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Brilliance in resilience: operations and supply chain management's role in achieving a sustainable future

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**Brilliance in resilience: operations and supply chain
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BRILLIANCE IN RESILIENCE:

OPERATIONS AND SUPPLY CHAIN MANAGEMENT’S ROLE IN ACHIEVING A SUSTAINABLE FUTURE

Abstract

Purpose: The purpose of this article is to discuss how the mastery of resilience in operations and supply chains plays a significant role in the transition to a more sustainable future. Furthermore, it is supposed to propose avenues for future research on operational and supply chain resilience, interacting with the sustainability literature in our field.

Design/methodology/approach: A conceptual review of resilience and sustainability themes within operations and supply chain management research is conducted. Reflections on the topic are informed by relevant literature published over the last decade.

Findings: The major conceptual contributions are threefold: i) This article elaborates on the understanding of operational resilience and supply chain resilience concepts and reviews their respective primary research streams. ii) It proposes resilience as the missing element in the pursuit of excellence in organizations that want to contribute to a more sustainable future. iii) The article offers a research framework that provides a future research agenda at the intersection of resilience and sustainability in operations and supply chain management research.

Originality: The article highlights gaps in current research and illustrates further areas of research that need to be addressed to maximize the contribution of operations and supply chain management research in supporting practitioners to achieve a more sustainable future.

Keywords: Operations management; operations excellence; operational resilience; supply chain management; supply chain resilience, sustainability.

1 | The impetus for investigating resilience.

This conceptual article is based on the 29th EurOMA conference organized by the University of Sussex Business School from 1-6 July 2022 in Berlin, Germany. The theme of the conference (as well as this paper) was “*Brilliance in resilience: operations and supply chain management’s role in achieving a sustainable future*”. This title emphasizes the connection between resilience and excellence in operations and supply chain management (OSCM) and highlights them as a joint route towards sustainability. Given current OSCM challenges, such as disruptions caused by the COVID-19 pandemic (Schleper et al., 2021), the Ukraine-Russia war (Srai et al., 2023), geopolitical tensions (Bednarski et al., 2023), or the ongoing climate crisis (Ghadge et al., 2020), OSCM scholars and practitioners are particularly well placed to answer the call to help businesses, policymakers, and other stakeholders to excel and build resilience to manage disruption risks and achieve a sustainable future at the same time. By reflecting on the EurOMA 2022 theme and unpacking its key meanings, this article seeks to elaborate on a better conceptualization of resilience and sustainability as well as their interplay. More specifically, we take stock of the OSCM literature on resilience and sustainability themes over the last decade and identify important avenues for future research in our domain.

From an etymological perspective, the word ‘brilliance’ describes the quality or state of being brilliant and the latter derives from the Latin, French, and Italian root for ‘sparkling’ and ‘shining’ (Merriam-Webster, 2023a). Its figurative meaning dates to the 18th century and refers to “*unusual mental keenness or alertness*” (Merriam-Webster, 2023a) or “*excellence or distinction in physical or mental ability*” (Collins, 2023). Achieving excellence or distinctiveness in their operations and supply chains is an important goal of organizations. It is widely recognized that developing excellent and distinctive operations and supply chains is a fundamental source of competitive advantage (Slack and Lewis, 2002; Li et al., 2006). Substantial progress has been made in academia in understanding the role of excellent practice in achieving a competitive advantage. For instance, pathways towards excellence in OSCM are constructed by acting on one or several of the following organizational elements: information and data analytics, strategic planning, leadership, human resource development, and process management (Ou et al., 2010; Vivares-Vergara et al., 2016; Raharjo and Eriksson, 2017; Fosso Wamba and Akter, 2019; Mokhatar et al., 2019). Excellence can be defined by the visibility, coordination, and reliable processes that link supply management (i.e., supply planning, sourcing, manufacturing/service provision, in- and outbound logistics), demand management (i.e., demand planning, marketing, sales, and service), and product management (i.e., R&D, engineering, and product development) (Hofman et al., 2013). Organizations’ decision to undertake a specific pathway or practice may depend on internal and external factors that shape their operational and

competitive environments and influence their choice of strategic priorities and goals. Changes in the environment may prompt a revision, adaptation or complete shift of their chosen pathway or practice with respect to some elements while others may remain unchanged. Building best-value supply chains on agility, adaptability, and alignment is considered a strategic means of achieving excellence in performance regardless of changes in the business environment (Li et al., 2015).

In this article, we argue that resilience presents the missing element in the search for excellence and distinctiveness in operations and supply chains under the current operating environment. Furthermore, based on relevant literature and considering the main questions derived from the EurOMA 2022 conference, we claim that brilliant OSCM approaches based on resilience-oriented strategies support the transition to a more sustainable future. The main contribution of this article is to develop a conceptual framework that encompasses brilliant resilience strategies, brilliant OSCM practices, as well as sustainability outcomes. This framework synthesizes previous research and highlights a wide range of future research opportunities, providing a foundation for an accumulation of knowledge and understanding of how OSCM research can contribute to the quest for a sustainable future.

The remainder of the article is organized as follows: The next section reviews resilience strategies and their relationship to a sustainable future. Section 3 presents the development of the conceptual framework and discusses it in the context of the conference theme, along with suggestions for further research. Section 4 concludes this article.

2 | The status quo

2.1 What we know about organizational resilience

The Merriam-Webster dictionary offers two definitions of resilience; one based on physics, i.e., “the capability of a strained body to recover its size and shape after deformation caused especially by compressive stress” (Merriam-Webster, 2023b), and another one referring to emotional resilience, i.e., “an ability to recover from or adjust easily to misfortune or change” (Merriam-Webster, 2023b). The management research literature often refers to another definition rooted in ecology, referring to the ideas of “recovering” and “getting back into the same previous shape”. Such an understanding of resilience describes an ecosystem’s main resilience feature as the ability to ‘bounce back’ (Holling, 1996; Wieland et al., 2023) and return to its original state after being disturbed.

Thinking on organizations and their supply chains as the ‘strained body’ and the ‘ecosystem’, we can understand resilience as returning to the previous organizational or network structure and size, and the previous state of operating conditions, by means of recovery or adjustment. Most organizational and supply chain resilience (SCRES) definitions revolve around similar concepts of adaptability, ability to cope, or ability to reconfigure (Hillmann and Guenther, 2021) and the actions

of preparation, response, and recovery (Han et al, 2020), respectively. However, a uniform definition has not yet been found (Hohenstein et al. 2015; Essuman et al., 2020; Han et al., 2020).

The conceptualization and operationalization of organizational resilience has developed for more than 40 years across different research fields spanning from natural, applied sciences, engineering, economic geography, strategy, and operations management (Annarelli and Nonino, 2016). Organizational and management research have been mainly interested in understanding how and why some organizations are more resilient than others in the face of adversity (Williams et al., 2017), with studies usually focusing on one level of analysis and within specific discipline boundaries (Frigotto et al., 2022). Organizational resilience refers to “*the organization’s ability to absorb strain and preserve or improve functioning despite the presence of adversity*” (Sutcliffe and Vogus, 2003, cited in Kahn et al. 2017). This definition considers resilience as a process to achieve a resilient outcome while others argue it should be considered a capacity or capability in organizations (Hillmann and Guenther, 2021). One example of the latter is the definition proposed by Burnard and Bhamra (2011) of resilience as inherent and adaptive set of qualities and capabilities of organizational systems enabling their adaptive capacity during turbulent times.

A recent review defined three forms of organizational resilience (Hepfer and Lawrence, 2022): *strategic resilience* (i.e., the ability of an organization to anticipate and respond to threats to its strategy, and especially its long-term goals), *operational resilience* (i.e., the ability of an organization to respond positively to adversity that affects the organization as-a-whole, potentially threatening its ability to continue operating), and *functional resilience* (i.e., the ability of a specific organizational function or system to respond positively to adversity). This conceptualization of resilience according to these three forms seems to improve conceptual clarity to understand relations and potential synergies between anticipation and responses to disruptions or adversities impacting different organizational levels. It also addresses critiques of previous studies that solely consider the organization-as-a-whole as the primary actor when dealing with adversity (Kahn et al., 2017). Hepfer and Lawrence (2022) state that each form has distinctive foundations and dynamics, and therefore a specific disruption or adversity might pose a specific type of threat – operational, functional, or strategic – within an organization without a scaling effect affecting the other forms of resilience. However, they also recognize a degree of interdependence or a cascading effect, where adversity impacting one of the forms can trigger the need for the other forms of resilience. This could happen when one resilience form sustained an intense period of accumulated disruption or adversities, or when it fails to act adequately to address the disruption or adversity.

Strategic resilience as defined by Hepfer and Lawrence (2022) encompasses works on strategic aspects of organizations related to achieving their long-term objectives and survival. This form of

resilience addresses both discrete disruptive events as well as evolving threats to organizations' business models, e.g., technology breakthroughs, changes in customers' needs and demand. To some extent, strategic risks, those that organizations are willing to accept to generate higher returns from their strategy (Kaplan and Mikes, 2012), could also be triggers of strategic resilience actions to prepare and manage these risks in case of eventual risk materialization. These risks are generally known to the organizations in advance and are discussed as part of the strategic planning process (Kaplan and Mikes, 2012). Triggers from the business environment and from organizations' striving for competitive advantages are often associated with the concept of strategic flexibility. Strategic flexibility has been defined as the ability of a firm to reallocate and reconfigure its organizational resources, processes, and strategies towards two aspects: resource flexibility, i.e., product range that can effectively develop, manufacture, distribute or market, and coordination flexibility, i.e., integration of subdivided functions and reconfiguration of existing organizational routines (Sanchez, 1995).

Several mechanisms and processes have been proposed to achieve strategic flexibility, such as anticipation of scenarios, formulation of strategies for each one, and preparation of required resources (Raynor and Leroux, 2004), identification of strategic flexibility points within strategic planning processes routines (Kouropalatis et al., 2012), and identification of strategic options related to acquired and deployed resources (Johnson et al., 2003). Moreover, strategic flexibility is only practiced at an organization's strategic level and strategic options can emerge from different organizational levels, managerial practices, and strategies (Brozovic, 2018). There is therefore scope for contributions on this aspect of organizational resilience from the perspective of operations management and operations strategy. Examples of previous studies linking operations management and strategic flexibility are provided by Zhou and Wu (2010) who investigate the influence of strategic flexibility on the effect of technological capability on exploration in the context of product innovation management and Kortmann et al. (2014) who analyze the relationship between strategic flexibility and operational efficiency via mass customization capability and innovative ambidexterity. According to Kim et al. (2014), action plans in operations strategy are a result of both top-down planning to achieve competitive priorities and objectives, and of bottom-up learning from operational practices and processes. Through these links to strategic flexibility, operations management research can make further contributions to the understanding and development of strategic resilience.

The concept of strategic flexibility has evolved from early conceptualizations as a responsive ability to a more proactive view as a means to model, shape, and transform an organization's environment (Brozovic, 2018). In this line, Sonenshein and Nault (2023) investigate how organizations employ resourcefulness to act resiliently time. Through inductive empirical research, their study identifies two types of resourcefulness: *promotive resourcefulness*, i.e., actions enabling opportunities

from adversity by repurposing resources, and *preventive resourcefulness*, i.e., actions focusing on survival by enacting financial austerity and stabilizing operations with minimum resources. Promotive resourcefulness led to major organizational transformation and emerging stronger from the crisis. Their study also shows that financial, emotional, and operational adjustments can drive a shift from preventative to promotive resourcefulness. They emphasize the importance of redeploying and reconfiguring resources within organizations to achieve resilient outcomes over time, which is consistently omitted in the OSCM literature.

Operational resilience appears to be the least developed of these three forms of organizational resilience and has received less attention in management and organizational research. It has been studied in more detail in systems and management engineering research, with a focus on systems and infrastructure resilience, including the resilience of railroads and road transportation. Essuman et al. (2020) argue that knowledge on operational resilience in management research is limited, as most research focuses on the firm and supply chain network level. An adversity triggering operational resilience actions is one that would paralyse multiple organisational functions affecting the organisations' day-to-day operations and its ability to continue operating (Hepfer and Lawrence, 2022). As an illustrative and prominent example, Hepfer and Lawrence (2022) describe Meyer's (1982) study on hospitals adaptation to a doctors' strike which provided insights on how organizations respond to environmental jolts (e.g., using diversification and slack to mitigate impacts and on the role of ideologies and structural constraints in shaping responses).

Operational resilience is triggered by endogenous and exogenous forms of adversity, although the former has been a prominent line of research (Hepfer and Lawrence, 2022). Examples of causes of endogenous adversity are internal risks comprising unauthorized, illegal, unethical, incorrect, or inappropriate actions by employees and breakdowns in routine operational processes (Kaplan and Mikes, 2012). Some of these risks, if materialized, may first require functional resilience actions, and could also evolve into a larger disruption affecting the operational ability of the organization-as-a-whole. For example, product adulteration or machine damage caused by dishonest employees, which can disrupt the entire production and delivery system (Tukamuhabwa et al., 2017). These types of adversity are also examined as part of the work on operational resilience (Hepfer and Lawrence, 2022). Causes of exogenous adversity are external disruptive events outside the control and boundaries of the organization, e.g., natural disaster or the financial crisis. Kaplan and Mikes (2012) suggest internal risks should be managed through active prevention, i.e., monitoring operational processes and guiding to employees' behaviors and decisions toward desired norms, whereas external risks should be managed by identifying risks and mitigating their effects, as preventing them is outside companies' influence or control. To expand knowledge of operational resilience from an OSCM perspective,

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interdisciplinary collaboration is required to take stock of the work carried out in the areas of systems and management engineering. Further research could deepen the understanding of responses and preparedness levels associated to endogenous and exogenous disruptions affecting organizational operability.

Functional resilience focuses on a specific organizational function or system with research mostly covering discrete disruptions to supply chains and information systems (Hepfer and Lawrence, 2022). Indeed, since the early 2000s, the research interest in SCRES has increased due to major disruptions (Hohenstein et al., 2015) caused by the 9/11 attacks, hurricane Katrina, the eruption of the Eyjafjallajökull volcano, the Tohoku earthquake and subsequent tsunami. More recently, the COVID-19 pandemic, the Ukraine-Russia war, or the climate crisis in general are attracting an increasing number of studies in the SCRES domain (Ghadge et al., 2020; Li et al., 2023a; Srail et al., 2023). Research on the pandemic alone accounts for an increase in SCRES studies by approx. 62%, making it one of the main thematic blocks in recent supply chain research (Castillo, 2023). The prominence of SCRES research has been highlighted also in previous reviews of organizational resilience research, and it has clearly constituted a research field on its own. For example, the review conducted by Annarelli and Nonino (2016) describes SCRES as a distinct sub-area for research on the implementation, improvement, and measurement of resilience since 2004, while no other clearly defined sub-areas are identified in their study. Other resilience studies within management and organizational fields take a general organizational view. Resilience has been less studied in other organizational functions, and there is potential to conduct further studies to expand knowledge of functional resilience in these areas, such as manufacturing and production operations (Puchkova et al., 2020; Alexopoulos et al., 2022; Dittfeld et al., 2022) and industrial service operations in product-centric organizations (Durugbo and Erkoyuncu, 2016).

According to Hohenstein et al. (2015) the most often used definition of SCRES is the one offered by Ponomarov and Holcomb (2009, p. 131), who define SCRES as *“an adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function”*. However, they also acknowledge that this definition lacks the perspectives of crisis as opportunity and growth contained in other widely cited definitions, such as those of Christopher and Peck (2004), who explain that the system could move to a new, more desirable state as it bounces back from adversity, and Pettit et al. (2010), who refer to the capacity of the organization to grow in the face of turbulence. The view that crises offer opportunities for learning, improvement and growth is becoming more prevalent in resilience studies (e.g., Nikookar et al., 2021; Sauer et al., 2022; Silva et al., 2023; Silvestre et al., 2023). This offers another interesting area of research in supply chain management studies

within the resilience remit. For example, would supply chain learning be in widespread demand in management practice in the new post-COVID-19 business environment? Would organizations increasingly adopt a supply chain disruption orientation (defined by Bode et al. (2011, p. 837) as the *"general awareness and consciousness of, concerns about, seriousness towards, and recognition of opportunity to learn from supply chain disruptions"*) and recognize supply chain disruptions as sources of organizational learning?

2.2 What does "a sustainable future" mean?

Many concepts have been proposed and discussed among academics, policymakers, and practitioners to refer to *"a more humane, more ethical and more transparent way of doing business"* (van Marrewijk, 2003, p. 95), and many schools of thought bring insights and perspectives towards sustainability in organizations and their supply chains. This section builds on the concept of corporate sustainability (CS) which is a term broadly used to refer to sustainability in organizations (Linnenluecke and Griffiths, 2010) and their application in products, policies, and practices (Bansal, 2005). A comprehensive definition of the term CS is provided by Meuer et al. (2020, p. 15) after analyzing its conceptual foundations, as *"a bundle of activities fully integrated into a firm's overall strategy that contribute effectively to the welfare of current and future generations through protecting and enhancing the resilience of the biosphere, social equity and cohesion, and economic prosperity"*. In their view, previous literature considers CS as either related to elements of organizational design, e.g., strategies, practices, processes, or to ways of doing business, e.g., approaches or paradigms. The latter would carry implications on business practices as well as on the nature and role of organizations within the society. From this perspective, CS would also refer to transgenerational equity, an idea that links to the concept of Sustainable Development (SD) as *"development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs"* (WCED, 1987, p. 8). Moreover, this CS definition also has a close link to the Triple-Bottom-Line (TBL) concept, according to which organizations are encouraged to balance and simultaneously satisfy their environmental, social, and economic goals (Elkington, 1997; Figge and Hahn, 2004; Hahn et al. 2014; Montiel and Delgado-Ceballos, 2014) and to deliver simultaneously environmental, social, and economic benefits to all their stakeholders (Hart and Milstein, 2003). This calls for an integrative view of CS rather than an instrumental logic based on win-win or trade-off approaches (Van Der Byl and Slawinski, 2015; Gold and Schleper, 2017). Both SD and TBL aspects are present in the extant literature on sustainability in OSCM. For example, Longoni and Cagliano (2015) investigate commitment to environmental and social sustainability in operations strategies, Gimenez et al. (2012) study the impact of environmental and social initiatives on TBL performance, and Agrawal et al. (2022) examine

strategies associated with adopting sustainable practices in supply chains to achieve Sustainable Development Goals (SDGs).

Next sections introduce in more detail the concept of resilience in organizations, their operations, and their supply chains, covering similar elements as CS studies, i.e., strategies, practices and processes, and approaches that inspire strategic views on how to do business. Initially, this positions resilience as a good candidate for conceptual comparison with sustainability. Indeed, the relation between resilience and sustainability have been investigated in several studies from different perspectives (e.g., Fiksel, 2003; Smart et al., 2017; Sauer et al., 2022). Resilience and sustainability have been explored jointly in the context of community development (e.g., Tobin, 1999), urban design (e.g., Jansson, 2013) and supply chains (see Negri et al., 2021 for a review). In the context of supply chains, sustainability and resilience are seen as complements and should be jointly investigated (Sarkis, 2021).

3 | Brilliance in resilience - A research framework towards a sustainable future

3.1 Operational resilience

We adopt the view of operational resilience as described in the section above, i.e., a form of resilience triggered when the disruption threatens the ability of the organization to continue operating (Hepfer and Lawrence, 2022), thus, making it unable to continue delivering its products and services to customers. For a logistics provider, this would mean being unable to conduct its logistics operations while for a service organization this would mean being unable to deliver the promised service to its customers. Thus, we consider *operational resilience* as the ability of an organization's operations to maintain their existing structure and their function, and to recover from disruptions (definition adapted from Williams et al., 2017; Essuman et al., 2020; Li et al, 2023b).

The operations function of organizations is a main source of value creation for the organizations themselves and their external networks, making it fundamental to devote research attention and efforts to understand resilience at the operations level (Essuman et al., 2020). Essuman et al. (2020) explicitly point out that there are only a few empirical studies that deal with the correlation between operational resilience, disruption, and efficiency. Their own findings suggest that disruption absorption and recoverability, defined as two dimensions of operational resilience, are also important determinants of operational efficiency. The relation between operational resilience and efficiency / lean has been investigated in very few empirical studies.

Birkie (2016) investigated resilience and lean from a granulated perspective, i.e., looking at relations between seven specific bundles of lean practices and five core functions of operational resilience, namely *sense, build, reconfigure, re-enhance, and sustain*. His findings indicate an overall synergy between resilience and lean, particularly lean practices associated with purchasing, human

resource management, customer involvement, and supplier management have synergetic effects on all or most of the core functions of operational resilience. Lofti and Saghiri (2018) investigated how resilience, along with leanness and agility, affects operational performance outcomes via a survey of 151 automotive parts suppliers. Their results show interdependence between agility and resilience constructs, thus, indicating agility as an element of resilience. This relation between agility and resilience is widely supported in resilience literature (e.g., Tukamuhabwa et al. 2015; Hillmann and Guenther, 2021), making it also a key common element between excellence and resilience from a performance viewpoint. Moreover, both resilience and leanness contribute to better cost, delivery, and recovery performance (Lofti and Saghiri, 2018). The latter being usually a contested topic because lean is often seen as detrimental to conduct a prompt recovery after disruptions. However, there may be more nuance to this, and this is therefore an area deserving further investigation, as Birkie (2016) also found that the 'build' and 're-enhance' core functions of resilience (including recovery-related practices such as selecting personnel with previous experience to handle disruptions or establishing systematic processes for recovery) benefitted more positively from synergies from lean bundles.

Lofti and Saghiri (2018) uncovered that while lean contributes to flexibility performance, resilience does not seem to be a direct contributor in their results. However, flexibility in terms of diversification and slack are commonly accepted response actions put in place to minimize impact from disruptions (Meyer, 1982). Consequently, developing a better understanding of the relation between resilience and flexibility provides another interesting area for future research. More granular studies could provide further insights. For example, Li et al. (2023b) studied operational resilience as a balancing between operational stability and operational flexibility from organizations' internal and external perspectives, i.e., internal competences and external network positions, respectively. Their results indicate that the matching between *internal flexibility* (i.e., product diversity) and *external stability* (i.e., network centrality), and the matching between *internal stability* (i.e., operational efficiency) and *external flexibility* (i.e., structural holes) have complementary effects for operational resilience. By incorporating the external perspective, they have expanded the scope of factors that improve operational resilience beyond the boundaries of the organization. This is an insightful approach that could be adopted in future studies on operational resilience by applying the internal and external perspective to both the causes of disruptions that affect the operational capability of organizations, i.e., endogenous and exogenous causes, and the factors and actions taken to build higher operational resilience.

Future research could also examine whether previous findings regarding the relations among operational resilience, lean, and flexibility constructs still stand in the light of the current environment of more frequent and major disruptions affecting organizations' operations. The studies conducted by

Birkie (2016) and Lofti and Saghiri (2018) are pre-pandemic while Li et al. (2023b)'s study was conducted in the aftermath of the COVID-19 pandemic. Further work is needed to better understand how the post-COVID-19 environment affects organizations' efforts and investments in operational resilience. These studies should also consider the different contexts in which organizations operate (e.g., developed and developing countries) as well as differences in the origin and intensity of disruptions.

3.2 *Supply chain resilience*

SCRES is a prominent area of research within the theme of resilience in organizational and management research. One plausible explanation lies in the relevance of supply chain functions within organizations and the potential organization- and network-wide consequences caused by disruptions in their supply chains, especially when it comes to critical supplies for organizations' core operations. This illustrates the cross-functional and cross-organizational character of supply chain management functions. Mentzer et al. (2001) defined the scope of supply chain management as both functional, i.e., encompassing several traditional business functions, and organizational, i.e., concerning inter-firm relationships with other organizations participating in a supply chain. This explains why SCRES studies often consider adversities with impact that spreads across multiple traditional organizational functions, i.e., those that are integrated into an overarching supply chain function in the company, and across organizational boundaries, i.e., the interconnected structure of all organizations that belong to a supply chain. Furthermore, the approach adopted in SCRES research resonates with the interdependence of resilience forms and cascading effects of adversities as discussed by Hepfer and Lawrence (2022). Each adversity will trigger a different form of resilience and could be contained there, or, in some cases, their effects may evolve and require other forms of resilience. Kahn et al (2017) refer to this as 'the geography of strain' and call for more attention to avoid treating strain in isolation, as strain (e.g., disruption, adversity) can occur locally and weaken certain parts of the organization, encompassing certain organizational capabilities with potential impacts elsewhere. Supply chain disruptions are strains that have the potential to cause this cascading effect throughout the organizational geography and beyond. Cascading effects can also be triggered by intense periods of accumulated disruptions (Hepfer and Lawrence, 2022). Therefore, better understanding of when and how cascading effects occur and how supply chain disruptions impact and spread within and outside organizational boundaries are promising topics for further research.

Intra-organizational perspective in SCRES research. Strategies, response actions, and capabilities have been common themes in SCRES research from an intra-organizational perspective, however these terms have not always been used consistently. In particular, research into SCRES capabilities has been intensified over the last decade. From several reviews, two important findings

emerge, namely a) that SCRES builds on multiple capabilities, and b) that these can be divided into proactive and reactive capabilities (Faruquee et al., 2023). These principles have been adopted in few empirical works looking at the effect of SCRES capabilities in organizational performance. For example, Birkie et al. (2017) studied SCRES capabilities as bundles of routine practices and their effect on performance loss and recovery after disruptions from a proactive vs reactive as well as an internal vs external perspective. Their findings highlight that internal proactive and reactive capabilities have a stronger impact on recovering performance after disruptions. They also find that supply chain complexity, defined by a set of measures organized into four main constructs related to company size, product portfolio, supply base dispersion, and restructuring through mergers and acquisitions (M&A), contributes to the reduction of performance losses due to disruptions. The authors highlight the importance of setting up internal resilience-oriented practices first before deploying or leveraging external capabilities. Yet, more research is needed to understand what level of complexity is helpful to avoid larger performance losses in different contexts and considering diverse types of disruptions. Thus, a better understanding of the underlying mechanisms of relations between different constructs and disruption recovery can be provided. Moreover, the study of supply chain complexities deserves further attention. While Birkie et al. (2017) argue that both larger company size and supply base dispersion can be leveraged to improve effectiveness of resilience capabilities, others see supply-side complexities as impact amplifiers (Manhart et al., 2020), especially in global sourcing (Gunasekaran et al., 2015), and even as driving factors of supply chain disruptions (Bode and Wagner, 2015).

A recent study conducted by Faruquee et al. (2023) propose a typological framework of supply chains based on their achieved levels of proactive and reactive resilience capabilities. The four configurations, namely *fragile*, *eagle-eye*, *nimble* and *durable*, display different sensitivity to disruptions and different capabilities to anticipate, prepare, recover, and adapt to disruptions. Their empirical findings suggest that each configuration of proactive and reactive resilience has different impacts on operational, supply chain, and relational performance and they argue that reactive resilience should be prioritized when trying to move away from a fragile supply chain. This framework presents different ways of building SCRES which could be adequate in different operational contexts and for different performance goals. It also opens another promising area for further research related to antecedents and contingency factors that may prompt a transition between these configurations or may make it worthwhile to maintain current configuration even when experiencing major changes in the operating environment.

Another stream of work on capabilities and resilience looks at the effects of certain organizational capabilities in the development of resilience, such as improvisation, anticipation and data analytics capabilities (Munir et al., 2022), entrepreneurial orientation elements such as innovativeness,

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3 autonomy, competitive aggressiveness (Sturm et al., 2023) and managerial capabilities of supply chain
4 managers related to social capital, human capital, and cognition (Nikookar and Yanador, 2022).
5 Research on SCRES capabilities could bring together supply chain management research and other
6 disciplines, such as organizational research or social and life sciences, looking at various levels and
7 subjects of analysis. A recent example of this is the study done by Pal and Altay (2023) developing a
8 conceptual framework for survival mechanisms in supply chain disruption management building on
9 coping theory from psychology.

15 **Inter-organizational perspective in SCRES research.** SCRES scholarship studying the inter-
16 organizational perspective has focused on two main aspects: supplier-buyer relationships and supply
17 chain network structure. A primary foundation of SCRES research looking at supplier-buyer
18 relationships is the understanding that collaboration – via information-sharing, communication,
19 mutually created knowledge, and joint relationship efforts – increases SCRES (Scholten and Schilder,
20 2015). Most studies focus on collaboration with suppliers as a means of building SCRES, considering
21 either disruptions that originate from suppliers or disruptions originated elsewhere that affect the
22 buyer-supplier relationship. For example, Bode et al. (2011) investigated disruptions in dyadic
23 relationships that triggered responses towards the suppliers – the greater the impact of the supply
24 chain disruption on the focal firm, the greater the response level (acting on the relationship where the
25 disruption originated). They measured impact related to resource provision (i.e., procurement costs),
26 production process (i.e., efficiency of operations, quality of final products), customers (i.e.,
27 responsiveness, delivery reliability) and financial performance (i.e., return on sales). Their results
28 suggest that the level of dependence on the supplier, the level of trust in the supplier, and the
29 disruption orientation of the firm influence the type of response to the disruption, i.e., whether
30 implementing buffering or bridging responses. Looking at disruptions which originated elsewhere but
31 which primarily affected buyer-supplier relationships, Faruquee et al. (2021) examined the role of
32 communication, trust, and digital transformation in a joint problem-solving context and their effects
33 on SCRES. Their findings confirm that collaborative joint-problem solving helps developing SCRES and,
34 in turn, communication and relational trust are key contributors to joint-problem solving effort,
35 independently of digital transformation levels. They suggest that simple technological platforms may
36 already be effective to improve the level of trust and communication in buyer-supplier relationships.

52 Supply chain network design and configuration has been a salient area of examination in SCRES
53 research (Ali et al., 2017) from analytical and empirical viewpoints. Cardoso et al. (2015) modelled five
54 network structures for the same case of supply chain and suggested building network structures more
55 resilient from the start will reduce the mitigation strategies are required to cope with disruptions.
56 Recent empirical work (e.g., Küffner et al., 2022; Holgado and Niess, 2023) identify implemented (and
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planned) medium- and long-term changes to supply chain structures in large organizations with extended supply chains with the objective of embedding more resilience into their global supply chains. Responses to disruptions related to supply chain structures regard both sourcing and location decisions.

It is widely understood that SCRES improves by strengthened coordination and collaboration with suppliers and increased multiple sourcing (Rice and Caniato, 2003; Tang, 2006). Additionally, recent studies confirm the trend to reconsider the geographical distribution of current supply chains. Even if started in pre-pandemic times in response to geopolitical issues and tariff wars, among other drivers, it seems to have been accentuated due to the COVID-19 pandemic (Bednarski et al., 2023). Van Hoek and Dobrzykowski (2021) gathered industry insights on reshoring considerations as a response to pandemic disruptions in three companies headquartered in USA. Their findings highlight the complexity of reshoring decisions and required longer-term time horizon for decision-making and implementation. Thus, changes would not happen overnight and may be subject to further development and changes in their operating environment. Küffner et al. (2022)'s results reveal a restructuring of supply chains and supplier base under development for automotive companies headquartered in Germany with considerations including re-shoring and near-shoring, establishing alternative suppliers and multiple sourcing strategies as well as using digital supplier platforms that integrate a wider range of companies. Holgado and Niess (2023) identify changes in sourcing approaches moving towards local or regional sourcing with suppliers nearby the organizations' production facilities (i.e., clustering approach) or close to their core markets and efforts to reshoring production either via new production partners or bringing production in-house (insourcing). Further investigation is needed on this emerging trend as more instances of reshoring and nearshoring are observed in industrial settings. The studies mentioned above take the view of focal firms in developed countries, and therefore, more diversity of views and contexts are very welcome.

3.3 *A desired sustainable future through brilliance in resilience strategies*

The aftermath of major disruptions can be seen as opportunities for transformation to a more desirable state rather than return to the previous state (Christopher and Peck, 2004). This has been discussed in the context of the 2008 financial crisis (DesJardine et al., 2019) and the COVID-19 pandemic (Sarkis, 2021; Sauer et al., 2022). It means seeing disruptions and crisis as opportunities and 'bouncing forward' rather than 'bouncing back', to build better and more sustainable organizations, operations, and supply chains. Figure 1 illustrates the bouncing back and forward actions emerging from organizational resilience and how the three forms of organizational resilience respond to different type of disruptions as discussed in section 2.1. The dashed bidirectional arrows indicate the potential for cascading effects between the forms discussed previously.



Figure 1. Bouncing back and forward actions from organizational resilience.

Research looking at resilience-oriented strategies and practices already started to consider the implications of their implementation regarding economic, environmental, and social sustainability elements together (e.g., Paul et al., 2021; Sauer et al., 2022). Future research should extend this literature stream and go beyond the still prevalent focus on economic and operational performance as main outcome of resilience building in organizations and their supply chains. However, it should not be overlooked that sustainability challenges can also be a source of disruption and negative impacts for different stakeholders (e.g., Hofmann et al., 2014; Duensing et al., 2023) and thus a trigger for distinct types of resilience-enhancing responses. In certain instances, disruptions depicted in Figure 1 will have sustainability origins. This could be another area to advance the understanding about the relation between sustainability and resilience. For example, Kalaitzi et al. (2019) investigated resilience-oriented practices based on bridging and buffering strategies in the context of environmental uncertainty caused by natural resource scarcity. According to their findings both buffering and bridging improve resource efficiency while only bridging brings competitive advantage in terms of ownership and accessibility to resources. Whereas some resilience-oriented actions may have positive effects on certain sustainability elements, other actions enhancing resilience such as multiple sourcing may increase the transportation needs and therefore have a negative impact on environmental sustainability (Holgado and Niess, 2023). Negri et al. (2021) suggest a source of conflict as sustainability focuses on efficiency while resilience seeks effectiveness overall. Further research could analyze the potential tensions and paradoxes when trying to achieve higher levels of resilience and sustainability in operations and supply chains.

Organizations can also leverage on their implementation of social and environmental practices (SEPs), i.e., those that have positive effect on their impact on social and natural environments, to improve their organizational resilience by developing mechanisms for sensing changes through strong stakeholders' relationships and creating a stock of flexible resources such as committed workers and corporate reputation (Ortiz-de-Mandojana and Bansal, 2016). DesJardine et al. (2019) find resilience-related benefits of strategic SEPs in terms of reducing both severity of loss and time to recovery after the 2008 financial crisis. They argue that strategic SEPs in the domains of environment, diversity, employee relations, human rights, product quality and safety, and corporate governance are long-term initiatives that build stability and foster creativity through building interdependencies among a diverse set of actors within the organizational, social, and environmental systems in which the organization is embedded. The multi-stakeholder perspective is another common principle of CS conceptualizations with definitions commonly referring to 'interactions with stakeholders' (van Marrewijk, 2003) and a holistic consideration of needs of all direct and indirect stakeholders, such as shareholders, employees, clients, pressure groups, and communities (Dyllick and Hockerts, 2002). Research on sustainability in OSCM has already taken such a multi-stakeholder perspective (e.g., Liu et al., 2017; Rosca et al., 2022; Schleper et al., 2022; Delabre et al., 2023). Future research should continue to pursue this perspective and include resilience more systematically.

Building on arguments and discussions presented in this article, a transformed future state featuring more sustainable organizations' operations and supply chains could emerge from bouncing forward from disruptions (as depicted in Figure 1). We build upon these discussions by addressing how contemporary organizations and supply chains, being dynamic, contingent, and competitive, effectively employ people, technology, and processes to achieve a better future state than the existing one after disruptions have occurred (Padgaonkar, 2023). We argue that resilience-oriented practices and strategies implemented to facilitate bouncing forward towards a more sustainable state will also be a source of excellence for organizations. Thus, pathways to sustainability through brilliance in resilience strategies can be formed by combining resilience-oriented practices and strategies.

Lee (2004) discovered that the best supply chains exhibit agility, adaptability, and alignment (AAA) about two decades ago. This framework for excellence in supply chains has been revisited under the current environment of higher uncertainty and frequent disruptions and shocks affecting supply chains. Lee (2021) refers to the dramatic acceleration of agility to cope with unprecedented surges in demand as super-agility while Cohen and Kouvelis (2021) suggest complementing downstream agility with upstream robustness measures such as safety stocks, multiple sourcing, and backup suppliers. Both upstream agility and downstream robustness are fundamental elements of resilience in supply chains. Adaptability of supply chain strategies initially focusing on adjusting to product and markets

maturity should be extended to consider adjustments due to the dynamic tariffs and trade agreements affecting supply sources and new economies becoming innovation centers and demand points besides being supply sources too (Lee, 2021). This revised adaptability dimension includes decisions on sourcing and production network locations and investments in advanced technologies (Cohen and Kouvelis, 2021; Lee, 2021). Finally, the scope for alignment needs to be broadened to consider the interdependence between supply chains from different industries and more diverse stakeholders (Lee, 2021) and to accommodate new contractual arrangements and business models such as performance-based (Cohen and Kouvelis, 2021). These suggestions to enhance the alignment dimension exemplify general shortcomings in SCRES literature such the lack of holistic perspectives beyond dyadic buyer-supplier relationships and neglecting the interdependencies between various supply chains.

This revision of the Triple-A or AAA excellence framework in supply chains that incorporates resilience considerations and practices could serve as inspiration for further works investigating the effect of resilience in operational excellence, taking into consideration insights from the conceptual development presented in this article. Figure 2 shows the proposed aspects of OSCM that can potentially be influenced by mastering resilience strategies and practices at strategic, operational and supply chain levels to support the transition to a more sustainable future. Thus, it illustrates the bouncing forward approach depicted in Figure 1 in more detail. The figure features a bidirectional arrow between resilience and CS to illustrate the need for better understanding of their effect on each other, via synergies and trade-offs between these concepts, and their strategies, practices, and processes, as discussed in previous sections in this article.

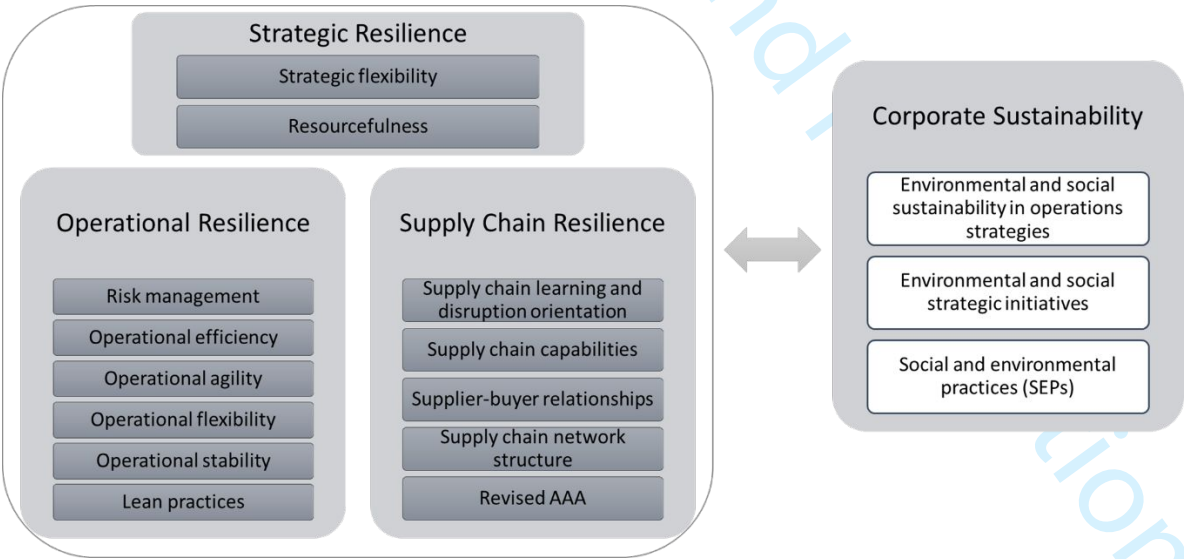


Figure 2. Brilliance in resilience strategies and OSCM practices towards a more sustainable future

Furthermore, following the study of Srinivasan and Kurey (2014) on the empowerment of people to foster a culture of quality, we propose creating a culture of resilience. This can be achieved by

maintaining a leadership emphasis, ensuring message credibility, encouraging peer involvement, and fostering a resilient culture both within the organization and across supply chains. Wieland et al. (2023) acknowledge the ignorance of sustainability issues during disruptions, but lately, studies are beginning to address this issue (e.g., Sauer et al., 2022). There is still a long way to go to understand the influence of a culture of resistance, whether in terms of handling feedback or managing polycentric governance within and across firms. Hence, based on the limited information available, we have conceptualized how culture plays a dominant role during disruptions to achieve a more sustainable future.

We are hopeful that future studies will theorize the role of people empowerment, the enhanced use of technologies, and process improvement in providing better support for organizations and supply chains to achieve various SDGs.

3.4 Research agenda

The discussions in sections 2 and 3 reveal numerous factors that enhance SCRES, such as organizational practices, operational efficiencies, dynamic capabilities, agility, flexibility, redundancy creation, collaborative supply chain relationships, technology utilization, complexity mitigation, supply relationship improvement, and illustrate potential trade-offs between sustainability and resilience. A summary of the identified knowledge gaps and suggested areas to address them in further research is presented in Table 1.

[Insert Table 1 around here]

4 | Concluding remarks

This conceptual article has unpacked and reflected on the theme of the international EurOMA 2022 conference “*Brilliance in resilience: operations and supply chain management’s role in achieving a sustainable future*”, bringing together different literature streams and contributing to a deeper understanding of resilience and sustainability concepts and their connectedness from an OSCM perspective. As a key contribution, we provided a higher-level discussion of how operational resilience and SCRES fit within the wider concept of organizational resilience, and we proposed resilience as the missing element in the search for excellence in organizations that seek to contribute to a more sustainable future. Lastly, we reflected on current research streams on operational resilience and SCRES which resulted in suggestions for future OSCM research. The discussion here emphasizes the idea of connections and synergies between brilliance/excellence, resilience and sustainability and encourages further academic work in these promising areas.

Organizations are facing increasingly turbulent environments where disruptions are not only more frequent and intense, but also have a longer-lasting impact on their operations and supply chains (Sodhi and Tang, 2021). Disruptions that were once just a minor consideration in their risks assessments are now likely to be materialized into actual disruptive events. With the climate crisis, one of the greatest challenges for economies and societies, and its detrimental effects still largely ahead of us (if the current scientific outlook and/or human behavior do not change dramatically). Thus, prospective operating environments are likely to be characterized by high uncertainty as well as major and more frequent disruptions. According to Meyer (1982), environmental jolts present opportunities for organizational learning and transformations. This potential for transformative change resulting from disruption underscores the possibility of moving from adversity to a new and better future state. Such a state will also be dynamic, contingent, and continuously challenged and hence require all three notions of resilience - persistence, adaptation, and transformation – as proposed by Wieland et al. (2023). Time will tell whether the accumulated effect of recent and potentially future major disruptions, including the COVID-19 pandemic and the climate crisis, will have the expected frame-breaking effect on OSCM, and whether, as envisaged within this conceptual development, it will contribute to a more sustainable future.

Addressing this new context in which organizations and their supply chains operate will require further theoretical development within our domain. However, we should not stop borrowing interesting and relevant theories from other disciplines and need to further establish cross-disciplinary collaborations, e.g., with systems and engineering fields as well as social and life sciences. This will allow OSCM to better capture the nuances and complexities associated with examining resilience and sustainability in organizations, their operations, and their supply chains. Amongst other, potential useful conceptual lenses for the joint study of resilience and sustainability are the following: planetary boundaries considered as 'the safe operating space' for humanity (Rockström et al., 2009; Whiteman et al., 2013); ecosystems services (Jansson, 2013), or complex adaptive systems (Winnard et al., 2014). In this spirit of cross-disciplinary collaborative research, the theme of the EurOMA 2023 conference, "*Systems lens on Operations*", embraces a systems-thinking perspective for OSCM as fundamental elements of industrial and sociotechnical systems pursuing both resilience and sustainability.

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Table 1. Summary of suggestions for further research

THEME	FURTHER RESEARCH TOPIC/S	ARTICLE SECTION
Strategic Resilience	Explore the contribution of operations management to strategic flexibility and resourcefulness to advance understanding and development of strategic resilience in organisations.	2.1
Functional Resilience	Expand knowledge of resilience in other organizational functions (besides supply chain and information systems) e.g. manufacturing and production, and service operations.	2.1
Organisational Resilience	Understand when and how cascading effects occur and how supply chain disruptions impact and spread within and outside organizational boundaries.	3.2
Operational Resilience	Deepen the understanding of responses and preparedness levels associated to endogenous and exogenous disruptions affecting the operational ability of organisations.	2.1
	Deepen the understanding of operational resilience in OSCM from a multidisciplinary perspective, e.g. systems and management engineering.	
	Develop a better understanding of the relation between resilience and flexibility at an operational level.	3.1
	Apply internal and external perspectives to understand the causes of disruptions and the factors and actions taken to build higher operational resilience in organisations.	
	Revisit the relations among operational resilience, lean, and flexibility constructs under current environment of frequent and major disruptions affecting organizations' operations.	
	Investigate contingency factors in operational resilience (e.g., developed and developing countries) and influence of the origin and intensity of disruptions.	
Supply Chain Resilience	Investigate whether supply chain learning and supply chain disruption orientation will become widespread practice in organisations under more disruptive environments.	2.1
	Understand to what extend and under what circumstances supply chain complexity and/or its constructs influence resilience capabilities.	3.2
	Investigate antecedents, contingency factors and transition between different configurations of proactive and reactive resilience capabilities	
	Deepen the understanding of how organisational capabilities influence the development of SCRES from multidisciplinary perspectives, e.g. looking at different levels and subjects of analysis within organisational research.	
	Develop a better understanding of reshoring and nearshoring decisions beyond the view of focal firms in developed countries, e.g. diversity of viewpoints and contexts.	
Sustainability & Resilience	Expand the knowledge on sustainability challenges as sources of disruptions and investigate how they may trigger different types of resilience-enhancing responses.	3.3

	Understand the influence of resilience strategies and practices on environmental and social performance to widen the still prevalent focus on economic and operational performance.	
	Examine tensions and paradoxes when trying to achieve higher levels of resilience and sustainability simultaneously in operations and supply chains	
	Investigate jointly sustainability and resilience in operations and supply chains adopting a multi-stakeholder perspective.	
	Elaborate how to create operations and supply chains that foster resilience and also promote and protect social and environmental sustainability	



Figure 1. Bouncing back and forward actions from organizational resilience.

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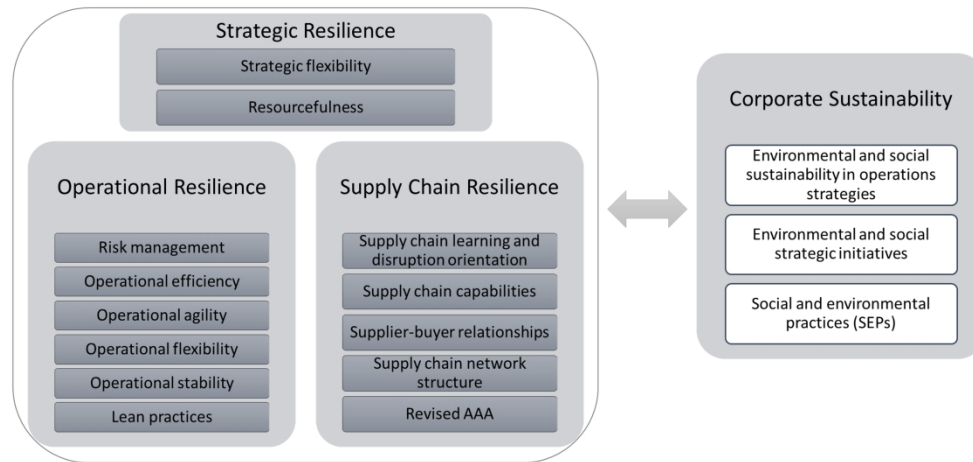


Figure 2. Brilliance in resilience strategies and OSCM practices towards a more sustainable future.

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