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Building and Improving the Resilience of Enterprises in a Time of Crisis: from a Systematic Scoping Review to a new Conceptual Framework

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ABSTRACT

The business environment is subject to continuous changes and puts pressure on enterprises to find effective ways to survive and develop. In this context, enterprises must build resilience to achieve long-term sustainability and to overcome unexpected events. In this paper, we present a systematic scoping review with the following aims: a) to identify and analyse any conceptual framework designed to develop and improve the resilience of enterprises and b) to identify resilience capabilities and corresponding strategies suggested in the analysed frameworks and to reorganize them into a new integrated conceptual framework. Fifty-seven conceptual frameworks were selected and classified according to the topics investigated. A new integrated conceptual framework comprising specific resilience capabilities and associated resilience strategies was developed. The framework aims to support enterprises in the development and improvement of resilience in different phases of a crisis (prevent, protect, respond, recover, prevent).

In ambienti di mercato dinamici ed in continua evoluzione, le aziende devono sviluppare buoni livelli di resilienza organizzativa, intesa come la capacità di anticipare, prepararsi, rispondere ed adattarsi al cambiamento e ad inconvenienti improvvisi, con l'obiettivo di sopravvivere e prosperare nel lungo periodo. Il presente lavoro, basato su una revisione sistematica della letteratura, ha un duplice obiettivo: a) identificare e analizzare i lavori scientifici che hanno proposto schemi concettuali a supporto delle imprese per sviluppare e migliorare la propria resilienza organizzativa; b) identificare dettagliatamente le capacità di resilienza e le strategie corrispondenti suggerite negli schemi concettuali selezionati, riorganizzandoli in un nuovo quadro concettuale integrato in grado di supportare le imprese nello sviluppo e nel miglioramento della resilienza nelle diverse fasi della crisi (prevenire, proteggere, rispondere, recuperare, prevenire).

Keywords: Resilience, Conceptual Framework, Scoping Review, Enterprises

1 – Introduction

Today's global business environment is dynamic and changing rapidly. It is subject to continuous changes that create opportunities and threats for any enterprise and that pressure enterprises to find effective ways to survive and develop (Erol et al., 2009; Bianchi, 2017).

The recent COVID-19 health emergency confirmed the unpredictability of some events that may have a significant impact on the life of enterprises (Juergensen et al., 2020). Disasters, crises, and other unexpected events have the potential to damage the management of a company and to interrupt the continuity in the flow of activities with consequences for companies' profitability (Selleri, 2018; Staiano and Montella, 2013; Mella, 2020).

In this context, enterprises must build resilience to achieve long-term sustainability and to overcome unexpected events (Arru e Ruggieri, 2016; Selleri, 2018). During potential disruptions, enterprises must have the ability to cope with emerging threats, adapt to turbulent environments, change processes and still be able to satisfy emerging stakeholder and business needs. At the same time, enterprises must be capable of maintaining operations during these potential disruptions (Erol et al., 2009).

This paper addresses the topic of enterprise resilience. The term 'resilience' has been used at the organizational level to describe the inherent characteristics of those organizations that are able to respond more quickly, recover faster or develop more unusual ways of doing business under duress than others (Sutcliffe and Vogus, 2003; Vogus and Sutcliffe, 2007; Linnenluecke , 2017). In summary, resilience is a desirable characteristic for an enterprise; it results in the ability to address increasing environmental complexity and to design systems that are not only more reliable but also more resilient to withstand unanticipated failures without catastrophic losses (Erol et al., 2009; Linnenluecke, 2017). Specifically, *enterprise resilience* is defined *as an enterprise's adaptive capacity and its ability to cope with, adapt to and recover after a disruption* (Gallopín, 2006).

To achieve this, enterprises need proactive approaches equipped with decision support frameworks that can contribute to understanding the interrelationships and interdependencies between different variables to better understand the processes of adaptation and the wider implications of those processes (Nelson et al., 2007). Many authors have contributed to this field by providing different conceptual frameworks that demonstrate how to develop and improve enterprises' resilience (Erol et al., 2009; Christopher and Peck, 2004; Burnard et al., 2018). Conceptual frameworks can support enterprises in identifying resilience capabilities, strategies and other factors that are essential in developing and improving resilience.

In this paper, we perform a systematic scoping review with the following two aims: a) to identify and analyse any conceptual framework designed to develop and improve the resilience of enterprises and b) to identify resilience capabilities and corresponding strategies suggested in the analysed frameworks and reorganize them in a new integrated conceptual framework. The paper consists of five sections. After this introduction, Section 2 presents the research methodology, including the material search phase and the paper selection phase. Section 3 is dedicated to the descriptive analysis of conceptual frameworks. A new integrated conceptual framework is described in Section 4. Finally, the discussion, conclusions and limitations wrap up the paper in Section 5.

2 – Method

A systematic scoping literature review underlies this study: scoping reviews are commonly used for "reconnaissance" – to clarify the working definitions and conceptual boundaries of a topic or field (Peters et al., 2015). Scoping reviews are therefore particularly useful when a body of literature has not yet been comprehensively reviewed or exhibits a complex or heterogeneous nature that is not amenable to a more precise systematic review of the evidence (Peters et al., 2015).

To the best of our knowledge, this is the first attempt to systematically review all conceptual frameworks based on the development of enterprise resilience. Our aim is to summarize the main topics and research findings to identify the main resilience capabilities and strategies proposed in conceptual frameworks, concluding with the development of a new integrated conceptual framework for resilience.

To achieve these aims, we started by selecting a database from which to find papers. The following databases were searched from 26.03.2020 to 20.04.2020 to identify potential studies for inclusion: Science Citation Index (Web of Science), Google Scholar, ProQuest and Wiley Online Library.

The search was limited to full-text articles published in academic journals in English without data restrictions. We extracted papers from the database using "2" separate keywords - *resilience* and *framework* - to find the most articles focused on this topic. In addition, we used 2 keywords focusing on the business setting - *enterprise** and *business** - using the Boolean operator AND. Using these keywords in different combinations, we were able to obtain a comprehensive overview of conceptual frameworks published on the issue investigated. These search terms were identified through discussion by the research team and by scanning the background literature. The search of the database with selected keywords was extended to the title, keywords and abstracts (topics range).

To be eligible for inclusion, papers needed to present an explicit conceptual or theoretical framework designed to develop or improve enterprises' resilience (*inclusion criteria*). Conceptual frameworks that referred to resilience in other contexts or that did not describe in detail the process elements related to the development or improvement of resilience were excluded from the review. Based on the difficulty of assessing the methodological quality of grey literature (Adams et al., 2017), meeting abstracts, proceedings or conference papers, book chapters, letters to the editors and editorials were also excluded (*exclusion criteria*) (Hopewell et al., 2005).

To reduce the selection bias, all article titles, abstracts and keywords identified from the electronic searches were reviewed in a first step by the two authors separately according to the inclusion/exclusion criteria. Abstracts were independently evaluated using a three-level scoring system to rank relevance (e.g., not relevant – "0", unclear relevance – "1", relevant – "2"). Full-text articles were reviewed for abstracts that received a score of "1" or "2".

When it was not possible to exclude articles based on the title and abstract alone, full-text versions were obtained, and their eligibility was assessed independently by the two authors. When disagreements occurred, the opinion of a third reviewer was sought, and the issue was resolved by discussion and arbitration by the third reviewer.

3 – Results

3.1 – *The Research Flow Diagram*

Our searches identified 321 potentially relevant references (see Flow diagram in Figure 1). Following review of the titles and abstracts, publications that obviously did not meet the inclusion criteria were excluded (46). The remaining papers were downloaded for a more detailed screening (275).

The citations of all articles were analysed, and a total of 170 relevant articles were selected. Considering the high probability of duplicates in this phase (the same papers are cited in multiple articles), the titles of the selected citations were imported into a spreadsheet using Excel, duplicate records were removed (97), and the remaining articles were downloaded (73).

All selected articles were screened independently by two reviewers (348). In the search PDF bar, the term "framework" was inserted to evaluate whether a framework was present; subsequently, the words "business, firm*, enterprise*" were searched to evaluate the context. After removing papers that did not meet the inclusion criteria, 57 conceptual frameworks were selected and included in this review.

For the selected articles, data sheets were prepared to extract all data of possible relevance. The extraction was performed independently by the authors to ensure accuracy. Specifically, two authors independently extracted relevant data from the selected studies using the same abstraction form with the following elements: authors, publication year, journal, number of

citations, aim, topic, title of the framework, main elements of the framework, and a summary of the main content of the paper.

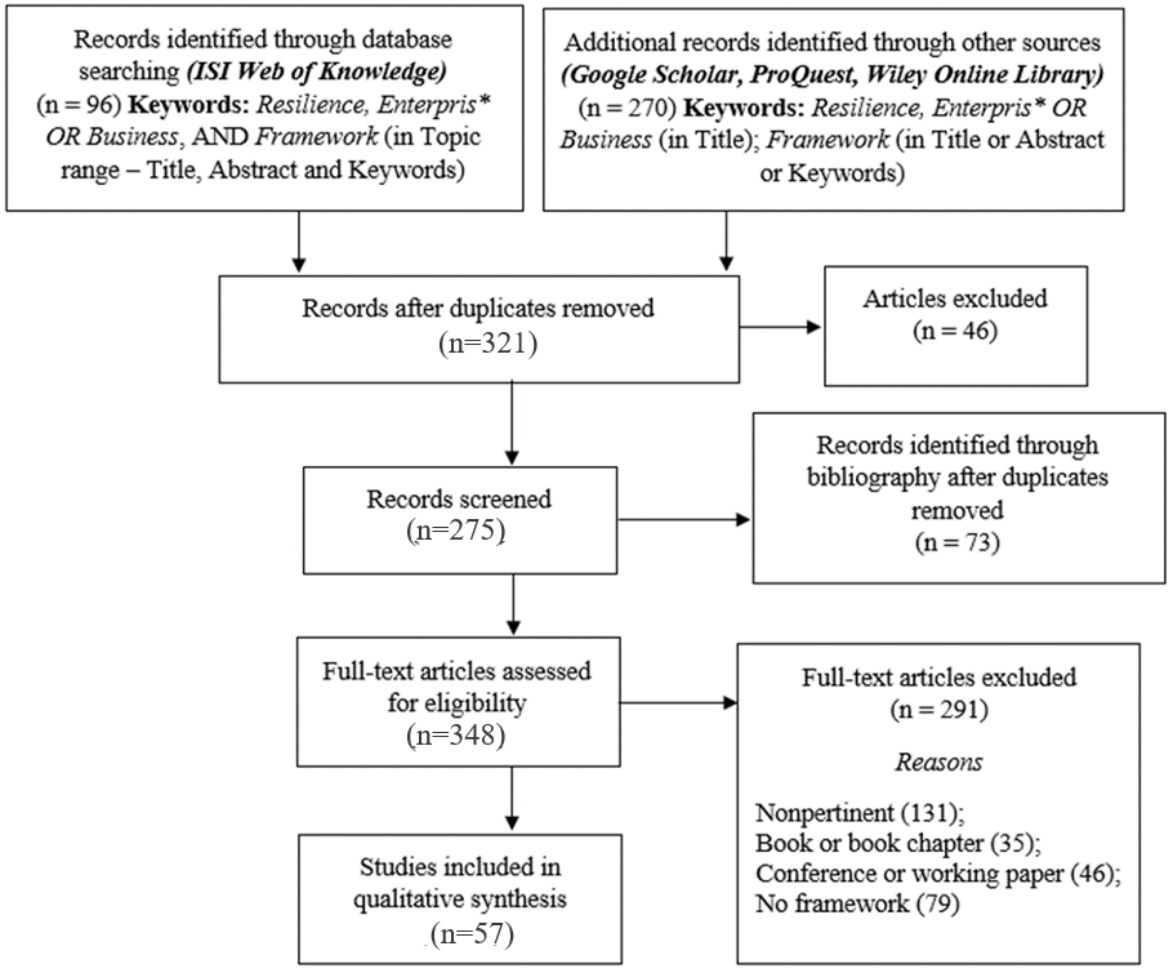

Figure 1 – Flow diagram. Identification of conceptual frameworks

3.2 – *Temporal distribution, journals involved and most cited conceptual frameworks*

Figure 2 presents the temporal distribution of the articles. The conceptual frameworks extracted ranged from 2000 to 2020. The significant increase in documents over the last 13 years suggests a growing interest in the topic of firm resilience. Considering recent COVID-19 health emergencies and the impact of lockdown on the reduction of enterprise activities, for the 2020 we expect an important increase in publications and relative conceptual frameworks on this topic.

With regard to the journals, we found more than one conceptual framework published in the same journal. Specifically, the most involved journals were (Table 1) *International Journal of Physical Distribution & Logistics Management* and *Journal of Business Logistics,* in which we found 3 conceptual frameworks on the topic of supply chain resilience (SCR); on the same topic, 3 conceptual frameworks were found in *Supply Chain Management: An International Journal*. Two frameworks in which the main traits for organizational resilience were conceptualized were found in the *European Management Journal*. In the *International Journal of Production Economics*, *International Journal of Production Research* and *Sustainability*, 2 conceptual frameworks were developed with a particular focus on enterprises or small and medium enterprises (SMEs).

Finally, in the *Safety Science* journal, we found two conceptual frameworks with a focus on business continuity management (BCM) systems.

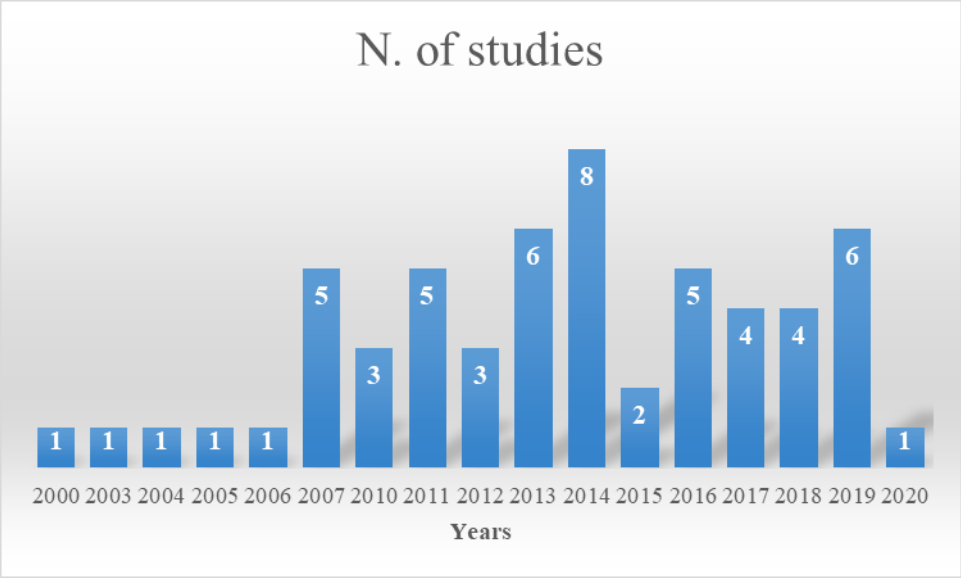

Figure 2 – Temporal distribution of selected conceptual frameworks

From Table 1, it is also possible to observe the most cited paper. As shown in the table, an important contribution in this scientific field was provided by Peck, Pettit and Blackhurst (see paper numbers 20, 24, 34-36).

Table 1. Journal list and most cited papers

No.	Author/s, Year, Title	*Journal*	*N. of Citations (until 30.05.2020)*
1	***Burnard et al, 2018.*** Building organizational resilience: Four configurations.	*IEEE transactions on engineering management*	27
2	***Iakovou et al, 2007.*** An analytical methodological framework for the optimal design of resilient supply chains.	*International Journal of Logistics Economics and Globalisation*	86
3	***Becken, 2013.*** Developing a framework for assessing resilience of tourism sub-systems to climatic factors.	*Annals of Tourism Research*	159
4	***Wedawatta & Ingirige, 2016.*** A conceptual framework for understanding resilience of construction SMEs to extreme weather events.	*Built Environment Project and Asset Management*	13
5	***Linnenluecke & Griffiths, 2010.*** Beyond adaptation: resilience for business in light of climate change and weather extremes.	*Business & Society*	223
6	***Duchek, 2019.*** Organizational resilience: a capability-based conceptualization.	*Business Research*	11
7	***Duchek et al, 2019.*** The role of diversity in organizational resilience: a theoretical framework.		7
8	***Linnenluecke et al, 2012.*** Extreme weather events and the critical importance of anticipatory adaptation and organizational resilience in responding to impacts.	*Business Strategy and the Environment*	203

9	***Doerfel et al, 2013.*** The evolution of networks and the resilience of interorganizational relationships after disaster.	*Communication Monographs*	61
10	***Adhitya et al, 2007.*** A model based rescheduling framework for managing abnormal supply chain events.	*Computers & Chemical Engineering*	99
11	***Soni et al, 2014.*** Measuring supply chain resilience using a deterministic modeling approach.	*Computers & Industrial Engineering*	191
12	***McCarthy et al, 2017.*** Adaptive organizational resilience: an evolutionary perspective.	*Current opinion in environmental sustainability*	29
13	***Erol et al, 2010.*** A framework for investigation into extended enterprise resilience.	*Enterprise Information Systems*	136
14	***Limnios et al, 2014.*** The resilience architecture framework: four organizational archetypes.	*European Management Journal*	137
15	***Conz & Magnani, 2019.*** A dynamic perspective on the resilience of firms: A systematic literature review and a framework for future research.		4
16	***Antunes & Mourão, 2011.*** Resilient business process management: Framework and services.	*Expert Systems with Applications*	73
17	***Sin et al, 2017.*** Building business resilience through incident management body of knowledge (IMBOKTM): the amalgamated framework for total resilient capability.	*Global Business & Finance Review*	1
18	***Gaonkar & Viswanadham, 2007.*** Analytical framework for the management of risk in supply chains.	*IEEE Transactions on automation science and engineering*	197
19	***Gibb & Buchanan, 2006.*** A framework for business continuity management.	*International journal of information management*	203
20	***Christopher & Peck, 2004.*** Building the resilient supply chain.	*International Journal of Logistics Management*	*2538*
21	***Datta et al, 2007.*** Agent based modelling of complex production/distribution systems to improve resilience.	*International Journal of Logistics Research and Applications*	138
22	***Kochan & Nowicki, 2018.*** Supply chain resilience: a systematic literature review and typological framework.	*International Journal of Physical Distribution & Logistics Management.*	21
23	***Svensson, 2000.*** A Conceptual Framework for the Analysis of Vulnerability in Supply Chains.		550
24	***Peck, 2005.*** Drivers of supply chain vulnerability: An integrated framework.		*754*
25	***Kamalahmadi & Parast, 2016.*** A review of the literature on the principles of enterprise and supply chain resilience: Major findings and directions for future research.	*International Journal of Production Economics*	293
26	***Pal et al, 2014.*** Antecedents of organizational resilience in economic crises—an empirical study of Swedish textile and clothing SMEs.		185

27	***Burnard & Bhamra, 2011.*** Organisational resilience: development of a conceptual framework for organisational responses.	*International Journal of Production Research*	318
28	***Ates & Bititci, 2011.*** Change process: a key enabler for building resilient SMEs.		203
29	***Thomé et al, 2016.*** Similarities and contrasts of complexity, uncertainty, risks, and resilience in supply chains and temporary multi-organization projects.	*International Journal of Project Management*	56
30	***Ehrenhuber et al, 2015.*** Toward a framework for supply chain resilience.	*International Journal of Supply Chain and Operations Resilience*	8
31	***Jiang et al, 2019.*** Building tourism organizational resilience to crises and disasters: A dynamic capabilities view.	*International Journal of Tourism Research*	3
32	***Golicic et al, 2017.*** Building business sustainability through resilience in the wine industry.	*International Journal of Wine Business Research.*	13
33	***Buliga et al, 2016.*** Business model innovation and organizational resilience: towards an integrated conceptual framework.	*Journal of Business Economics.*	24
34	***Pettit et al, 2010.*** Ensuring supply chain resilience: development of a conceptual framework.		*693*
35	***Pettit et al, 2013.*** Ensuring supply chain resilience: development and implementation of an assessment tool.	*Journal of business logistics*	*390*
36	***Blackhurst et al, 2011.*** An empirically derived framework of global supply resiliency.		*375*
37	***Koronis & Ponis, 2018.*** A strategic approach to crisis management and organizational resilience.	*Journal of Business Strategy*	5
38	***Teo et al, 2017.*** The relational activation of resilience model: How leadership activates resilience in an organizational crisis.	*Journal of Contingencies and Crisis Management*	28
39	***Faisal et al, 2007.*** Information risks management in supply chains: an assessment and mitigation framework.	*Journal of Enterprise Information Management*	206
40	***Kantur & İşeri-Say 2012.*** Organizational resilience: A conceptual integrative framework.	*Journal of Management & Organization*	126
41	***Winnard et al, 2014.*** Surviving or flourishing? Integrating business resilience and sustainability.	*Journal of Strategy and Management*	42
42	***Carayannis et al, 2014.*** Business model innovation as antecedent of sustainable enterprise excellence and resilience.	*Journal of the Knowledge Economy*	87
43	***Chewning et al, 2013.*** Organizational resilience and using information and communication technologies to rebuild communication structures.	*Management Communication Quarterly*	70
44	***Gong et al, 2014.*** An interdependent layered network model for a resilient supply chain.	*Omega*	79

45	***Wright et al, 2012.*** A framework for resilience thinking.	*Procedia Computer Science*	29
46	***Vugrin et al, 2011.*** A resilience assessment framework for infrastructure and economic systems: Quantitative and qualitative resilience analysis of petrochemical supply chains to a hurricane.	*Process Safety Progress*	203
47	***Boin & Van Eeten, 2013.*** The resilient organization.	*Public Management Review*	180
48	***Torabi et al, 2016.*** An enhanced risk assessment framework for business continuity management systems.	*Safety science*	106
49	***Torabi et al, 2014.*** A new framework for business impact analysis in business continuity management (with a case study).		72
50	***Andersson et al, 2019.*** Building traits for organizational resilience through balancing organizational structures.	*Scandinavian Journal of Management*	14
51	***Scholten et al, 2014.*** Mitigation processes–antecedents for building supply chain resilience.	*Supply Chain Management: An International Journal.*	240
52	***Johnson et al, 2013.*** Exploring the role of social capital in facilitating supply chain resilience.		163
53	***Arsovski et al, 2015.*** Modelling and enhancement of organizational resilience potential in process industry smes.	*Sustainability*	10
54	***Sanchis et al, 2020.*** A Conceptual Reference Framework for Enterprise Resilience Enhancement.		2
55	***Xu & Kajikawa, 2018.*** An integrated framework for resilience research: a systematic review based on citation network analysis.	*Sustainability Science*	17
56	***Dervitsiotis, 2003.*** The pursuit of sustainable business excellence: Guiding transformation for effective organizational change.	*Total Quality Management & Business Excellence*	67
57	***Bianchi, M. (2019).*** Beyond the structural modelling for the analysis of organizational performances in the resilience management.	*Economia Aziendale Online*	2

3.3 – *Synthesis of studies*

Conceptual frameworks were classified according to the topic investigated.

Specifically, we found 18 *conceptual frameworks for analysing and building traits for organizational resilience*. In 20 papers, conceptual frameworks were developed *to enhance resilience in* the supply chain (SC). Three conceptual frameworks discussed the role of *business continuity management in improving enterprise resilience*. Five conceptual frameworks analysed the relationships among *business model innovation (BMI), sustainability and resilience*. Three conceptual frameworks suggested strategies for *improving the resilience of enterprises in the face of weather events and climate changes,* and 5 were developed for *improving resilience in Small and Medium enterprises (SMEs)*. Finally, in 3 conceptual frameworks, *the role of information technology in resilience improvement* was discussed (see Table 2).

A narrative synthesis of the included frameworks is presented in the next subsections.

Table 2. Conceptual frameworks that could be used to guide enterprises in improving resilience

No. of studies on topic	*Author/s, year*	*Aim*	*Title of framework*
Frameworks for analysing and building traits for organizational resilience			
1	Antunes & Mourão, 2011	To propose a framework characterizing business process management (BPM) resilience according to planning and response dimensions	Adopted framework to characterize resilient BPM
2	Kantur & İşeri-Say 2012	To propose an integrative framework for organizational resilience	Integrative framework of organizational resilience
3	Wright et al., 2012	To develop a set of key features of a resilience system, providing a framework to guide further research	Conceptual model of an enterprise resilience system
4	Boin & Van Eeten, 2013	To explore relation between organizational characteristics, processes and resilience	High reliability organizations framework
5	Limnios et al., 2014	To propose a framework that forms a platform for the integration of divergent research streams – organizational rigidity, dynamic capabilities and organizational ambidexterity – into the study of organizational resilience	The Resilience Architecture Framework
6	McCarthy et al., 2017	To develop a theoretical framework for describing and explaining the process of functioning of organizational resilience	An evolutionary framework of adaptive organizational resilience
7	Sin et al., 2017	To uncover the converging domains and interplays between the concepts and the building blocks of enterprise risk and resource management, emergency and crisis management, business continuity and disaster recovery management to achieve business resilience	Potential integrating framework for resilience
8	Teo et al., 2017	To propose a resilience model to explain how leaders can utilize relationships to activate resilience during crisis	Relational Activation of Resilience model
9	Xu & Kajikawa, 2018	To propose a framework that synthesizes principles of resilience from different research fields embracing key components (behaviours, capacities, influencing factors, interventions, and system dynamics)	Integrated framework for resilience analysis
10	Burnard et al., 2018	To examine how processes of response, both before and in the aftermath of a disruption, support the building and development of organizational resilience	Organizational Response Framework
11	Koronis & Ponis, 2018	Organizational resilience is revisited as a new strategic direction of crisis management	The Proposed Framework for Organizational Resilience
12	Conz & Magnani, 2019	To propose, according to a literature review, a conceptual framework for the resilience of firms	The resilience of firms. A conceptual framework

		that can represent the basis for further theoretical and empirical developments	
13	Andersson et al., 2019	To describe and explain how balancing organizational structures can build traits for organizational resilience	Framework for organizational resilience: anticipation principles
14	Duchek, 2019	To develop a conceptual framework that illustrates the main stages of the resilience process and points to underlying capabilities that together constitute the meta-capability of organizational resilience	A capability-based conceptualization of organizational resilience
15	Duchek et al., 2019	To analyse the role played by diversity in the development of organizational resilience	Proposed effects of diversity on resilience capabilities
16	Jiang et al, 2019	To develop a theoretical framework that shows how an organization's existing operational routines transform into new ones that are resilient to disruptive events	Dynamic capabilities—crisis/disaster resilience framework
17	Sanchis et al., 2020	To propose a conceptual framework to characterize enterprise resilience capacity	ER (Enterprise resilience) conceptual reference framework
18	Bianchi, 2019	Beyond the structural modelling for the analysis of organizational performances in the resilience management	Identification of data sources in the evaluation process of resilience projects
Conceptual frameworks to assess and enhance resilience in SC			
1	Svensson, 2000	To propose a conceptual framework for the analysis of vulnerability in SC	A conceptual framework for the analysis of vulnerability in supply chains
2	Christopher & Peck, 2004	To develop a managerial agenda for the identification and management of SC risk	Creating the Resilient Supply Chain
3	Peck, 2005	To show the main sources and drivers of SC vulnerability	An integrated model of a supply chain as an adaptive system
4	Adhitya et al., 2007	To propose a model-based framework for rescheduling operations in the face of SC disruptions	Proposed model-based rescheduling framework
5	Datta et al., 2007	To present a framework for studying SC subject to demand variability, production and distribution capacity constraints with the aim of improving operational resilience	Model for improving resilience
6	Iakovou et al., 2007	To propose a methodological framework to support the design and operations of efficient SC in the new business environment by taking into account the stochasticity of various factors that can lead to disruptions	Mitigating supply chain risks: security and resilience interventions

7	Faisal et al., 2007	To identify various information risks that could impact a SC and develop a conceptual framework to quantify and mitigate them	Interpretive structural modelling-based model for information risk mitigation in a supply chain
8	Gaonkar & Viswanadham, 2007	To develop a framework to classify SC risk-management problems and approaches for the solution of these problems	Conceptual framework to approach supply chain risk problems
9	Pettit et al., 2010	To create a conceptual framework for evaluating and improving SCR.	Supply Chain Resilience Framework
10	Vugrin et al., 2011	To propose a framework for evaluating the resilience of infrastructure and economic systems	A framework for resilience assessment
11	Blackhurst et al., 2011	To assess and enhance resilience in SC	Framework of supply resiliency
12	Johnson et al., 2013	To explore how social capital may act as facilitators or enablers of the four formative capabilities (i.e., flexibility, velocity, visibility, and collaboration)	Framework showing social capital as a potential source for SCRES
13	Pettit et al., 2013	To develop a framework to improve SCR	Supply Chain Resilience Assessment and Management
14	Gong et al., 2014	To address the problem of designing SCs that are resilient to natural or human-induced extreme events	Problem-solving process
15	Scholten et al., 2014	To develop an integrated SCR framework	Integrative Framework for Building Supply Chain Resilience
16	Soni et al., 2014	To propose a conceptual model that considers the major enablers of SCR and their interrelationships	Identification of enablers of SCR
17	Ehrenhuber et al., 2015	To develop a framework that combines capabilities, enablers and objectives of resilience	A framework for SC resilience
18	Thomé et al., 2016	To offer a research synthesis of complexity, uncertainty, risks, and resilience in supply chain management (SCM) and project management (PM)	Complexity and uncertainty, risks, and resilience: a synthesis framework for SCM and PM.
19	Kamalahmadi & Parast, 2016	To develop a framework for the principles of SCR that can be used as a basis for understanding SCR	Supply chain resilience principles framework
20	Kochan & Nowicki, 2018	To develop a typological framework to further understand SCR and identify SCR measures and assessment techniques	Typology of SCRES based on the CIMO logic
Implementing business continuity management to improve enterprise resilience			

1	Gibb & Buchanan, 2006	To propose a framework for the design, implementation and monitoring of a BCM programme within the context of an information strategy	A framework for BCM
2	Torabi et al., 2014	To propose a novel framework to conduct the business impact analysis (BIA) in organizations in a more systematic and comprehensive way mostly by relying on effective multi-attribute decision-making techniques	The proposed BIA framework
3	Torabi et al., 2016	To propose a risk assessment framework within the context of a BCM system	The enhanced RA framework equipped with analytical tools
Business model innovation, sustainability and resilience			
1	Dervitsiotis, 2003	To provide a framework for system resilience and sustainable business excellence	Levers for facilitating transformation for adaptation
2	Carayannis et al., 2014	To demonstrate how organizational sustainability and resilience can be achieved with BMI	BMI and organizational sustainability for enterprise excellence and resilience
3	Winnard et al., 2014	To explore the concepts of business resilience and sustainability and their relationship, supporting decision-makers to proactively build both characteristics	Simple process flow for Resilient Sustainability approach
4	Buliga et al., 2016	To develop a conceptual framework in which the BMI and organizational resilience literature are united under one theoretical roof	Framework development
5	Golicic et al., 2017	To address how wine businesses build sustainability – the ability to survive and be successful over the long term – in a complex market environment	Theoretical framework
Conceptual frameworks for development and improvement of the resilience of enterprises in the face of weather events and climate changes			
1	Linnenluecke & Griffiths, 2010	To present a framework that provides insights into dealing with new types of environmental change	Resilience framework
2	Linnenluecke et al., 2012	To propose a comprehensive conceptual framework of organizational adaptation and resilience to extreme weather events to address the effects of ecological discontinuities in organizational research and strategic decision-making	Organizational adaptation and resilience: conceptual framework
3	Becken, 2013	To assess the resilience of tourism sub-systems to climatic factors	Resilience and Adaptive Capacity in the SES of a Tourist Destination and the Importance of Epistemological Pluralism
	Conceptual frameworks for improving resilience in SMEs		

1	Ates & Bititci, 2011	To demonstrate that change management process capability is fundamental to creating resilience in SMEs	A conceptual framework for change process in SMEs to create resilience
2	Burnard & Bhamra, 2011	To assess the detection and activation of features within the response of an organization to disruptive events	Resilient response framework
3	Pal et al., 2014	To provide evidence on factors that contribute to resilience development in SMEs	Theoretical framework (SMEs' resilience)
4	Arsovski et al., 2015	To introduce a two-step model for the assessment and enhancement of organizational resilience in SMEs of the process industry in an uncertain environment	The framework for assessment and enhancement of organizational resilience
5	Wedawatta & Ingirige, 2016	To understand the resilience of SMEs to extreme weather events	Expanded framework for extreme weather event resilience in construction SMEs
The role of information technology in resilience improvement			
1	Erol et al., 2010	To propose a framework for investigation into 'extended enterprise resilience' based on the key attributes of enterprise resilience in the context of extended enterprises	Framework for extended enterprise resilience.
2	Chewning et al., 2013	To provide a framework for understanding what elements of technology work and how they can help in organization recovery	Technology-in-practice framework
3	Doerfel et al., 2013	To examine organizational resilience via the analysis of interorganizational networks of disaster-struck organizations	Multi-Theoretical Framework and Resilience

3.4 – *Frameworks for analysing and building traits for organizational resilience*

Eighteen studies in which conceptual frameworks were used to analyse and propose strategies for building and improving organizational resilience were found.

The term "organizational resilience" refers to the capacity of crisis managers to make decisions and take actions that contribute to avoiding a crisis or at least reducing its impact (Sin et al., 2017; Wright et al., 2012).

Some authors have proposed integrative conceptual frameworks to identify sources of organizational resilience (Kantur and İşeri-Say, 2012). These frameworks are categorized as perceptual stance, contextual integrity, strategic capacity and strategic acting. In this sense, organizational resilience leads to organizational evolvability as its outcome.

Other conceptual frameworks for analysing resilience, guiding principles and the characteristics of resilient systems were found. Specifically, Limnios et al. (2014) developed a resilience architecture framework in which four types of organizations are described according to two dimensions: the ''magnitude dimension'', which refers to the level of the system's resilience (higher or lower levels of disturbance the system can tolerate and still persist), and the ''desirability dimension'', which refers to the level of desirability of the system state (more

or less desirable system state at its current functional level). Resilient organizations are characterized by a high level of desirability and high magnitude.

Starting from the hypothesis that organizational resilience can be profitably viewed as an evolutionary process in which organizations adapt their configurations in response to changes in two external conditions, disturbance and munificence, McCarthy et al. (2017) presented a framework that views resilience-driven configuration change as an evolutionary process of variation, selection, and retention for firms.

In particular, the framework allows us to understand the process of adaptive organizational resilience. In this context, one interesting aspect involves the concept of munificence, which is the extent to which the resources available to a population of firms are abundant or scarce. In other words, munificence can provide firms with the resources to buffer disturbances and maintain existing configurations. In contrast, scarce resources provide an impetus for firms to rethink their strategies and generate new organizational configurations.

Antunes and Mourão (2011) proposed a framework to characterize resilient business process management. The authors developed a resilience framework based on two criteria: control, which may be prescriptive, mixed or discretionary, and response, considering planned and nonplanned actions. Resilience occurs in the presence of discretionary/unplanned interventions. Other factors, such as leadership and relational connections, are critical to promoting organizational resilience in a crisis. Teo et al. (2017) linked the two concepts and provided a conceptual framework that explicates the critical role of leadership in activating resilience during crisis situations through a relational network perspective.

In analysing the role of crisis leaders, Boin et al. (2013) offered a comprehensive framework to assess the work that crisis leaders must perform based on five key tasks: sensemaking to process information from environmental cues to promote a collective understanding of the crisis, decision-making and facilitating effective coordination among various parties, providing an interpretation of the situation and bringing authentic hope and confidence to stakeholders, restoring trust in the organization, and facilitating reflection and learning from the crisis.

Recent studies explore the processes of response, both before and in the aftermath of a disruption, and how these processes support the building and development of organizational resilience (2018).

Using case study data from three UK-based organizations, the authors explore why responses vary from one situation to another and identify two dimensions that determine the configurations of organizational resilience, namely, preparedness and adaption. According to this, the paper presents the Resilience Configurations Matrix, which gives rise to and establishes four distinct types of organizational configurations: process based, resourceful, at high risk, and resilience focused.

Xu and Kajikawa (2018) proposed a framework that synthesizes principles of resilience from different research fields that embrace key components (behaviours, capacities, influencing factors, interventions, and system dynamics). In their framework, the authors treat resilience and its cognate concepts as the behaviours of the focal system in the face of disturbances.

In the framework developed by Koronis & Ponis (2018), organizational resilience is revisited as a new strategic direction of crisis management. The paper adopts a strategic view on organizational survival and argues that preparedness, responsiveness, adaptability and learning abilities constitute organizational drivers of resilience.

In 2019, Duchek conceptualized resilience by developing a conceptual framework of organizational resilience and suggesting three successive stages of resilience (anticipation, coping, and adaptation). The author provides an overview of factors that together contribute to the improvement of organizational resilience (knowledge base; time, financial, human and social resource availability; power and responsibility) (Duchek, 2019).

In the study by Ducken et al. (2019), the authors develop a conceptual framework to analyse the role of diversity in the development of organizational resilience. The authors argue that diversity can play a central role in enhancing organizational resilience if it is well managed.

The findings indicate the potential role of diversity in enhancing organizational resilience by contributing to the development of different capabilities underlying the three stages of the resilience process (anticipation, coping, and adaptation).

Andersson et al. (2019) developed a framework that showed how balancing organizational structures can foster organizational resilience traits. One limitation of the study is that the results are based on only one long-term successful organization. It is not clear whether the identified organizing processes are context-dependent or more generic. Therefore, the authors suggest further research to investigate the generalizability of the results.

Jiang et al. (2019) developed a theoretical framework that shows how an organization's existing operational routines transform into new ones that are resilient to disruptive events, with a focus on the tourism sector. The framework describes one evolutionary process that illustrates that organizations acquire learning from past experience and knowledge, build, renew, and reconfigure resources in response to disruptions in the environment through organizational dynamic capabilities, and identify good traits such as capabilities, behaviours, or strategies for future events.

Conz and Magnani (2019) proposed a conceptual framework in which two distinctive dynamic 'resilience paths' are identified: absorptive and adaptive.

Firms can be resilient by either absorbing or adapting to a shock (or both).

Bianchi (2019), starting from the description of the basic elements of an organizational process (Targets, Resources and Results), describes the indexes of Efficacy, Effectiveness and Adequacy.

These indexes express coherently a system of indicators meaningful for the organizational analysis of performances and can be treated as cardinal variables and usable to analyze the gap between real and perceived performances.

The approach showed by the author can be applied to the evaluation of results in resilience projects as in other subjects in which the performance has to be detected.

More recent studies have proposed a framework that comprises the constituent capabilities of enterprise resilience in terms of preparedness and recovery capabilities (Sanchis et al., 2020).

Elements that support the transition from preventive actions (for preparedness capability) to knowledge registration actions (for recovery capability) are also presented (Sanchis et al., 2020).

3.5 – *Supply Chain resilience*

Volatile and unpredictable market conditions are likely to create considerable SC risks such as excess cost, lost sales due to delivery problems or quality impairments. SCR is therefore essential for companies striving to achieve their business objectives (Ehrenhuber et al., 2015). SCR is defined as the ability to maintain, resume, and restore operations after a disruption (Gaonkar and Viswanadham, 2007).

According to this, to achieve a competitive edge in an uncertain business environment, one of the significant challenges for an organization is to mitigate risk by creating resilient SCs (Scholten et al., 2014; Adhitya et al., 2007). Uncertainties in supply, demand, transportation, market conditions, and many other factors can interrupt SC operations, causing significant adverse effects. These uncertainties motivate the development of conceptual models for managing disruptions in the SC.

Twenty studies were found in this field.

Svensson (2000) developed a conceptual framework for the analysis of vulnerability factors in the SC. These factors include the volatility of the supplier's location and issues related to

labour and manufacturing capacity at the supplier's facility. Factors related to the flow of material between nodes may also significantly reduce supply resilience. These factors include the number of nodes in the SC, presence of regulation and security issues, and congestion of ports and vessel capacity restrictions in the SC.

Christopher and Peck (2004) offer a concise definition of SCR. Following research on building the resilient SC at Cranfield University, the authors define resilience as the ability of a system to return to its original state or move to a new, more desirable state after being disturbed.

Their conceptual framework provides insight into five principles to design resilient SCs: (i) select SC strategies that keep several options open; (ii) re-examine the 'efficiency vs. redundancy' trade off; (iii) develop collaborative working; (iv) develop visibility; and (v) improve SC velocity and acceleration.

Peck (2005) provides some insights for practising managers and policy makers through an integrated framework: to survive, organizations and their SCs must be resilient; they must develop the ability to react to an unforeseen disturbance and to return quickly to their original state or move to a new, more advantageous one after suffering the disturbance. Resilience may be seen as a way to overcome SC vulnerability.

In recent years, research related to SCR seems to be evolving into more materialized efforts in the form of proposed models and frameworks. For example, Priya Datta et al. (2007) developed an agent-based computational framework for studying a complex multi-product, multi-country SC with variable demands, production and distribution capacity constraints with the aim of improving resilience. Their findings are empirically validated in a paper tissue manufacturing SC.

In the same year, Adhitya et al. (2007) developed a model-based framework for rescheduling operations in the face of SC disruptions, and Iakovou et al. (2007) proposed a framework focused on the practical implementation of resilience through the design of the SC, referring to the following resilience interventions: (i) flexible sourcing; (ii) demand-based management; (iii) strategic safety stock; (iv) total SC visibility; and (v) process and knowledge back-up. Regarding operations management, they interpret resilience only in terms of recovery time, i.e., the ability to restore operations quickly.

Finally, Faisal et al. (2007) developed a conceptual framework to quantify and mitigate risks that could impact a SC. Their research suggests that management should focus on improving the high driving power enabler variables.

Other conceptual approaches and implementation methodologies have been developed to assess and enhance resilience in SCs through a portfolio of capabilities by balancing enterprises' inherent pattern of vulnerabilities (Pettit et al., 2010; Pettit et al., 2013).

In particular, Pettit et al. (2010) identified fourteen capability and seven vulnerability factors and proposed a conceptual SCR framework capable of pinpointing weaknesses in SC networks and providing managerial guidance for setting priorities to create a strategy for improving SCR. Their framework was validated with focus groups and interviews in an apparel and beauty care product retailer with a complex global SC. The authors distilled the two key drivers of resilience in an industrial SC: (i) the level of the SC's vulnerability and (ii) the capability of the SC to withstand and recover from disruption.

Another stream of research in SC reengineering critically examines concepts such as density, complexity, and node as the main characteristics that need to be considered in designing resilient SCs. Blackhurst et al. (2011) found that density and complexity are inversely related to SCR. As the number of nodes increases, a SC becomes more complex and more prone to disruptions. On the other hand, suppliers located in risk-prone areas and/or geographically clustered have an increased likelihood of disruptions within a SC. The results of their study emphasized the need for firms to have pre-defined communication protocols to mitigate the effects of disruptions through effective information sharing.

The framework described by Vugrin et al. (2011) allows for the qualitative assessment of attributes that enhance the SC's absorptive, adaptive, and restorative capacities.

In 2013, Johnson et al. (2013) aimed to explore how social capital may act as facilitators or enablers of the four formative capabilities (i.e., flexibility, velocity, visibility, and collaboration). Specifically, this paper provides an illustration of some links between resilience and social capital constructs within one supply network in the context of crisis response.

In 2014, Scholten et al. developed an integrated SCR framework depicting the relationship between specific processes and capabilities needed in the different disruption phases.

Gong et al. (2014) presented a framework for SC restoration that takes into account disruptions to the services provided. They used the model to develop SC restoration plans that can improve a company's resilience to disasters.

Soni et al. (2014) proposed a framework for support organizations to measure and analyse SCR. The framework considers all the major enablers of resilience (agility, collaboration among players, information sharing, sustainability, risk and revenue sharing, trust among players) and their interrelationships for analysis.

Ehrenhuber et al. (2015) developed a framework that combines capabilities, enablers and objectives of resilience according to a literature review.

Specifically, the framework connects various capabilities (changeability, innovativeness, flexibility, collaboration, visibility, and sensing) of SCR to companies' general objectives (survivability, sustainability, and robustness) and depicts organizational structure and processes as enabling factors.

Kamalahmadi and Parast (2016), based on a literature review of enterprise and SCR, presented a framework for the principles of SCR.

Thomé et al. (2016) contributed to this field by shedding light on the similarities and contrasts between SC management and project management related concepts and offering a synthesis framework that outlines the relationships among the constructs of complexity, uncertainty, risks and resilience.

Wedawatta and Ingirige (2016) highlighted that SMEs form a significant portion of many economies and are among the most vulnerable companies to the impact of extreme weather events. Accordingly, based on the findings of two in-depth case studies of construction SMEs, the authors developed a framework to represent the extreme weather event resilience of construction SMEs, where resilience was seen as a collective effect of the vulnerability, coping strategies, and coping capacities of SMEs, characteristics of the extreme weather event and the wider economic climate. We decided to report this paper in this section due to the particular focus of the study on SMEs.

Finally, most recent conceptual frameworks in this field have been developed to further understand SCR and identify SCR measures and assessment techniques (Kochan and Nowicki, 2018).

3.6 – *Implementing business continuity management to improve enterprise resilience*

The risk of disruptive events encourages organizations to design and implement their own customized BCM system to prepare to deal with any possible disruption (Gibb and Buchanan, 2006; Torabi et al., 2016; Torabi et al., 2014). By implementing a BCM system, suitable business continuity plans (BCPs) are provided to respond to possible incidents that could damage the organization's resources (Torabi et al., 2016; Torabi et al., 2014). BCM is a risk management system that enables organizations to improve their organizational resilience level.

The conceptual frameworks proposed under this topic aim to support enterprises in designing, implementing and monitoring a BCM programme to manage and assess risks (Gibb

and Buchanan, 2006). The frameworks include different steps (i.e., identifying, analysing, evaluating, and responding to risks) (Torabi et al., 2016).

3.7 – Business Model Innovation (BMI), sustainability and resilience

BMI is based on the premise that firms can innovate by leveraging their internal capabilities and resources (Amit and Zott, 2010). In the context of environmental changes, the innovation of a business model can be an effective response to improve an organization's resilience since an organization's business models might be victim to a shelf life due to technological advancements (Chesbrough, 2010). BMI involves fulfilling unmet customer needs or attracting new customer groups.

The conceptual frameworks developed under this topic demonstrate the key attributes that are essential to developing organizational resilience to facilitate an organization's prompt and effective transformation to cope with new conditions (Dervitsiotis, 2003).

Conceptual frameworks are also provided to illustrate the linkage between the concepts of BMI and organizational sustainability (Carayannis et al., 2014; Winnard et al., 2014; Buliga et al., 2016). Innovation and organizational design along with enterprise excellence form and enhance a firm's organizational intelligence, leading to robust competitiveness and sustainable entrepreneurship.

The latter also advances organizational resilience. Indeed, one source of unpredictability is the unsustainability of commerce's environmental, economic or social impacts and the limitations this places on businesses.

Most recent studies have proposed conceptual frameworks designed to improve business sustainability. Golicic et al. (2017) suggest that the development of business resilience is achieved through innovation and experimentation, obtaining resources/developing capabilities and relying on SC connections.

3.8 – *Conceptual frameworks for assessing and improving the resilience of enterprises in the face of weather events and climate changes*

One of the major consequences of human-induced climate change and global warming is a greater occurrence of extreme weather events with potentially catastrophic effects for organizations, enterprises, industries, and society (Linnenluecke and Griffiths, 2010).

An extreme weather event might cause damage to organizations, such as high economic loss consequences and/or losses of human life (Linnenluecke and Griffiths, 2010).

Discussions on organizational adaptation need to be broadened, and new conceptual and practical approaches are needed to incorporate the effects of climate change and a greater occurrence of weather extremes into corporate strategy and decision making (Linnenluecke and Griffiths, 2010). Starting from this concept, some authors have developed resilience frameworks that provide insights into dealing with new types of environmental change (Becken, 2013; Linnenluecke and Griffiths, 2010; Linnenluecke et al., 2012).

In particular, Linnenluecke and Griffiths (2010) suggested that anticipated changes in climate and weather patterns put great pressure on business organizations to strengthen their capacity not only for adaptation but also for resilience—that is, their capacity to absorb the impact and recover from drastic environmental change associated with weather extremes. In their framework, the authors propose the application of the adaptive cycle to organizations.

According to the adaptive cycle, organizations repeatedly pass through four characteristic phases: growth and exploitation, conservation, collapse or release, and renewal and reorganization.

The growth and exploitation and conservation phases can be understood as management approaches under relatively stable natural environmental conditions.

During the phase of collapse or release, a rapid change due to a major perturbation appears. Finally, during the phase of reorganization, novelty, new policies and ideas can arise.

According to this view, organizational resilience is defined by the amount of disturbance the organization can absorb before it loses its structure and function.

Linnenluecke et al. (2012) proposed a conceptual framework for studying organizational adaptation and resilience based on the literature reviewed. The authors identify different resilience phases:

1) *Anticipatory adaption*: Organizational actors can initiate anticipatory adaptation when they become aware that their organization may become exposed to a future extreme event. In this sense, the authors argue that anticipatory adaptation to extreme weather events contributes to building organizational resilience if it creates resources and capabilities that allow an organization to be more resistant to or recover more quickly from the impacts of more frequent and/or severe extreme weather events.

2) *Exposure and impact resistance phase*: The organization is subject to perturbation from an extreme weather event.

3) *Recovery and restoration phase*: This phase includes the immediate disaster (i.e., short-term) response as well as the usually longer-term reconstruction phase that an organization undergoes after the initial exposure to an extreme weather event.

4) *Post-impact determination of overall resilience*: The overall degree of an organization's resilience becomes fully visible only after the organization has been exposed to an extreme weather event and has engaged in recovery attempts. Post-event resilience is expressed in terms of organizational capacity to absorb the impact and recover from the occurrence of an extreme weather event.

5) *Future adaptation*: Once an organization has survived and recovered from the impact of an extreme weather event, organizational actors can engage in activities to enhance further adaptation towards climate change and future extreme weather events. Future adaptation might be facilitated after an extreme event due to the heightened awareness of risks and a broad consensus that preventive actions are needed.

In recent studies, resilience frameworks have been developed for tourist destinations with a particular focus on climatic disturbances or stress and their impacts on tourism activity subsystems (Becken, 2013). A tourism-specific framework with eleven resilience surrogates was developed. These surrogates could serve as a basis for defining a set of indicators that allow future monitoring of resilience.

3.9 – *Conceptual frameworks for improving resilience in SMEs*

There is very limited scholarly work on resilience practices in SMEs (Kamalahmadi and Parast, 2016). Only four conceptual frameworks were found in this context.

Ates and Bititci (2011) developed a conceptual framework for the change process in SMEs to create resilience with five categories: prepare, plan, implement, embed, and review.

The findings showed that sustainability and resilience in SMEs are enhanced by (1) the ability to embrace organizational and people dimensions as well as operational aspects of change management and (2) paying attention to long-term planning and external communication to drive change proactively.

In a turbulent organizational environment, dynamic capability development is important for response activation in crises, as proposed in the conceptual framework developed by Burnard and Bhamra (2011). Attention is drawn to the implications of resilience on SMEs. The authors highlight that the lack of strategic planning, the focus on short-term benefits during the

decision-making process and the low degree of standardization and formalization within SMEs can severely limit an SME's ability to respond to disruptive events effectively.

Other factors that can cause an SME to fail are identified. These factors include insufficient issues with cash flow, inability to capture and manage innovation, lack of investment, lack of business experience, and limited external support.

In the framework of Pal et al. (2014), three vital resilience enablers have been identified: (1) leadership and top management decision-making, (2) collectiveness and sense-making, and (3) employee wellbeing.

In summary, small firms have relative advantages (over large ones) in terms of rapid decision-making, the capacity for rapid learning and rapid internal communications, making them learning-oriented to enable resilience.

The assurance of optimism among employees, establishing a clear sense of vision and ascribing sense-making yield collectiveness.

Finally, in SMEs, working together effectively across the company leads to a sense of cognitive wellbeing through alignment of the organizational values, corporate culture, shared vision and responsibilities for promoting adaptive learning capabilities.

The conceptual framework developed under this topic also provides an overview of factors that together contribute to the improvement of SMEs' resilience (Sanchis et al., 2020).

Specifically, enablers of resilience are represented by the following:

a) Assets and resourcefulness (material, financial, social, network and intangible resources): A stock of these resources can help to overcome immediate problems of disruption.

b) Dynamic competitiveness: Dynamic capability development is important for response activation in crises as a key determinant of the organizational flexibility or 'adaptive capacity' needed for developing resilience. In this regard, there are four focal categories: (1) flexibility, (2) redundancy, (3) robustness, and (4) networking.

Flexibility appears to predominantly involve rapid decision-making, rapid and effective internal communications, the capacity for fast learning and the ability to quickly adapt routines and strategies. Another mechanism for achieving resilience in firms is by building redundancy of resources, such as unused capacity and multiple sourcing.

Organizational robustness is another imperative element to achieve resilience by resisting disruptions and building reliability. Robustness organizations are able to develop internal quality control of variability and lean processes, adding a great degree of resilience through stabilized processes, reduced SC variability and low inventory levels.

Finally, organizational networking and connectivity reduce the risks of crises and result in the creation of deep interpersonal skills and relationships at the social level.

c) Learning, culture and resilience: In general, learning and cultural aspects play a pivotal role in enabling organizational resilience, perhaps to a higher degree in the case of SMEs.

3.10 – *The role of information technology in resilience improvement*

The role of information technology in assisting connectivity and collaboration is frequently recognized as contributing to resilience on all levels (Erol et al., 2010).

Information technology contributes to connecting systems, people, processes and information in a way that allows enterprises to become more responsive to the dynamics of their environment, stakeholders and competitors (Erol et al., 2010). In this context, studies provide frameworks for understanding what elements of technology work and how they can help in organizational recovery.

In particular, Chewning et al. (2013) identified three themes that involve the use of information and communication technologies (ICTs) to enact resilience: coordinating contacts, coordinating resources, and enacting work routines.

ICTs are crucial to establishing first contact as well as for maintaining an open line of communication with many stakeholders through remote connection.

The use of ICTs also allows organizations to access information and material resources, which enables organizations to begin recovery (coordinating resources).

For example, in the case of a disaster event, by connecting with other organizations via email or telephone, one organization could identify new places in which its activity could continue and coordinate the use of new facilities. ICT access is especially important to connect effectively and efficiently with business contacts, thus facilitating more efficiency and effectiveness in connections upon returning.

ICTs support organizations in enacting work routines across and accomplishing business tasks (enacting work routines). For example, the Internet or telephone can be used to conduct meetings that would have normally taken place face to face, to exchange information, or to coordinate work with colleagues. ICT can be used to sell to a customer base outside of the enterprise territory.

Finally, Doerfel et al. (2013) developed a multi-theoretical framework that shows that communication networks, relationships and networking patterns developed through ICTs can support enterprises during a disaster and facilitate speedy rebuilding in the face of recovery.

4 – Identifying resilience capabilities and corresponding strategies: the development of a new integrated resilience conceptual framework

4.1 – *Main resilience capabilities and corresponding strategies*

The scoping review conducted in this paper allowed us to identify the main resilience capabilities and corresponding strategies that enterprises should undertake to improve their resilience. All of these are described in Table 3.

Table 3. Identification of resilience capabilities and strategies in selected conceptual frameworks

Resilience capabilities	
Accepting the problem	The ability to accept a problem (Duchek, 2019).
Adaptability	This ability refers to adjustments following crises and is directed towards organizational advancement (Limnios et al., 2014; Burnard et al., 2018; Koronis and Ponis, 2018; Linnenluecke et al., 2012; Duchek, 2019; Conz and Magnani, 2019).
Agility	The capability to provide a quick organizational response when dealing with turbulences, maintaining existing organizational structures and strategies (Andersson et al., 2019; Conz and Magnani, 2019).
Anticipation capability	The ability to detect critical developments within the firm or in its environment and to adapt proactively (Duchek, 2019; Linnenluecke et al., 2012; Kamalahmadi and Parast, 2016).
Changeability	Changeability is the ability to quickly align processes on both an individual and an organizational level in the direction of an expected outcome (Ehrenhuber et al., 2015).
Collaboration	Collaboration in the context of resilience is the ability to improve internal and external communication in order to achieve fast processes and high-quality results (Ehrenhuber et al., 2015).

Coping capabilities	The overall ability to cope with unexpected events (Becken, 2015; Duchek, 2019).
Flexibility	The capability of implementing rapid decision-making processes, quick internal communication and fast learning to quickly adapt routines and strategies to changing conditions (Kantur and İşeri-Say, 2012; Chewning et al., 2013; Burnard and Bhamra, 2011; Pal et al., 2014; Conz and Magnani, 2019).
Innovativeness	Companies that wish to ensure their long-term resilience must reach beyond their own boundaries and develop an understanding of the intricate systems in which they participate and strive for continuous innovation and renewal (Ehrenhuber et al., 2015).
Observation and identification	The ability to recognize early signals of crisis to respond quickly and thus avoid escalation (Duchek, 2019).
Organizational ambidexterity	The ability of organizations to simultaneously apply the exploitation of existing business activities and the exploration of new opportunities (Limnios et al., 2014).
Organizational change capabilities	The ability to simultaneously believe in and question past experience when introducing a change in organizations (Linnenluecke et al., 2012; Duchek, 2019; Limnios et al., 2014; Xu and Kajikawa, 2018).
Positive perception	Positive perceptions and optimism are inevitable features of resilient people and organizations (Kantur and İşeri-Say, 2012).
Preference for cooperation	The mobilization of different actors to avoid undesired events (Andersson et al., 2019).
Preparation capability	For organizations, being prepared means that a firm or agency is equipped to deal with unforeseen adversity and is ready to capitalize on unexpected opportunities (Duchek, 2019; Burnard et al., 2018; Koronis and Ponis, 2018).
Redundancy	The capability to keep some resources in reserve (e.g., safety stock; backup sites) to be used in case of necessity (Conz and Magnani, 2019).
Resourcefulness	The capability to accumulate different diversified assets and resources—financial, physical, human, technological, organizational and reputational (Conz and Magnani, 2019; Pal et al., 2014).
Risk awareness	The capability of realizing one's own vulnerability and not allowing failures caused by human pride or lack of common sense (Andersson et al., 2019).
Robustness	The capability to resist shocks by preventing and reducing the effects of variables that can make a firm vulnerable in its operating environment (Conz and Magnani, 2019).
Sense of reality	The ability to accept the reality and vulnerabilities of enterprise (Kantur and İşeri-Say, 2012).
Sensing	The skill of managing good forecasts and realizing processes ahead of time (Ehrenhuber et al., 2015).
Tolerance	Flexibility and ability to change also necessitate tolerance for ambiguity by organizational members (Kantur and İşeri-Say, 2012).
Transparency/visibility	The ability to build transparent structures and processes to identify needs and disruptions quickly and to be able to implement changes in an effective manner (Ehrenhuber et al., 2015).

Resilience strategies	
Building partnerships and knowledge integration	Building partnerships and knowledge integration allow risks to be shared and spread across organizations in case of crisis (Linnenluecke and Griffiths, 2010).
Continuous communication	An important factor for coordination in complex systems that are subject to an imminent crisis (Kantur and İşeri-Say, 2012; Scholten et al., 2014; Faisal et al., 2007).
Development and implementation of solutions	Coping with unexpected events implies the development and implementation of solutions; when a crisis occurs, organizations must put their crisis plans into action and develop ad hoc solutions (Duchek, 2019; Kamalahmadi and Parast, 2016).
Development of a BCM programme	Developing a BCP involves identifying and managing the risks that threaten to disrupt essential processes and associated services and mitigating the effects of these risks. It also includes strategies that ensure that the recovery of a process or service is achievable without significant disruption to the enterprise (Gibb and Buchanan, 2006).
Development of focused strategy	In times of change and crisis, the organizational environment is characterized by ambiguity and uncertainty, which increases the need for planned and focused strategies (Kantur and İşeri-Say, 2012).
Effective coordination	Organizational units must be coordinated with the corporate objectives and strategy (Kantur and İşeri-Say, 2012).
Employee involvement	Employee involvement is part of organizational strategies to deal with unexpected events (Kantur and İşeri-Say, 2012; Scholten et al., 2014).
Power and responsibility	Power and responsibility play an important role: cognitive processes, learning, and capabilities in organizations are associated with power relationships (Duchek, 2019). With the endeavour to achieve their goals, powerful actors can foster as well hinder organizational learning or change processes. They have an impact on the use of new knowledge and solutions via resource allocation processes (Duchek, 2019).
Resource availability	Providing adequate resources (financial, material, social and network resources) that employees can access to turn adversity into an organizational opportunity (Duchek, 2019; Pal et al., 2014).

The main resilience capabilities and strategies discussed in the selected conceptual frameworks are reorganized in a new integrated conceptual framework.

Specifically, the research methodology used to develop this new integrated resilience framework consists of three main phases based on the three main elements of the framework: (1) identification of resilience capabilities, (2) identification of resilience strategies, and (3) resilience objectives.

The framework aims to support enterprises in the development and improvement of resilience (Figure 3). The starting point is set by the consideration of different phases of a crisis: from prevention to the first signals of a crisis up to the actual existence of a crisis. Finally, the recovery phase at the end of the crisis and the return to a new planning phase are also considered. In the following subsections, we describe the suggested resilience capabilities and corresponding strategies illustrated in the proposed framework for each phase of a crisis.

4.2 – *Prevention phase*

Prevention is the phase in which no crisis has yet occurred, and there are no signals of disturbance. However, since a crisis does not announce its arrival, a company must consider the

need to adopt and implement some preventive measures. In summary, resilience needs to be planned before systems are damaged and undesired consequences occur.

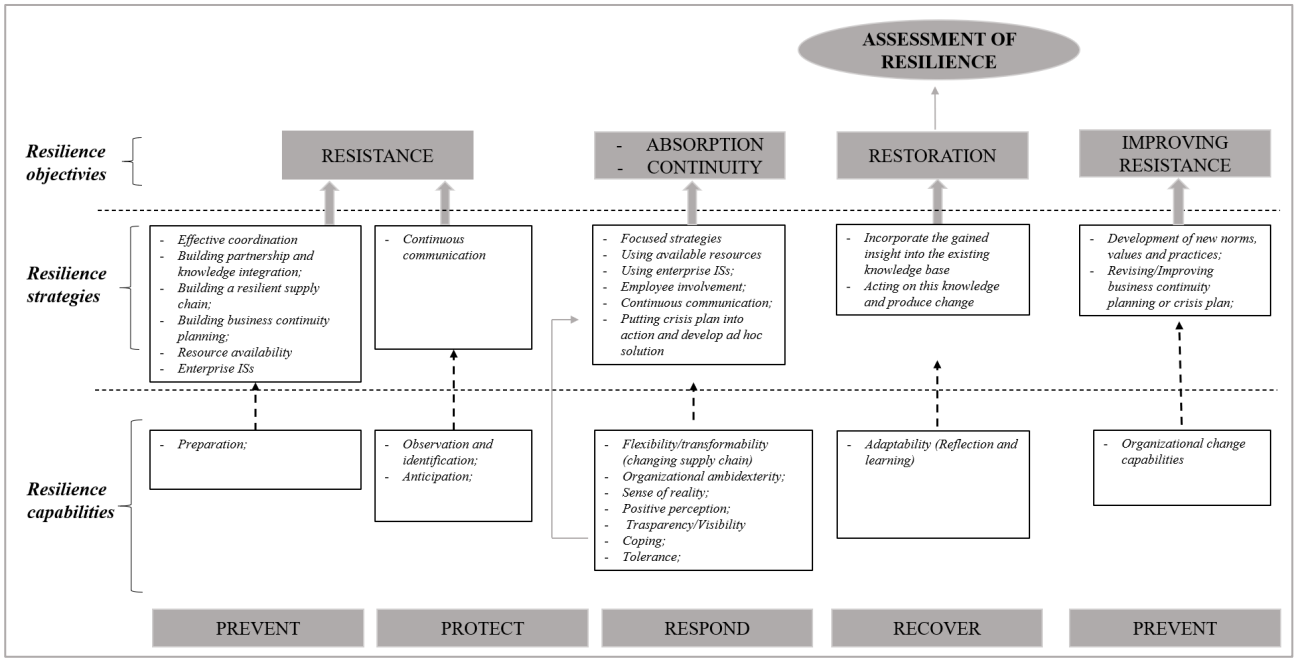

Figure 3 – *Building and improving resilience: a new integrated framework* (*Source:* Autors' elaboration)

According to this, *preparation* is the first important *capability* for developing a resilient organization (Duchek, 2019). For enterprises, being prepared means that a firm is equipped to deal with unforeseen adversity and is ready to capitalize on unexpected opportunities (Burnard et al., 2018; Duchek, 2019).

From a practical point of view, preparation capability results in different strategies:

a) *Effective coordination:* Organizational units must be coordinated with corporate objectives and strategy. This allows us to support the organizational environment: in chaotic times, organizations will face an urgent need for change, and the presence of effective coordination will reduce the level of anxiety among employees (Kantur and İşeri-Say, 2012).

b) *Building partnerships and knowledge integration* allows risks to be shared and spread across organizations in times of crisis. For example, an event such as an epidemic requires the closure of the activity within the territory in which it spreads. If the company has a second location in a territory where the epidemic does not spread, the impact of the event is reduced (Linnenluecke and Griffiths, 2010).

c) Building a resilient SC: SC and operation managers should anticipate the occurrence of disruptions and prepare their SCs for any expected and unexpected changes in the environment (Kamalahmadi and Parast, 2016). Resilient SCs are able to absorb disruptions and quickly return to stable conditions (Sheffi and Rice, 2005), which could give companies a unique competitive advantage. Indeed, each company is a citizen of its SC since it depends on the web of suppliers, dealers, and many others to obtain its input resources and distribute its products to customers (Sheffi and Rice, 2005). Thus, developing a resilient SC in a phase of prevention contributes to avoiding possible customer disruptions in the presence of unexpected events that potentially threaten business continuity.

Many studies in this context have suggested different strategies to develop a resilient SC (Pitt and Goyal, 2004). Among these, two specific strategies are highlighted in this framework. First, enterprises should consider the need to stock some critical components of the productive process to ensure that the SC can continue to function smoothly when facing a disruption in

supply. Another suggestion involves the creation of a flexible supply base (sourcing from multiple suppliers). Although sourcing from a single supplier enables a firm to reduce cost, it could create problems for managing major disruptions. For example, a flexible supply base with the presence of suppliers in different countries enables a firm to maintain a continuous supply of materials when a major disruption occurs in a particular country.

d) *Development of a business continuity planning:* The inevitability of crises within the business environment suggests that all organizations should develop a BCP, through a holistic, integrated approach (Pitt and Goyal, 2004). The BCP is a security plan for a company to continue its activity if a catastrophic event occurs. It refers to unexpected external events that must be dealt with in a preventive way. A catastrophic external event compromises the integrity of a company. In this context, the BCP contains the actions to be undertaken. These actions must be planned before the event occurs, when it is still possible to think, meditate on the procedures and build an efficient plan that allows the company to absorb the event, resume and restore a level of activity following an interruption.

d) Resource availability: As a pre-event measure, for the organization to withstand the challenges of a crisis or a chaotic business situation, there must be adequate resources (financial, material, social and network resources) that employees can access to turn adversity into an organizational opportunity (Duchek, 2019).

In this framework, we consider financial resources (low levels of debt and high levels of cash on hand) a key tool that can serve as a buffer or shock absorber and thus contain the negative consequences of a crisis (Pal et al., 2014).

In times of crisis, financial resources allow staff to be retained (instead of laying off staff) and thus to recover human resources.

In sum, enterprises need a cushion of spare resources that can be flexibly used (Duchek, 2019).

Material resources and assets, such as a stock of raw materials, work in progress or finished goods as inventory, used strategically can help to overcome immediate problems of disruption.

Social resources refer to human resources or people with requisite skills. These are emphasized as a critical contributor to superior organizational performance. Teamwork and enhanced trust among employees are essential to distinguish organizations with the potential to bounce back from plausible disruptions by their ability to develop an internal risk management culture and collaborate and communicate proactively (Sheffi, 2007).

Finally, network resources refer to collaborative interorganizational relationships through mergers and acquisitions, strategic alliances, or outsourcing. These help to transfer and exchange knowledge resources and relationships (Lippman and Rumelt, 2003). This allows us to reduce and spread risks and manage market turbulence through appropriate strategies, enterprise culture and relationships (Sheffi, 2007). Networked organizational structures offer greater agility and adaptability by maintaining countless secured relationships with quality stakeholders (suppliers, customers, financers, etc.) (Leiblein, 2011).

Such strategic choices yield the fullest utilization of slack resources, sharing risks and providing financial reserves and bargaining power to firms for organizational growth (Pal et al., 2014).

e) Development of effective enterprise information systems and applications. The term enterprise information systems refers to the enterprise-wide information systems and applications that support the business functions, processes, operations, and services of the enterprise (Erol et al., 2009).

The effective use of enterprise systems can provide timely information and warning signals, fostering decision-making abilities that result in increased flexibility, agility, and adaptability, all of which support attributes of resilience.

The term enterprise information systems also refers to information and communication technologies (ICTs). In this case, ICTs are valid support for business continuity in a time of crisis (Chewning et al., 2013). In the context of one emergency that implies a lockdown of activities (e.g., the COVID-19 emergency), information systems allow the business activities to continue. For example, if the activity allows, it is possible to use these systems to receive orders with home delivery. In any case, the designed information systems must be prepared to allow the maintenance of contacts with customers and suppliers. Moreover, ICTs such as social networks can be used to develop relationships and networking patterns in the pre-disaster phase. These ICTs play a vital role in post-disaster rebuilding (Doerfel et al., 2013).

4.3 – *Protection phase*

Protection addresses the first visible signal of a crisis. The full impact of a change or crisis is not visible. At this stage, it is important for enterprises to anticipate the response to the crisis, observe the first signal and identify the possible reasons.

In this phase, resilience results in two capabilities:

a) *Observation and identification*: Researchers agree that these capabilities are important for resilience. They argue that organizations must recognize the early signals of crisis to respond quickly and thus avoid escalation. In practice, observation and identification capabilities help firms see and react to changes before their full impact becomes visible (Duchel, 2019).

b) Accordingly, *anticipation capabilities* refer to the ability to detect critical developments within the firm or in its environment and to adapt proactively.

In summary, these abilities refer to enterprises that are able to see the unexpected more quickly than others; these enterprises are able to immediately react while others "wait and see" (Duchel, 2019; Linnenluecke et al., 2012).

In terms of strategies, *continuous communication* is an essential component to increase organizational resilience from different points of view. It allows employees to improve their involvement and enhances the quality of interaction in the process of empowerment (Kantur and İşeri-Say, 2012). Continuous communication is also an important factor for coordination in complex systems that are subject to an imminent crisis. Finally, ongoing and effective communications create knowledge and build trust.

Prevention and protection strategies aim to improve enterprise *resistance*. Resistance is accomplished when the threat or hazard damage potential is limited through containment, avoidance, or neutralization efforts.

In this case, the actual amount of damage is constrained to the greatest extent feasible. The entire system experiences less damage than would otherwise be the case.

4.4 – *Response phase*

Different capabilities and strategies are needed to enable an efficient and effective response to a crisis.

First, if disruptions occur, companies need to react and change strategies and processes to satisfy customer needs (Koronis and Ponis, 2018). Organizations need to be *flexible* to survive under conditions of change (Kantur and İşeri-Say, 2012). Flexibility refers to the ability to quickly change how inputs are acquired or how outputs are delivered (*changing supply chain*). The capability to design products that allow more flexibility in supply and manufacturing is one of the essential resilience capabilities for company success (Kantur and İşeri-Say, 2012; Ehrenhuber et al., 2015; Xu and Kajikawa, 2018).

Organizational ambidexterity refers to the ability of organizations to simultaneously apply the exploitation of existing business activities and the exploration of new opportunities, fostering

organizational resilience (Limnios et al., 2014). Superior performance is expected by these organizations.

Sense of reality: The perception of reality is important for the organization to recognize its own strengths, weaknesses and vulnerabilities and take appropriate actions. Accepting vulnerabilities is also a crucial strategy in fostering resilience within organizations because it helps leaders accept the organization's limitations and identify possible internal and external sources to complement these limitations. The acknowledgement of a realistic self-image of the organization and its vulnerabilities is an important component of the perceptual stance that leads to resilience (Kantur and İşeri-Say, 2012).

Positive perception: Positive perceptions and optimism are inevitable features of resilient people and organizations (Kantur and İşeri-Say, 2012).

Transparency refers to the ability to build transparent structures and processes to identify needs and disruptions quickly and to be able to implement changes in an effective manner (Ehrenhuber et al., 2015).

Coping ability is closely related to crisis (incident) management (Jaques, 2007). Coping with unexpected events starts with accepting the problem. Organizations need to develop the ability to accept a problem; only then can they face critical situations and react quickly. Coping with unexpected events also results in the development and implementation of solutions. When a crisis occurs, organizations must put their crisis plans into action and develop ad hoc solutions (Pearson and Clair, 1998; Duchek, 2019).

Finally, in times of crisis under uncertainty and ambiguity, *tolerance* for ambiguity by organizational members is a necessary ability to avoid panic and increase the opportunity to generate creative solutions (Kantur and İşeri-Say, 2012).

In terms of resilience strategies, in times of change and crisis, the organizational environment is characterized by ambiguity and uncertainty, which increases the need for planned and *focused strategies* (Kantur and İşeri-Say, 2012).

There will undoubtedly be changes in previously developed strategies according to contingencies; however, the existence of a focused strategy will provide direction and serve as an anchor in times of uncertainty and chaos (Kantur and İşeri-Say, 2012).

Resources set aside before a crisis can serve as a buffer or shock absorber at this stage and thus contain the negative consequences of a crisis (Pal et al., 2014) and can help to handle and recover from acute crises (Lampel et al., 2014).

Moreover, in times of stressful and turbulent conditions, organizations need to adopt adaptive behaviours at various levels in a timely manner. In this context, *employee involvement* is part of organizational strategies to address unexpected events. It is a tool for promoting resilience at the individual level to facilitate organizational adaptation in changing environments (Kantur and İşeri-Say, 2012).

Empowered employees will engage in decision-making processes and be able to generate creative solutions with enhanced authority and ability.

Continuous communication is also an essential component in this phase. In times of crisis, continuous communication enables organizational members to share information and be informed about each other's activities and therefore act appropriately (Kantur and İşeri-Say, 2012).

Resilience capabilities and strategies in this phase allow for the improved absorption of disruptive events to support business continuity.

4.5 – *Recovery phase*

The recovery phase includes the immediate disaster (i.e., short-term) response as well as the usually longer-term reconstruction phase that an organization undergoes after the initial exposure to an extreme weather event (Xu and Kajikawa, 2018).

Adaptation capabilities are the main ability during the recovery phase (Linnenluecke et al., 2012; Duchek, 2019; Limnios et al., 2014; Xu and Kajikawa, 2018). This refers to adjustments following crises and is directed towards organizational advancement (Limnios et al., 2014).

Adaptation includes two types of capabilities: *reflection* and *learning*.

"Reflection is the process of stepping back from an experience to ponder, carefully and persistently, its meaning to the self through the development of inferences; learning is the creation of meaning from past or current events that serves as a guide for future behavior" (Daudelin and Hall, 1997; p. 39). In particular, learning implies the discussion of errors or unexpected outcomes of actions. Linnenluecke and Griffiths (2010) emphasize the importance of learning. Experience with disruptive extreme events must become residual memory within organizations to improve the organizations' resilience. These capabilities result in the incorporation of the obtained insight into the existing knowledge base (resilience strategy). Additionally, organizations must be able to act on this knowledge and produce change (resilience strategy) (Edmondson, 2002).

Organizational resilience during this phase aims to restore the organization to the same level (referring to the same state of the organization as prior to exposure to the crisis) or to a different level (referring to a different state of the organization, either due to improvement or failure to restore parts of the organization or its functionality) (Weick et al., 2005).

At the end of this phase, it is possible to evaluate the overall resilience of enterprises. Indeed, the overall degree of an organization's resilience becomes fully visible only after the organization has been exposed to an extreme event and has engaged in recovery attempts.

Specifically, overall and post-event resilience are evaluated in terms of enterprises' capacity to absorb the impact and recover from the occurrence of an extreme event (Linnenluecke et al., 2012).

4.6 – *The new phase of prevention*

Once an organization has survived and recovered from the impact of an extreme event, organizational actors can engage in activities to enhance further adaptation and prevention towards future extreme events (Linnenluecke et al., 2012). The end of a crisis does not imply that it will never happen again. A new phase of prevention is undertaken based on past experience. The best strategy is to learn from past experience and plan a new prevention phase that is even more efficient.

Organizations must be able to believe in and question their past experience and to introduce different organizational changes (Linnenluecke et al., 2012). Overall change can only be achieved by higher-level learning, which results in the development of new norms, values, and practices (Linnenluecke et al., 2012; Duchek, 2019; Limnios et al., 2014; Xu and Kajikawa, 2018). Additionally, according to past experience, the BCP must be revised to improve enterprise resistance.

5 – Discussion, conclusions and limitations

This systematic scoping review presents, to our knowledge, the most comprehensive overview of conceptual frameworks relating to the development and improvement of resilience in enterprises.

Fifty-seven conceptual frameworks met our inclusion criteria. Papers were classified according to the topics investigated, which showed that most studies are focused on strategies that could contribute to improving the resilience of the SC. This is not surprising given that a company's resilience is a function of its competitive position and the responsiveness of its SC: each company is a citizen of its SC since it depends on the web of suppliers, dealers and many others to obtain its input resources and distribute its products to customers (Sheffi and Rice, 2005).

Our search provides contributions for both research and practice.

In particular, the review of conceptual frameworks and the new integrated framework developed in this paper can help guide enterprise managers to understand the main elements that can guide the development of resilience.

Indeed, the final output of this systematic search is a synthesis that is useful for understanding the main resilience capabilities and strategies observed and considered in the previous conceptual frameworks while reorganizing them in a new integrated conceptual framework. The framework aims to support enterprises in the development and improvement of resilience considering different capabilities and corresponding strategies for each phase of a crisis (from prevention to recovery to the planning of a new prevention phase). For researchers, we provide an overview of conceptual frameworks that were published in scientific journals to support the development and improvement of resilience in enterprises.

While this systematic scoping review aimed to be rigorous, our results may be affected by some limitations. First, only papers published in the English language were reviewed; data published in other languages were automatically excluded from this study. Our inability to systematically review literature in other languages may be considered a weakness. Although we intended to review the non-English literature, professional language translation services proved prohibitively expensive. The selection process was necessarily limited to publicly available papers in scientific journals, and the study was thus potentially subject to publication bias (Hopewell et al., 2005). Finally, considering the consequences of the recent COVID-19 health emergency and the effect of lockdown on enterprises, the number of studies that seek to improve enterprise resilience will increase rapidly. It is highly probable that this systematic scoping review does not consider an important number of studies that are currently under review in scientific journals. Future research that includes these studies are necessary. This systematic review could provide a starting point for further investigation of resilience in business studies.

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