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Knowledge sharing, knowledge reciprocity and supply chain resiliency: A conceptual discussion

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Abstract

Resilience is a highly desirable quality of supply chains, as it increases a firm's readiness in dealing with risks and disruptions that can emerge from the supply chain environment. Based on the extensive literature on knowledge sharing and supply chain resilience, the current study sets a stage to investigate the relationship between supply chain resiliency and specific elements of knowledge sharing. The study is conceptual in nature, and it aims to derive a set of hypotheses by combining social exchange theory used in knowledge sharing and the systems theory used in supply chain management literature.

Keywords: Supply chain resiliency, Knowledge sharing, Knowledge reciprocity

Introduction

The present business scenario has rendered organizations no longer as independent entities, but rather a complex network of interdependent suppliers and manufacturers working together as a system to achieve mutually set objectives (Simchi-Levi et al., 2008). Additionally, increasing length and connectivity between supply chain members have thus elevated the complexity of supply chains, and along with it, the risks and disruptions associated with it. According to Business Continuity Institute (BCI, 2019), it has been observed that more than 70% of firms face a disruption in their supply chain, a significant portion of which is caused by external threats that are beyond the control of supply chain professionals. As a result, it has become imperative for supply chains to be (re)designed in such a fashion that they not only withstand disruptions but actually can bounce back from it in an even stronger shape – a concept known as *supply chain resiliency* (Christopher and Peck 2004; Ponomarov and Holcomb, 2009; Sheffi, 2005).

Resilience is a highly desirable quality of supply chains, as it increases a firm's readiness in dealing with risks and disruptions that can emerge from the supply chain environment, the internal supply chain processes adopted or the integration mechanisms employed, or a combination of the above (Purvis et al., 2016). Additionally, a resilient supply chain had been observed to adapt and recover from unforeseen (and adverse) disturbances and adapt to new (and even better) 'post-event' state, while maintaining competitive advantage (Ali et al., 2017; Blackhurst *et al.*, 2011; Chopra and Sodhi, 2014; Jüttner and Maklan, 2011; Ponomarov and Holcomb, 2009; Rice and Caniato, 2003),

and therefore is considered as an essential strategic capability (Seville *et al.*, 2015; Sheffi and Rice 2005).

Previous studies on supply chain resiliency have emphasized the importance of effective knowledge management and sharing as one of the key strategies in designing a resilient supply chain. Sharing knowledge and information regarding supply chain disruptions and risks has a significant impact on its resiliency as it can improve its recovery and response by increasing its visibility and reducing the time for detection of the events (Jüttner and Maklan, 2011; Manuj and Mentzer, 2008) and by coordinating response and recovery actions (Fattahi, et al., 2017; Gunasekaran et al., 2015; Khan et al., 2012). Furthermore, collaboration to share crucial information and both, tacit and explicit knowledge can also be important components of an organization's (and its supply chain's) resiliency strategy (Handko et al., 2018; Johnson et al., 2013; Jüttner and Maklan, 2011; Ole-Hohenstein et al., 2015; Pettit et al., 2010, 2013; Sheffi, 2005). Thus, adequate exchange of knowledge and information, based on positive and timely collaborative relations, significantly contributes to supply chain resiliency (Kamalahmadi and Parast 2016; Scholten et al., 2019). However, it is not known to what extent and how explicit and tacit knowledge sharing, knowledge quality and knowledge reciprocity help in improving a) the resiliency of supply chain, and b) each of its dimensions, readiness, reaction and recovery (Altay and Ramirez, 2010; Chowdhury and Quaddus, 2016).

Based on extensive literature on knowledge sharing and supply chain resilience, the current study sets a stage to investigate the relationship between supply chain resiliency and specific elements of knowledge sharing. The study is conceptual in nature, and it aims to derive a set of hypotheses by combining SET and TPB for the knowledge sharing construct and hypotheses and the ST, CT, RBV, and DCT used in supply chain management literature. Beginning with the overview of the theoretical foundations of the concepts, the current study subsequently goes on to derive a set of hypotheses, which will be subsequently validated through a primary survey of supply chain professions and analyzing the responses through the statistical technique of structural equation modeling. Based on the insights from the relevant literature, the current study expects to observe that both explicit and tacit knowledge sharing has a positive and significant effect on supply chain resiliency, while knowledge reciprocity has a moderating role in enhancing the relationship. Although there have been prior studies analyzing the relationship between knowledge management and supply chain resiliency, this is one of the first studies analyzing three distinct elements of knowledge management – explicit and tacit knowledge sharing, knowledge quality, and knowledge reciprocity – in influencing supply chain resiliency. This adds to the novelty of the current study and contributes to the body of literature on supply chain resiliency, as well as knowledge management.

The paper is structured as follows: first, the paper presents the theoretical foundations of the supply chain resiliency and knowledge sharing concepts and after that, it provides the link between these concepts. The paper concludes with defined research questions that will guide the development of the research instruments and hypothesis of the study.

Theoretical foundations of the concepts

The following section of the paper will be devoted to a discussion on the theoretical foundations behind the concepts.

Supply chain resiliency

The concept of reliance, which stems from the Latin word *resilire*, meaning ‘to spring back or rebound’, is the ability of an object to spring back into shape after disturbance (Ganguly et al., 2018). Clapham (1971), in one of the early conceptualization of resilience, mentioned it as restoration of the initial structure and function of an ecosystem after disturbance. Over the years, the concept of resiliency has gradually diffused from the ecological domain to the domain social science, with the supply chain becoming one of the newest members to embrace the concept. In the context of supply chains, resiliency can be stated as sustaining the original stable situation (or achieving a new, stable situation) of the supply chain after a disruption (Asbjornslett and Rausand, 1999; Wieland and Wallenburg, 2013).

According to Tukamuhabwa et al. (2015, 2017), the essential components of a resilient supply chain consists of its ability to prepare, react, stay connected, and recover to the original or, preferably, an improved state after a disruption. Furthermore, along with reacting to disruptions, being proactive to disturbances, designing and implementing response strategies accordingly can also be considered as important pre-emptive capability of a resilient supply chain (Martins de Sá et al., 2020; Ponomarov and Holcomb, 2009), i.e. *readiness* (Chowdhury and Quaddus, 2016). Additionally, it has also been argued that resilience should not only be limited to response and recovery but also should harbor a resistance against the disruption in the first place, where resistance represent supply chain robustness, i.e. the supply chain’s ability to withstand the impact of disruption (Vlajic et al., 2012; Dolgui et al., 2018; Li et al., 2019). Furthermore, supply chain resilience requires that the stakeholders control and contain disturbances from diffusing to other organizations within a system, and provide immediate *reaction* and *recovery*, as well as maintaining competitive advantage (Ali et al., 2017; Chopra and Sodhi, 2014; Martins de Sá et al., 2020). Thus, while a resilient supply chain might not prove to be the most cost-effective (low cost) one, it is one that has the most capability to cope with disruptions in business and subsequently bounce back to a stable state (Carvalho et al, 2012; Tukamuhabwa et al., 2017).

Supply chain management literature shows that multiple theories are used to explainability of a supply chain to resist and recover from a disruption. *Systems theory* (Boulding, 1956), which emphasizes on the interconnected nature of the activities of an organization (Ashmos and Huber, 1987; Ketchen and Hult, 2007), has been used to discuss the resilient attributes of supply chains (Erol et al., 2010; Blackhurst et al., 2011). These authors consider a supply chain as a network of multiple, complex components that are expected to function in harmony, indicating a complex system. This is in line with the theory on supply chain structure, which consists of various nodes (supply chain partners) and links (flows of materials, information, or finance), (cf. Lambert and Cooper, 2000). Various degrees of importance of nodes and links in this network for the achievement of supply chain objectives show the degrees of supply chain complexity. Additionally, *dynamic capability theory* (DCT) of an organization, which can be stated as “firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (Teece et al., 1997, p. 516), has also been used to discuss resilient supply chains (Chowdhury et al., 2017). Lastly, contingency theory (CT) and resource-based view (RBV) are relevant in studies that focus on exposure and readiness of the supply chains to resist or respond to the risks and disruptions (Brandon-Jones et al, 2014, Vlajic et al., 2019). Namely, these studies suggest that choice and type of response might be subject to contextual factors, both, environmental ones and internal, a supply chain, or an organization related factors. Thus,

the current study adopts the aforementioned theoretical underpinnings to analyze the resiliency of an organization's supply chain.

Response/mitigation strategies

Considering resilience as a supply chain feature that can be achieved via the development of its dimensions: readiness, reaction, and recovery, response strategies must span these three dimensions. *Readiness* refers to the pre-disruption phase, where specific response strategies are planned in terms of their activation (when, where, which risk or disruption), (Knemeyer et al, 2009) and measurement (Chowdhury and Quaddus, 2016), risks and disruptions are anticipated and warning signals are incorporated in the decision-making process (Pettit et al, 2010). In particular, planning for flexibility, visibility, velocity/responsiveness, redundancy is emphasized in multiple studies (Juttner and Maklan, 2011; Pettit et al., 2010; Ponomarov and Holcomb, 2009) as a contributor to the increased level of readiness.

Reaction refers to the post-disruption capability, i.e. to the ability to quickly respond to the risk or disruption by reconfiguring resources (Chowdhury and Quaddus, 2016), organizational or supply chain structure or by switching to decision making under new circumstances. Reaction might result in avoidance, transfer, application of particular mitigation strategy (e.g. flexibility, responsiveness, or other) or acceptance of risk or disruption (Waters, 2011).

Recovery refers as well to the post-disruption capability, i.e. ability to return to the same or better state after a disruption. Recovery requires managing selected mitigation strategies in the post-disruption period and driving supply chain performance towards pre-disruption levels (c.f. Sheffi and Rice, 2005).

While numerous studies investigated the contribution of response strategies to increased supply chain resilience in general, a very limited number of studies (e.g. Christopher and Peck, 2004; Juttner and Maklan, 2011; Scholten and Schilder, 2015) considered which response strategies have the highest effectiveness in which dimension of resilience and how knowledge sharing might enhance their efficiency.

Knowledge sharing in supply chain

The success of a supply chain lies in its ability to successfully control the flow of goods, services, money, and information across its various nodes and actors, and the failure of any of the links can lead to severe disruption in this flow (Desouza et al., 2003). Additionally, the complexity of modern supply chains has been observed to exhibit a mix of parametric as well as strategic choice decisions, which in turn defines the strategies adopted by the stakeholders in the supply chain (Sudhindra et al., 2019). In this context, one of the strategies to optimize supply chain operations has been effective knowledge management and sharing across the supply chain. Knowledge sharing, which can be stated as "the act of making knowledge available to others..." (Ipe, 2003, p. 341), as well as the quality and reciprocity of knowledge, involve the action of exchange of knowledge among individuals as well as across the organization. Further, the effective (and efficient) flow of knowledge among the various interfaces of supply chains is extremely critical to its success (Desouza et al., 2003). Thus, knowledge sharing in supply chains aid organizations to reduce their costs and improve its performance (Barnstein et al., 2015; Cerchione and Esposito, 2016), along with improving the customer-supplier relationship (Hult et al., 2006). Additionally, sharing of knowledge across the supply chain can also lead to inter-organizational collaboration, which involves combining capabilities and

resources for all parties, which in turn might lead to gaining sustainable competitive advantage (Cheng et al., 2008).

The current business environment, where decision making is becoming highly chaotic and complex in nature, managing and sharing knowledge, both explicit as well as tacit, makes it easier to address the uncertainties (Shih et al., 2012). While tacit knowledge represents "...non-codified, disembodied knowledge that is acquired via informal take-up of the learned behavior of procedures" (Howells, 1996, p. 92), explicit knowledge can be stated as "...know-what" that is described in a formal language, print or electronic media, often based on established work processes, use people-to-documents approach" (Smith, 2001, p. 314). A few studies suggest that tacit and explicit knowledge can also be an important component of an organization's (and its supply chain's) resiliency strategy (Handko et al., 2018; Johnson et al., 2013; Jüttner and Maklan, 2011; Ole-Hohenstein et al., 2015; Pettit et al., 2010, 2013; Sheffi, 2005).

The *Social Exchange Theory (SET)* (Blau, 1964) and the *Theory of Planned Behavior (TPB)* (Ajzen, 1991) have been considered as the theoretical foundation behind the constructs associated with knowledge sharing in multiple studies (Gagné, 2009; Nguyen et al., 2019; Ryu et al., 2003; Wang et al., 2015). According to SET, an individual may be involved in an exchange of resources with the intention of receiving something (Yan et al., 2016), where the benefits from the exchange can be either tangible or intangible (Liang et al., 2008). Further, TPB, which is "an individual's intention to perform a given behavior" (Ajzen, 1991, p. 181), can be comfortably linked to knowledge sharing, which is once again an action that is not unconscious but rather is a planned action (behavior) with one or multiple specific intentions (Wang et al., 2015). Both SET and TPB have been used in previous knowledge sharing research (Gagné, 2009; Wang et al., 2015; Yan et al., 2016) and thus the current study decided to use these as the fundamental theories behind the derived constructs and hypotheses.

Knowledge sharing and supply chain resiliency

Jüttner and Maklan (2011), in their study on supply chain resiliency, argued that effective knowledge management can aid in a better understanding of the disruptions, and in turn lead to a more resilient supply chain. Their findings were subsequently supported by Scholten and Schilder (2015), who argued that mutually created knowledge through sharing and management can lead to greater visibility, flexibility, and velocity in the supply chains exposed to large disruptions – which in turn translates to more resilient supply chain. Additionally, social capital, which can be considered as an important antecedent to knowledge sharing (Ganguly et al., 2019), has also been observed to play an important role in supply chain resiliency (Johnson, et al., 2013), especially as the four facilitators of resiliency (velocity, visibility, collaboration, and flexibility), as discussed by Jüttner and Maklan (2011). Further, adaptability, flexibility, and agility, which is known to serve as three fundamental attributes of a resilient supply chain (Christopher and Peck, 2004), and knowledge management (and sharing) can serve as key enablers to achieve the same, and hence supply chain resiliency (Kong and Li, 2008). Additionally, effective knowledge sharing across supply chains can provide the members with prior knowledge on supply chain disruption, which, through the reduction in the time for event detection, can improve the event readiness of the supply chain (Jüttner and Maklan, 2011; Manuj and Mentzer, 2008). Finally, sharing important information and knowledge across the various components of a supply chain can lead to the establishment of joint collaborative efforts, which can also be considered as an important resiliency strategy

(Johnson et al., 2013; Jüttner and Maklan, 2011; Ole-Hohenstein et al., 2015; Pettit et al., 2010, 2013; Sheffi, 2005).

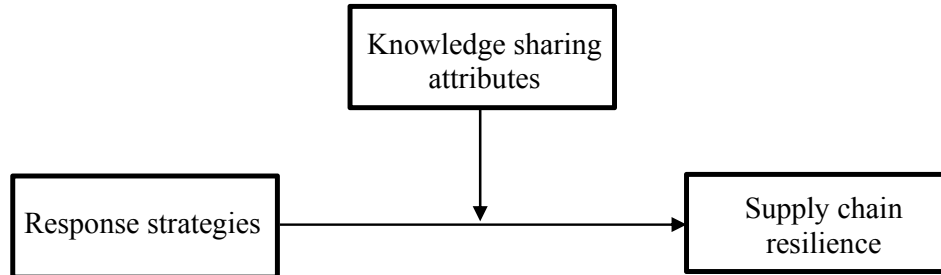


Figure 1. Research model

Knowledge sharing and response strategies

Sharing of knowledge of information across the supply chain can lead to increased visibility, which in turn might improve the resiliency of supply chains. Supply chain visibility can be stated as the degree of shared understanding that the actors in a supply chain have regarding information that they request, and that too without any delay, distortion, or ambiguity (Hofstede, 2003). Visibility across the supply chain can aid an organization to identify potential disruptions, often proactively, thereby not only mitigating risks but also enhancing the resilient character of a supply chain (Brandon-Jones et al., 2014). Thus, information or knowledge sharing plays a role of utmost importance in optimizing the visibility of a supply chain (Dubey et al., 2017), and subsequently, in its resiliency. Additionally, flexibility in supply chains, which can be considered as one of the foremost weapons in achieving supply chain resiliency (Christopher and Peck, 2004), increases the complexity of the supply chain and the key to the success of supply chain flexibility lies in having a clear understanding of the decisions that will have a greater influence on the overall performance, which can be achieved by effective sharing of knowledge (Wadhwa and Saxena, 2007). Additionally, Blome et al. (2014), in their study on supply chain complexity and flexibility, determined that an organization's internal as well as external knowledge transfer process had a direct relationship with the flexibility of its supply chain. Further, a prior study conducted by Chow et al. (2008) also indicated that information sharing between purchasers and suppliers, along with other factors, positively affects the flexibility of a supply chain as well as business performance. Finally, it is worthwhile to mention that the role of information and knowledge sharing in enhancing the responsiveness of a supply chain, which can be stated as another foundation stone for supply chain resiliency has also studied in prior research (Handfield and Bechtel, 2002; Lim and Lee, 2020).

Research methodology and the validation context

The current study embarks on the quest to investigate the role of knowledge sharing, knowledge quality, and knowledge reciprocity on supply chain resiliency.

The primary objective of the current study was to analyze the role of knowledge sharing on supply chain resiliency, especially in the context of the food industry. The current study aims to answer a research question: *What is the role of knowledge sharing in enhancing the resilience of a supply chain by efficient and effective use of response strategies?* Furthermore, the study also aims to seek answers to the following two concatenate questions as given below

1a. What is the influence of knowledge quality in creating a resilient supply chain through efficient and effective use of response strategies?

1b. What is the influence of knowledge reciprocity in creating a resilient supply chain through efficient and effective use of response strategies?

Based on an in-depth literature review on knowledge sharing and supply chain resiliency related elements, in this study, we intend to develop a set of hypotheses and subsequently quantitatively validate them. The proposed hypotheses are validated through a primary survey gathered from the professionals and experts associated with the food industry. The rationale behind selecting the food industry is the level of complexity of its supply chains (Skilton and Robinson, 2009), as well as susceptibility to internal and external disruptions (Dani and Deep 2010; Vlajic et al, 2012), thereby requiring it to be even more resilient. The survey responses will then be analyzed using the statistical technique of structural equation modeling, and the findings will be discussed in context to the extant literature. The limitations of the current study, conclusions are drawn from the current study and future research avenues will also be discussed.

Conclusion and expected findings

As observed from the extant literature, the complexity of modern supply chains has rendered them more vulnerable to disruption, and therefore, building an effective strategy to combat the disruption forms a very important component of an organization's business model. A resilient supply chain, that has the capability to bounce back from unforeseen, negative disturbances, can prove to be an effective strategic tool in the hand of organizations. In this context, effective sharing of knowledge (and information) across the various components of the supply chain can greatly aid in making it more risk-averse, and therefore resilient in nature. Additionally, with the food supply chain being even more vulnerable to disruption due to its complex and perishable nature, is it expected that its supply chain should be even more resilient. The study expected to find that both explicit as well as tacit knowledge has a significant and positive role to play in supply chain resiliency, along with the quality and reciprocity of the shared knowledge. The findings of the current study are expected to aid the supply chain managers and policymakers of the organizations to better understand the role of knowledge sharing in improving the resiliency of their supply chain, and design strategies and policies accordingly.

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