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## Towards a relational framework for supply chain resilience

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**Abstract:** Increases in disruptions coupled with enhanced competition have led firms to develop capabilities to sustain performance and enable them to gain competitive advantage. This has underscored the value of supply chain resilience. Supply chain is a network of multiple firms involved in an exchange relationship; hence, developing effective supply chain resilience requires stronger relationship and collaboration between the associated partners. This forms the foundation for investigating supply chain resilience using a relational view. With the help of theoretical lenses like resource-based view and relational view of firm coupled with dynamic capabilities theory, the study argues that a suitable combination of several relational resources such as trust, commitment, communication, cooperation, adaptation and interdependence will determine the effectiveness of supply chain resilience as a dynamic capability. Accordingly, the study aims to investigate the relationship between these relational resources and supply chain resilience. Further, these relationships might alter with varying levels of environmental uncertainty. To explore this, the moderating roles of environmental uncertainty on these relationships are also considered. Suitable outcomes like supply chain security culture and supply chain business continuity planning are also discussed.

**Keywords:** relational view; supply chain resilience; security; continuity; relational attributes.

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### 1 Introduction

The key challenge to supply chain managers is to maximise customer service. There is a continuous challenge to ensure the availability of the right product or service when a customer demands, while reducing costs (Sheffi, 2005a). The complexity of supply

chains increases with their global reach, reduced product life cycles and ever increasing customer requirements. Consequently, breadth of supply and delivery options expands increasing the associated risk and vulnerability because transportation risks, cultural risks or exchange rate risks gain importance (Berry, 2004). As firms opt for outsourcing, additional dependencies are created adding to the increasing complexity (Juttner et al., 2003).

Most of the supply chain activities have an inherent risk that an unexpected disruption might occur. All these made businesses realise that supply chain disruptions can cause undesirable operational and financial impact. Disruptions such as the loss of a critical supplier, a major fire at a manufacturing plant, or an act of terrorism can adversely impact both revenue and cost. These can lead to lost sales, reduced market share and increase in costs due to expedited logistics services. Also catastrophes such as 9/11, Hurricane Katrina, or the Tsunami in 2004 had allied consequences. For example, after the terrorist attacks of September 11, 2001, Ford and Toyota had to stop their production at their manufacturing plants in the USA due to significant delays in delivery of parts coming from foreign countries (Sheffi, 2001). Maple Leaf Foods recalled their products utilising best practices following the listeriosis crisis in 2008 and this step significantly helped the firm to regain trust of the public in their products (Beauchamp and Littlefield, 2012)

Other examples are delayed deliveries due to quality problems or a complete loss of a supplier caused by its insolvency. In December 2001, Land Rover had to worry about the production of its key model discovery since its only supplier for Chassis, UPF-Thompson; filed for bankruptcy (Sheffi and Rice, 2005). The reader is referred to Chopra and Sodhi (2004), Martha and Subbakrishna (2002), Sheffi (2001), and Sheffi and Rice (2005) for more details. Even the popular network risk called the bullwhip effect that describes the amplification of inventory when moving up the value chain (Lee et al., 1997) can also lead to financial losses for a firm amongst others like negative image or bad reputation eventually accompanied by a loss in demand as well as damages in security and health (Juttner et al., 2003). In the light of these risks and their inherent consequences, it can be assumed that the performance of a supply chain will be affected negatively (Thun and Hoenig, 2011).

Therefore, increased customer expectations, more global competition, longer and more complex supply chains, increased environmental uncertainties, etc. cumulatively stress the need for the management of risks within a supply chain. Hence, supply chain risk management can lead to increased value for firms as such assessment mechanisms entail monitoring and evaluation of every step from raw material to end-product consumption, with corresponding impacts on both operational and financial regimes (Ratick et al., 2008).

To combat exposure to various risks, supply chains must be designed to mitigate disruptions, provide an efficient and effective response, and be capable of recovering to their original state or even better post the disruptive event. This gives the essence of supply chain resiliency (Ponomarov and Holcomb, 2009).

Though 'supply chain risk management' and 'supply chain resilience' sometimes used interchangeably, there exist an important distinction between the two. While the former focuses on the identification, assessment and mitigation of risks for supply chains in order to reduce its vulnerability (Juttner et al., 2003), supply chain resilience aims at

developing the adaptive capability to prepare for unexpected events and to respond to disruptions and recover from them.

Supply chain resilience assumes that not all risk events can be prevented (Jüttner and Maklan, 2011).

Since inception, resilience has been a multidisciplinary and multifaceted concept. Originally, being a subject of scientific research for many years in psychology and ecosystems; recently, it is a subject of interest in relatively new emerging disciplines such as risk management and supply chain management. Still, supply chain resilience lacks sufficient empirical investigation except a few (e.g., Jüttner and Maklan, 2011; Blackhurst et al., 2011). Mostly conceptual works can be cited to date which either review the literature and provide definitions (Rice and Caniato, 2003; Ponomarov and Holcomb, 2009) or guidelines based on best practice examples (Sheffi, 2005b).

Pettit et al. (2010) conceptualised supply chain resilience as a state that can lead to enhanced performance when vulnerabilities are matched with capabilities. Ponomarov (2012) in his dissertation investigated for the antecedents and consequents of supply chain resilience from a dynamic capability perspective and found supply chain management capabilities and information management capabilities act as positive and supply chain vulnerability as negative antecedents to SC resilience. On the consequences side, the study found supply chain resilience to enhance supply chain capital and knowledge development while reducing supply chain process variability. Zsidisin and Wagner (2010) found in their study of supply chain risk sources on disruption occurrence, a significant moderating impact of supply chain resiliency practices. They measured supply chain resilience in terms of redundancy and flexibility in supply chains.

But supply chain, being a network of organisations, consists of entities engaged in exchange relationships and working in collaboration for ensuring overall profitability and success. As disruptions are inherent, therefore, the importance of relational attributes (for e.g., trust, commitment, etc.) in integrating supply chain partners for effective supply chain resilience cannot be undermined. Supply chain studies have repeatedly underscored the importance of various relational attributes like trust, commitment (Johnston et al., 2004), mutual adaptation (Mukherji and Francis, 2008) including supply chain relationship quality (Fynes et al., 2004, 2005a) and buyer-supplier partnership quality (Srinivasan et al., 2011) in models explaining supply chain performance under contingencies. But the field lacks in investigation on supply chain resilience using the lens of relational exchange. Therefore, the following study attempts to address the corresponding gap in the literature.

Specifically, the study tries to address the following questions:

- 1 What are the important relational attributes for ensuring effective supply chain resilience?
- 2 What is the relative importance of specific relational attributes for building resilient organisations?
- 3 What are some of the outcomes of supply chain resilience?
- 4 What are the ways to measure supply chain resilience, the antecedents and outcomes?

## 2 Theoretical background

### 2.1 Supply chain resilience: a dynamic capability

Two main theoretical lenses have been used to develop the proposed framework – resource-based view (RBV) (Barney, 1991) and relational view (Dyer and Singh, 1998) of firm. RBV of firm have been extensively employed for investigating various aspects of supply chain operations. The extent to which a firm can gain a competitive advantage largely determined by its capacity to properly deploy its resources and capabilities which are often rare, valuable, not substitutable and difficult to imitate (Barney, 1991). These resources and capabilities are often viewed as total tangible and intangible assets that may comprise a firm's management skills, processes and routines, etc. (Barney, 2001). Since the resources and capabilities possessed by various firms are different, hence their performance (Wernerfelt, 1984). While resources are viewed as a collection of factors owned and or controlled by a firm; capabilities are viewed as a capacity to deploy these resources (Amit and Schoemaker, 1993).

This was later extended by Teece et al. (1997) through dynamic capabilities theory. The theory examines how firms integrate, build and reconfigure their internal and external firm specific competencies to match their turbulent environment (Teece et al., 1997). The theory aims to understand how firms use their dynamic capabilities to create and sustain a competitive advantage by reacting positively to environmental uncertainties (Teece, 2007).

Supply chains are network of inter-connected firms; therefore, the importance of relationship dimensions cannot be undermined in emanating a better performance. In fact, studies have been instrumental in developing the linkage between supply chain relationship quality and supply chain performance subjected to different uncertainties like demand, supply and technological (Fynes et al., 2004), customer type, competitive intensity, technological turbulence (Fynes et al., 2005a), etc.

Stronger relationships are based on several relational attributes. Previous studies have underscored the importance of various relational attributes like trust (Spekman and Strauss, 1986), commitment (Dwyer et al., 1987; Moorman et al., 1992; Morgan and Hunt, 1994), communication (Mohr and Spekman, 1994; Olkkonen et al., 2000), cooperation (Anderson and Narus, 1990; Frazier and Rody, 1991; Landeros and Monczka, 1989) adaptation (Heide and John, 1988) and interdependence (Heide and John, 1988; Fynes et al., 2005b) in fostering better relationships and developing capabilities. The importance of these relational attributes is enhanced during environmental uncertainties in binding supply chain partners for ensuring optimal performance (Srinivasan et al., 2011).

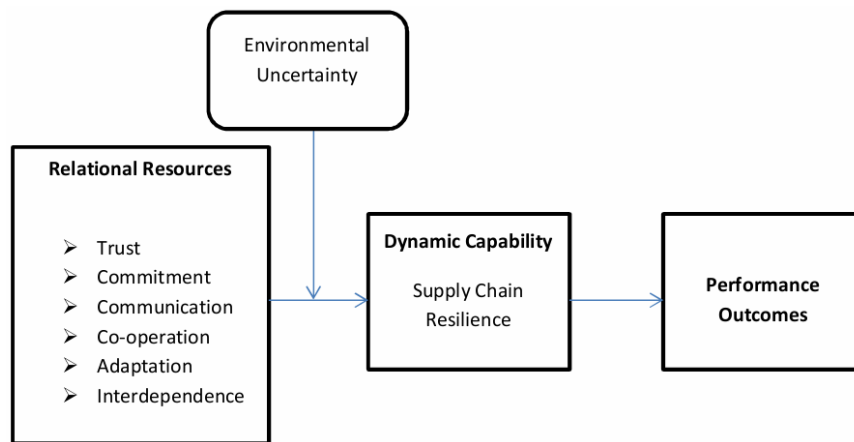
Dyer and Singh (1998) complement this perspective as they argues that relational rents generated through such capabilities can often lead to sustained competitive advantage as they are often difficult to understand by others and. This is complemented by other relational view studies who argue that close supply chain partnerships between the focal firm and its suppliers are difficult to imitate because of the presence of partner-specific causal ambiguity (Dyer, 1996). Also, potential firms with complementary resources are normally rare (Dyer and Singh, 1998). Thus, relational view of firm suggests integration of relational resources.

Gligor and Holcomb (2012) adopted the relational view to explain the relationship between relational resources of communication, coordination and cooperation and supply

chain agility. They argued that the relational view of firm complemented the RBV and also it is more appropriate for investigating capabilities; especially in a supply chain context as it involves multiple entities involved in an exchange relationship.

Accordingly, the current study posits that relational resources are necessary to develop dynamic capabilities (e.g., supply chain resilience) in supply chains. This is in line with the definition of capabilities (i.e., capacity to deploy resources in a suitable manner to match the context, e.g., the environment) (Amit and Schoemaker, 1993; Teece et al., 2007). Further, as firms interact, exchange of know-how takes place that further helps in developing performance outcomes (Powell, 1998).

**Figure 1** Theoretical framework (see online version for colours)



## 2.2 Supply chain resilience

The concept of resilience has been explored in multiple ways across different domains. It was first investigated in ecology by the Canadian ecologist Holling (1973) who observed that systems have two distinct properties: resilience and stability. Resilience determines the ability of systems to absorb changes, and stability is the capacity of systems to return to an equilibrium state after a temporary disturbance. The faster a system returns to equilibrium, the greater its stability. There is an implicit assumption of stability in the system; without stability there would be no presumed return to the pre-disturbance state, but rather an adjustment to some new equilibrium level that could be better or worse than the previous state (Clapham, 1971). Though resilience has been investigated differently, Ponomarov and Holcomb (2009) through an integrated review attempted to witness the concept from different perspectives for, e.g., psychological perspective, economic perspective, organisational perspective, emergency management and sustainable development perspective and finally supply chain risk management perspective. Table 1 is a list of definitions proposed by different researchers.

Thus, resilience has multidisciplinary perspectives. But a unifying theme in all of them is the sustenance of operations. Accordingly, the current study posits supply chain resilience as – the ability of a supply chain to sustain operations profitably when faced with disruptive events. Adopting a relational view and dynamic capabilities perspective,



literature is “the firm’s belief that another company will perform actions that will result in positive actions for the firm, as well as not take unexpected actions for the firm, that would result in negative outcomes for the firm” [Anderson and Narus, (1990), p.45]. Different type of trust exists like contractual trust, competence trust and goodwill trust (Fynes et al., 2005b). Zaheer et al. (1998) further distinguished between interpersonal trust and inter-organisational trust. Moorman et al. (1993) refer to trust as the willingness to rely on an exchange partner in whom one has confidence. Morgan and Hunt (1994) referred to trust as “a firm’s belief in its partner’s trustworthiness and integrity”. Pruitt (1981) defines trust as the belief that a party’s word is reliable and that a party will fulfil its obligation in an exchange. This definition indicates a firm’s willingness to collaborate. Zand (1972) argues that absence of trust will prohibit information exchange and will hamper joint problem efforts. In exchange relationships, the presence of trust will facilitate better stress management and adaptive capability (Williamson, 1985). Therefore, for building effective supply chain resilience, the importance of trust between supply chain partners cannot be undermined. Accordingly, the study proposes:

P1 A greater level of trust between supply chain partners is positively associated with supply chain resilience.

### 3.1.2 Commitment

The willingness of trading partners to apply effort due to the relationship is referred to as commitment (Porter et al., 1974). Quite frequently it indicates a firm’s attempt to build a relationship that can be sustained in times of problems and contingencies (Gundlach et al., 1995). High levels of commitment develops the platform in which both parties to exchange can realise joint goals without any opportunistic behaviour (Cummings, 1984). Committed parties are willing to invest in transaction-specific assets, demonstrating that they can be relied upon to perform essential functions in the future (Anderson and Weitz, 1992). This investments help in arriving in stabilising supply chain relationships and eliminate the uncertainty of continually searching and forming new relationships. There has been a positive relationship between commitment and relationship success (Mohr and Spekman, 1994). Therefore, the culmination of commitment from all partners in a supply chain is necessary for developing any kind of capability, particularly in during uncertainties. Accordingly, the study formulates the next proposition:

P2 A greater level of commitment between supply chain partners is positively associated with supply chain resilience.

### 3.1.3 Communication

Many of the problems in supply chain can be attributed to absence of communication between appropriate members. Communication is defined as “the formal as well as informal sharing of meaningful and timely information between firms” [Anderson and Narus, (1990), p.44]. Hence, effective communication is an essential determinant of successful collaboration among supply chain partners. Large (2005) in his investigation of relationship quality obtained efficient communication having a positive effect on successful supply chain management. Accordingly, communication is absolutely necessary for supply chain partners to develop relationship (Luc, 2006). There are three aspects of communication behaviour that are important in relationships (Mohr and

Spekman, 1994). Firstly, the quality of the communication is important which includes aspects such as accuracy, timeliness, adequacy and credibility. Secondly, the form of information sharing or the extent to which critical, and sometimes proprietary, information is exchanged. Thirdly, the extent to which both parties jointly engage in planning and goal setting. The quality of communication, information sharing and participation are all significant predictors of successful supply chain relationships (Mohr and Spekman, 1994). Thus, for building an effective capability to recover from disruptions, the importance of quality communication, information sharing and participation cannot be undermined. Accordingly, the next proposition can be formulated as:

- P3 A greater level of communication between supply chain members is positively associated with supply chain resilience.

### *3.1.4 Cooperation*

Cooperation refers to situations where firms work together to achieve mutual goals (Anderson and Narus, 1990). Although conflicting actions and cooperative behaviours can co-exist, researchers (Frazier and Rody, 1991) suggest that presence of cooperation does not mandate the absence of conflict. Parties in an exchange can continue to cooperate in spite of having conflicts over serious issues; may be due to high cost of relationship termination. Similarly, cooperation is not the same as acquiescence since the former is proactive and the latter is reactive (Morgan and Hunt, 1994). Cooperation also implies coordination is central to building effective relationships as highlighted in relationship marketing studies (Morgan and Hunt, 1994). Cooperation in various processes for, e.g., in information exchange on productions schedules, new products/processes and value analysis can lead to reduced costs and improved processes (Landeros and Monczka, 1989). Thus, cooperation among supply chain partners is crucial for the development of supply chain resilience. Accordingly, the study proposes:

- P4 A greater level of cooperation between among supply chain partners is associated with supply chain resilience.

### *3.1.5 Adaptation*

Asset specificity is a crucial dimension of any transaction as buyer-supplier after making an investment will involve and operate in a bilateral exchange for a considerable time (Williamson, 1981). Hence, the need of adaptation that refers to the extent to which buyer and seller make sufficient investments in a relationship (Ford and Håkansson, 2006). In supply chain relationships, suppliers have to adapt to specific needs of customers and customers have to adapt to specific supplier capabilities (Fynes et al., 2005b). Hakansson (1982) suggests that such adaptation occurs by investment in transaction-specific assets for, e.g., product/process technology and human resources. Adaptation becomes important mainly because of costly and non-transferable investments, necessary for business and may have strategic consequences for firm's competitiveness. Although, the mechanism of adaptation is still unknown, the extent of adaptation is a determinant of relationship success (Woo and Ennew, 2004). Greater adaptation ensures the tendency to continue relationship both for buyer-and-seller. Hallen et al. (1991) found adaptation as an effective driver of working business relationships. Fynes et al. (2004) found adaptation



to be a crucial component of supply chain relationship quality. Therefore, higher the adaptive capability between supply chain members, greater is the effectiveness of supply chain resilience. Accordingly, the next proposition is formulated as:

- P5 A greater level of adaptation between supply chain members is positively associated with supply chain resilience.

### 3.1.6 Interdependence

Firms in supply chain need to maintain exchange relationships for achieving desired goals. This is referred to as dependence (Frazier, 1983). Dependence can be viewed in two ways. First, dependence may be defined in terms of a relationship between one party (usually supplier) on another party (usually buyer). Second, the power one party has over another may be due to dependence, usually due to a high percentage of a supplier's output going to one buyer (Handfield and Bechtel, 2004). But in a market with limited suppliers, buyers will have limited interest in negotiating with suppliers. Exchange relationship sometimes makes both the parties to depend on each other (Gundlach and Ernest, 1994). The structure (magnitude and relative asymmetry) of this bilateral dependence establishes the extent of interdependencies exchange relationship (Mohr and Nevin, 1990). Therefore, "interdependence exists whenever one actor does not entirely control all of the conditions necessary for the achievement of an action or for obtaining the outcome desired from the action" [Pfeffer and Salancik, (1978), p.40]. Interdependence results from a relationship in which both firms perceive mutual benefits from interacting (Levine and White, 1962). However, if a firm becomes more dependent on its suppliers, then it loses its flexibility to respond to environmental changes. Therefore, greater interdependence might adversely affect the capability of a firm to respond to disruptions. Accordingly, the study proposes:

- P6 A greater level of interdependence between supply chain members is negatively associated with supply chain resilience.

### 3.1.7 Moderating role of environmental uncertainty

Environmental uncertainty refers to the degree to which a firm's external environment in terms of its competitors actions, technology, and consumer tastes and preferences, is characterised by an absence of pattern, unpredictability, and unexpected change (Fynes et al., 2004). The success of a firm's strategies depends on the environment in which their partners operate (Holweg, 2005). The allied literature presents two contradicting viewpoints relating to environmental uncertainty.

The first one highlight that firms will collaborate more to reduce uncertainty when it is high (Pfeffer and Salancik, 1978). Based on transaction cost theory, the second one suggests that firms will make efforts to be more self-reliant in times of high uncertainty (Heide and Miner, 1992). Perceived environmental uncertainty has significant impact on a firm's processes (Sutcliffe and Zaheer, 1998). Uncertain environment often mandates high information exchange between partners (Tushman and Nadler, 1978). But transaction cost theory-based literature indicates the difficulty in performance evaluation of partners in uncertain environments (Williamson, 1985). Consequently, it may be difficult for firms to form exchange relationships in such environments (Williamson, 2008).

However, the current study posits that as per RDT, a firm cannot produce everything alone and has to depend on other firms for complementary resources. Hence, the presence of strong relationships will not only help in procuring essential inputs; but will enable both partners to an exchange to perform better under normal circumstances and recover effectively when encountered with environment uncertainties. Studies have portrayed that stronger supply chain relationships are important predictors of performance in times of environmental uncertainties (Fynes et al., 2004, 2005a). This leads to the following argument: greater the environmental uncertainty, stronger is the relationship between the relational resources and the dynamic capabilities.

This forms the ground for the next segment of propositions:

- P7a The greater the environmental uncertainty, the stronger the relationship between trust and supply chain resilience.
- P7b The greater the environmental uncertainty, the stronger the relationship between commitment and supply chain resilience.
- P7c The greater the environmental uncertainty, the stronger the relationship between communication and supply chain resilience.
- P7d The greater the environmental uncertainty, the stronger the relationship between cooperation and supply chain resilience.
- P7e The greater the environmental uncertainty, the stronger the relationship between adaptation and supply chain resilience.
- P7f The greater the environmental uncertainty, the stronger the relationship between interdependence and supply chain resilience.

### *3.1.8 Outcomes of supply chain resilience*

Though there can be several outcomes of supply chain resilience, but mainly three constructs are of interest in this study mainly because of recent importance such as:

- 1 supply chain security culture
- 2 supply chain innovation
- 3 supply chain business continuity planning (BCP).

### *3.1.9 Supply chain security culture*

The disastrous events of September 11, 2001 (9/11) have alarmed many firms regarding the security of their business operations. The consequences are of more significance to supply chains recently due to their global spread, integrated and complex nature and involve many firms. Many US-based supply chain firms have become aware of these issues and are participating efforts in securing their supply chain (Eggers, 2004).

Therefore, supply chain security has become an essential part of supply chain risk management. Due to its complex nature, supply chains are inherently vulnerable to disruptions, and the failure of any one element in it could cause the whole network to fail [Rice and Caniato, (2003), p.22]. Disruptions have negatively impacted business operations, whether intended or unintended (Hendricks and Singhal, 2005).

The post 9/11 era witnessed implementation of security initiatives mainly to reduce vulnerabilities and associated risk. Some organisations have to implemented various security initiatives for regulatory compliance or participating in public-private partnerships (PPPs), such as The Customs-Trade Partnership Against Terrorism (C-TPAT), that provide supply chain performance benefits to participants (Martens et al., 2011). The latter collaborations illustrate that a firm may realise both security and non-security benefits from security initiatives and investments (Peleg-Gillai et al., 2006).

Supply chain security has been defined as (Closs and McGarrell, 2004):

“The application of policies, procedures, and technology to protect supply chain assets(product, facilities, equipment, information, and personnel) from theft, damage, or terrorism and to prevent the introduction or unauthorized contraband, people or weapons of mass destruction into the supply chain”

Thus, supply chain security is also concerned in protecting the supply chains from various unwanted and unexpected events. Hence, the security initiatives may include arrangements to protect the supply chain from environmental uncertainties as well. Therefore, the study argues that developing a dynamic capability directed towards recovery of supply chain operations to the original state profitably is also an important step in creating a supply chain security focus across the firm. This indicates that creation of such a capability might create security as a norm for the employees.

Organisation culture is defined as:

“the pattern of shared values and beliefs that help individuals understand organizational functioning and thus provide them norms for behavior in the organization.” [Desphande and Webster, (1989), p.4]

In accordance with the above definition, the study argues that supply chain resilience has the potential of establishing supply chain security as a norm, a priority for the employees of an organisation and requires them to behave and operate accordingly. This gave rise to the concept of supply chain security culture. The above argument suggests supply chain resilience to have associations with supply chain security culture. This rationale leads to the following proposition:

P8 A greater level of supply chain resilience is positively associated with creating a supply chain security culture.

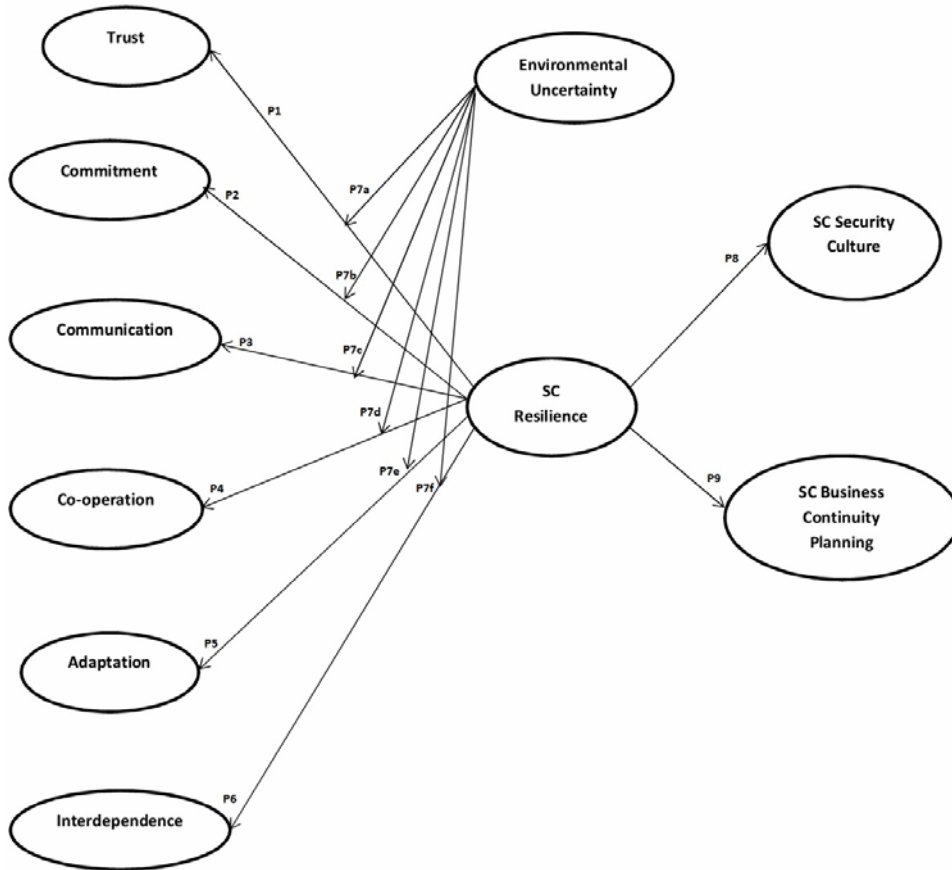
### 3.1.10 Supply chain BCP

Due to ever increasing supply chain disruptions stimulated by nature or human activities, firms have taken a proactive stance on planning and making arrangements for such contingencies well in advance. Firms are adopting an approach to manage these unpredictable disruptions that have an immediate and significant impact on the ability of supply chains in meeting customer requirements. This approach is known as BCP in supply chains (Zsidisin et al., 2005). In fact, managing risk is a key aspect of any business continuity plan.

Savage (2002) indicated the process to consist of various activities, e.g., business risk and impact analysis, identifying and authorising detailed activities for various recovery phases, and implementing the entire process, etc. Bajgoric (2012) indicated several skills and competencies that must be possessed by a system and its administrator to ensure business continuity from a system standpoint. According to Elliot et al. (2010), BCP is:

“planning which identifies the organization’s exposure to internal and external threats and synthesizes hard and soft assets to provide effective prevention and recovery for the organization, whilst maintaining competitive advantage and value system integrity.”

**Figure 2** Theoretical model



BCP in the realm of supply chain consists of four main phases creating awareness, prevention, remediation and knowledge management (Zsidisin et al., 2005) The study also highlights that risk management is central and an undeniable component in supply chain BCP. Supply chain resilience aims to restore supply chain operations profitably under disruptive conditions. Therefore, such a capability acts as remedy whenever a supply chain faces a disruption. Accordingly, supply chain resilience must have a positive influence on BCP in supply chains. Hence, the next proposition can be formulated as:

P9 Greater supply chain resilience will be positively associated with BCP in supply chains.

The above propositions can be summarised in the conceptual model in Figure 2.

#### 4 Managerial implications

The proposed model holds important implications for managers despite being in the conceptual stage. Firstly, managers should understand that recent times urges the presence of trust, commitment, communication, cooperation along with a significant amount of adaptability are all the more important for maintaining effective supply chain relationships. Without these, the benefits of effective collaboration can never be felt to the full. Therefore, supply chain managers must accept that trust with their suppliers and commitment for maintaining the same is vital for mutual existence and optimal performance. The maintenance of the above factors in supply chain relationships urges timely information exchange between the relevant supply chain members. This underscores the importance of communication in supply chain. Without communication it becomes extremely difficult for the partners to understand each other and creates confusion about each other's standing in terms of resources and performance. Cutting-Decelle et al. (2007) discussed various types of supply chain systems and underscored the importance of communication in transmitting relevant and timely information among them. They also highlighted the kind of information that might be required at the critical supply chain junctions depending on the nature of the supply chain.

Secondly, the model suggests managers to collaborate with their partners for preparing for contingencies. This is impossible without the presence of effective relationships between the supply chain partners. Developing capabilities for meeting the environmental changes and uncertainties urges focal firm to collaborate well with each and every member of the relevant supply chain coupled with efficient information exchange between the same. Managers must urge their partners to develop capability to adapt to each other's need for a better 'fit'. At the same time, managers should ensure that their firm is not too dependent on all of its partners and is self-reliant in the main activities and routine operations. In short, a firm should have a certain level of flexibility also in terms of decision making. Lower interdependence is the key for having this desired flexibility.

Thirdly, though the model ignores (to maintain model parsimony) the interrelationships between the relational factors considered, managers must understand that like earlier studies, e.g., Morgan and Hunt (1994), Mohr and Spekman (1994), etc. the above factors are interlinked. This is also fostered by the discussion of the earlier implications in the preceding paragraphs. Hence, supply chain managers should understand that a single factor of those discussed above; though necessary but not sufficient enough for harnessing the benefits of relational exchanges. Accordingly, all the factors are equally important for the maintenance of effective supply chain partnerships.

Fourthly, the model suggests managers to go for stronger relationships in times of environmental uncertainties. Technology will evolve, customer's tastes and preferences will change but to meet these challenges, every member should collaborate with the other one in the chain. This is required for mutual existence and also for performing optimally during such uncertainties. The model also suggests that development of any kind of capabilities in a supply chain mandates the presence of strong relationships which are formed by a culmination of relational attributes of trust, commitment, communication, cooperation, adaptation and interdependence.

Finally, the model suggests that development of capabilities can often lead to the birth of a security culture. This can result due to continuous effort by firm and its suppliers to match the environment. As firm and its supply chain members work in a unified way under contingencies, mutual exchange of values and beliefs take place. This results in an urge to abide by norms for respective members thereby developing a culture of security. Managers must encourage significant interactions to facilitate exchange of ideas and know-how between members. Then only the benefits of the development of capabilities can be felt in future business continuity plans and developing a security culture.

## 5 Conclusions

While past research (Ponomarov and Holcomb, 2009; Pettit et al., 2010; Barroso et al., 2011) discussed supply chain resilience, the current study contributed in two major ways. Firstly, by combining the theoretical lenses of RBV and relational view of firm along with dynamic capabilities theory, the current study formulates a relational model of supply chain resilience. Although relational view been adopted in earlier studies for investigating capabilities in supply chain context (e.g., Gligor and Holcomb, 2012), the study is the first to conceptualise SC resilience as a dynamic capability that is developed based on relational resources and results in suitable performance outcomes. Like other conceptual frameworks, the proposed one also has its limitations. Firstly, being conceptual in nature, the framework must be verified empirically for generalisation purposes. Secondly there must be other relational attributes that might help in developing supply chain resilience as a dynamic capability. The following gives a partial list of further research in this arena.

- What are the inter-relationships between the relational attributes used in the proposed framework of supply chain resilience?
- Do the inter-relationships change according to varying levels of environmental uncertainty?
- What are the other capabilities relevant to supply chain that can be investigated using the developed framework?
- Does there exist any theory that suggests specifically the usage of the above (such as trust, commitment, etc.) relational attributes in investigating relational exchanges in a dyadic setting?
- What are the other relational attributes that can be brought to use in the proposed framework of relational view?
- Does this kind of framework holds good in cases governed by contracts?
- What are the other suitable outcomes that can be investigated using the above framework both in case of supply chain resilience and other similar capabilities in supply chain?

However, the current model must be verified empirically before comparing to other contexts or for generalisation purposes. The study is novel as it underscored the importance of relational attributes in recent days of increasing usage of contracts for

making relational exchanges work appropriately. Future research will ensure how other theories can be used to advance the proposed framework.

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