8	.068	4.042	93.329			
9	.050	2.976	96.304			
10	.040	2.375	98.679			
11	.022	1.321	100.000			
Rescaled						
1	.474	27.987	27.987	2.347	21.340	21.340
2	.328	19.376	47.363	2.432	22.109	43.448
3	.246	14.523	61.886	1.321	12.008	55.457
4	.163	9.646	71.532	.911	8.278	63.735
5	.119	7.030	78.562			
6	.096	5.669	84.231			
7	.086	5.056	89.287			
8	.068	4.042	93.329			
9	.050	2.976	96.304			
10	.040	2.375	98.679			
11	.022	1.321	100.000			

4. Discussion

A structured version of a small-group debate to obtain consensus is known as a nominal group technique (NGT). NGT asks participants to react to questions presented by a moderator before asking them to rank the thoughts or suggestions made by each group member. The NGT groups offer more original ideas than interactive groups, more evenly distributed participation among group members, a greater feeling of success, and better satisfaction with the calibre of ideas and group productivity. NGT was modified by Bartunek & Murninghan (1984), which aids in handling a poorly organised discussion. The facilitator asks if the ideas apply to the same topic after the usual thoughts are developed and listed. If not, the issue is deemed poorly structured, and the thoughts are grouped into coherent groups. This greatly helps in developing accountability for the problem and, thus, aids in fixing the issue. In the case discussed in this article, the authors, with the consensus of the experts, developed four main themes of the CSFs. Hence, it became easier for the organisation to design a foolproof system or a resilient system with the bare minimum risks.

Through the consensus, CSFs were categorised into four major groups. The top management and strategic role can be implemented by the strategic managers, while an SC partnership needs to be developed by the tactical management, whereas the use of modern technologies needs to be set up by the operational level as well so that they know how exactly to work in the event of a disaster.

The experts emphasised the importance for the top management to enforce effective measures allowing for the design of the supply chain with the primary focus on the resilience goal. Therefore, the decision-making approach must be top-down. Measures must

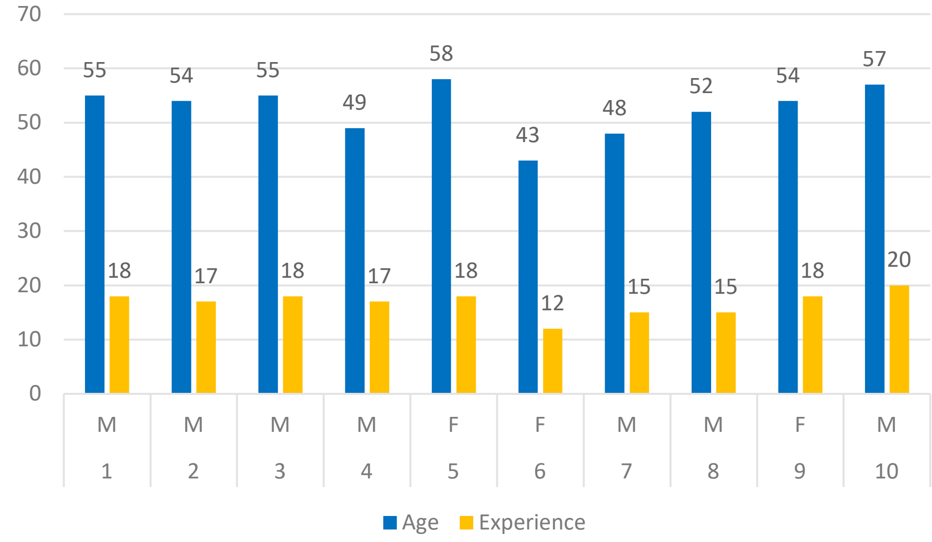

Fig. 5. Age and experience of experts

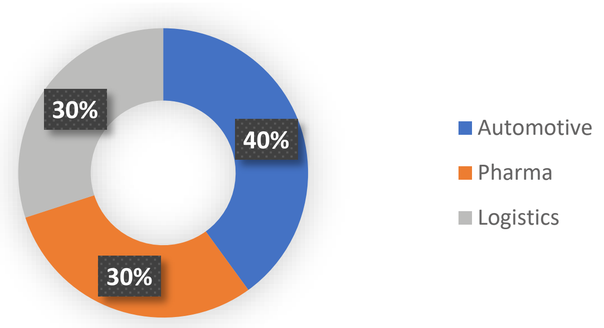

Fig. 6. Sectors represented by experts

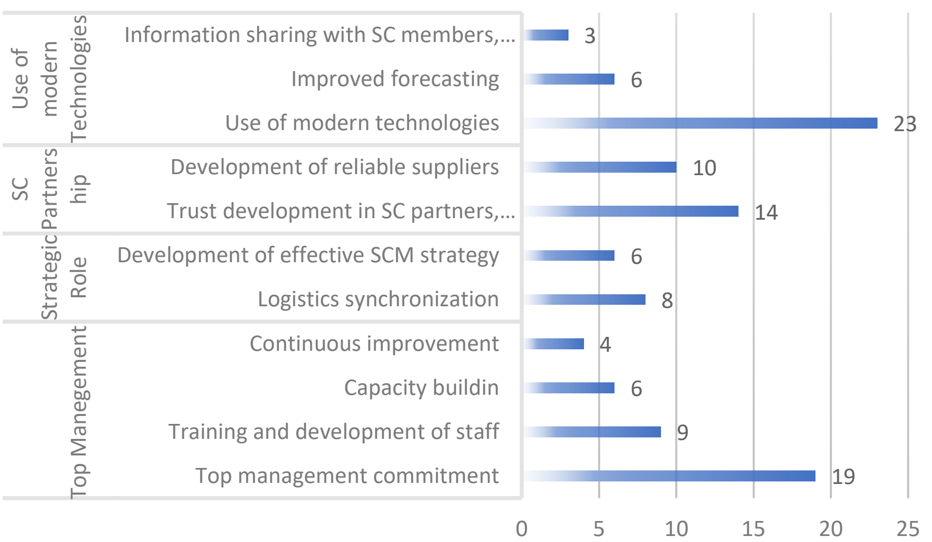

Fig. 7. Four Major CSF Domains of A Resilient Supply Chain

be created to develop a fool-proof system, and staff training and development must be regular and not only in events of disaster but throughout the year. Capacity building becomes an integral part of strategic decisions so that this capacity can be utilised in events of unforeseen risks. Continuous improvement strategies have become the norm after lean manufacturing practices.

The second task that strategic management needs to work on is the role played in strategic management. Designing features like Keiretsu, where a group of vendors is selected and is financially and technologically aided by the parent organisation, are doing wonders for vendor relationship management. This is a win–win situation for both parties. Logistics Synchronisation is a widely used term in logistics systems, and it promises to increase efficiency by coordinating supply and demand over time and space.

The second — tactical — level develops the SC Partnership. Developing good relationships with vendors goes a long way. For this purpose, an effective SCM strategy needs to be in place. A vendor management system needs to be top-notch. Annual vendor conferences have become a regular practice. These conferences help the tactical management in rating their vendors, which helps in determining the vendors fit for such programmes as Keiretsu.

The third — operational — level requires the practical use of modern technologies. Unless the organisation has well-organised demand, supply, supplier and vendor information, it will not be able to fulfil orders on time, especially in events of disruption.

Conclusion

This study examines journal papers published between 2010 and 2022. The SLR approach helped in exploring and analysing how various CSFs for small and medium enterprises are combating the effects of risks. Three major databases were selected, and various keywords were used to identify the most significant studies relating a supply chain with CSFs. A comprehensive list of the most fundamental CSFs was compiled in this manner. The study has offered a thorough list of critical factors found in the literature, together with their definitions, using a conceptual mapping categorisation methodology. It is evident from the study that some very important CSFs, such as the use of modern technologies and top management commitment, are the basis of any organisation that wants to establish a resilient supply chain.

The major outcome of this study is a conceptual mapping of the CSFs. They can be put into four different domains, and work can be done to ascertain their effect on the supply chain's resilience. The literature review investigated SCRM and the issues arising in this field. Furthermore, PCA was performed on the CSFs, and the variance, their loading factors, and the commonality were explored in depth. This comprehensive study will be helpful for other researchers in this field and will serve as a starting point for additional research in the domain of CSFs for a resilient supply chain and their classifications, along with the gaps identified via the literature as well as other opportunities for research identified in this study.

Albeit most analysts would concur that supply chains are innately unsafe, one issue remains moderately neglected: a common point of view on the further development of supply chain flexibility to manage disruptions. This conceptual framework can be validated by a case study in any industrial sector and by verifying the robustness of the model.

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