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Review Article

Conceptualising the moderating role of knowledge management within supply chain risks and supply chain risk management

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Abstract: There is a dearth of empirical and theoretical investigation in the field of supply chain risk management. Even though SCRM is an important component in supply chain management research, there is still a lack of understanding regarding the term and the concept to develop advantageous SCRM. In the literature of SCRM, different aspects have been discussed, for instance, risk identification, risk assessment, risk management strategies, risk monitoring, and contingency plans. Supply chain risks are increasing because of multiple outsourced partners linked with each other making it more complex, along with this, business is also uncertain, so these scenarios increase supply chain risks. Knowledge management has been used to know about the market scenarios and the information of trading partners and supply chain managers from different firms to know about the uncertainty or risks. However, the discussion shows that the efficient implication of KM capabilities on the SCRs and SCRM is still lacking. This paper provides a comprehensive conceptual framework on the effect of knowledge management within supply chain risk and supply chain risk management.

Keywords: supply chain risk; supply chain risk management; knowledge management; transaction cost theory; knowledge-based view

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Abbreviations
SC: Supply Chain. SCRs: Supply Chain Risks. SR: Supply Risk. PR: Process Risk. DR: Demand Risk. FR: Financial Risk. ER: Environmental Risk. SCRM: Supply Chain Risk Management. RI: Risk Identification. RA: Risk Assessment. RMS: Risk Management Strategies. KM: Knowledge Management. KA: Knowledge Acquisition. KA: Knowledge Application. KC: Knowledge Conversion

1. Introduction

Now-a-days, the supply chain risks are increasing drastically due to the internalisation and intense competitive business environment. Indeed, supply chain risks are increasing because, with multiple outsourced partners linked to each other it is becoming more complex, and business is also uncertain, so these scenarios increase the supply chain risks (Cantor, Blackhurst, Pan, & Crum, 2014). Firms are facing serious challenges to cope with SCRs. There is, therefore, an escalating trend to examine how firms can develop effective supply chain risk management. The lack of theoretical and empirical research on the relationship between SCRs and SCRM shows that this area is more attractive for researchers. However, literature highlights that there is a noticeable research gap for studying the relationship and dealing with the interconnectedness or interrelationships of SCRs and SCRM (Prakash et al., 2017).

Different firm activities do possess risks, including management, marketing, finance, and strategic level risks (Lavastre & Gunasekaran, 2014). Several empirical studies conducted on the relationship between SCRs and supply chain performance found negative relationships. The major reason behind this was the improper implementation of the SCRM (Nyamah et al., 2017; Wagner & Bode, 2008). This is because the SCRM aspects are still ambiguous and there is no mutual consent of the researchers. Generally, five aspects of SCRM have been found in literature, i.e., risk identification, risk assessment, risk mitigation strategies, risk monitoring, and contingency plan. An empirical study conducted by Kern et al., (2012) found significant results on the dependency of

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three aspects, i.e., risk identification, risk assessment, and risk management strategies. This study will consider these three aspects of SCRM.

The study of (Stranieri, Orsi, and Banterle, 2017) showed that there is an inconsistent relationship between uncertainty or risk and risk management. In a more recent study, (Akhavan, Shahabipour, and Hosnavi, 2018) argued that environmental complexity and individuals' perceptions are constrictions to the implementation of effective risk management in the supply chain. These scenarios happen because of insufficient knowledge about the appetite of risk and consequence. Noteworthy, Jüttner and Maklan (2011) argued that knowledge management creates more effective SCRM. The study of du Plessis (2007) suggested that firms should be acquiring, sharing, and assimilating information to create knowledge about SCRs. In the continuity of the study by Cantor, et al. (2014), they deployed knowledge management to recognise early disturbances and respond to the SCRs, and developed effective SCRM to overcome all kinds of disruptions. With evidence from literature, the implementation of KM between the SCRs and SCRM is lacking.

SCRs for the present study have been identified from the literature and cross verified from industry experts. It implies that the identified risks are most relevant to supply chains. The present study has categorised SCRs into five risks, i.e., supply risk, process risk, demand risk, financial risk, and environmental risk (Chen, 2013; Louw and Jordaan, 2016; Nyamah et al., 2017; Prakash et al., 2017; and Samvedi, Jain, and Chan, 2013).

According to this perspective of research, the objective of this paper is twofold, the first one aims to shed light on the relationship between SCRs and SCRM and the second objective seeks to determine the moderation effect of Knowledge management between the SCRs and SCRM. To reach this end, this paper answers the following research question: Does there exist a relationship between SCRs and SCRM? Does the KM moderate the relationship between the SCRs and SCRM?

The rest of the paper is organised as follows: Section 2 discusses the literature review and theoretical foundation. Section 3 describes the research methodology and proposed empirical validation of this model. Section 4 discusses the conceptual foundation, which leads to the presentation of the proposed framework's constructs and prepositions. Section 5 concludes the paper.

2. Literature review and theoretical foundation

2.1. Transaction cost theory

There is a dearth of theoretical and empirical research in the field of SCRM (Sreedevi and Saranga, 2017). There are only a few theories that consider SCRM in their theoretical perspectives (Cantor et al., 2014; Kilubi, 2016). Importantly, dependency on different resources creates the need to rely on supply chains and hence, increases supply chain risks (Hillman, Withers, & Collins, 2009). These supply chain risks are only one- amongst several types of risks. The transaction cost theory is the theory that explains the transaction cost of an exchange relationship in order to define the best governance which can be either of market or hierarchy (Coase, 1937).

In regard to the TCT on the field of operations management, more specifically within supply chain management, there needs to be more elaboration (Williamson, 2008). With the continuation of Grover and Malhotra (2003) and Hoffmann, Schiele, and Krabbendam (2013), they argued that there is a need for future transaction cost research to evaluate different supply chain management challenges, supply chain risks, and knowledge sharing with the stakeholders and trading partners.

In the TCT in the field of operations management, more research is required, specifically in the area of supply chain management (Williamson, 2008). Grover & Malhotra (2003) had also pleaded for the support of transaction cost to assess the different challenges which are faced by supply chain management, i.e., investment, coordination problems of information, and the

physical product flow outside the organisation caused by the worldwide supply chain.

The TCT is mostly used for the governance mechanism (Williamson, 1979). Importantly, the TCT is used for studying problems in the inter/external relationships of organisations, especially in the operations management discipline of SCM (Grover & Malhotra, 2003; Williamson, 2008). In their studies, Grover & Malhotra (2003) and Hoffmann, et al. (2013), argued that the TCT will play a major role for studying the efficiency of SCRM. Recent theoretical developments by Miller & Folta (2002) and the empirical findings of Geyskens (2006), Olmos (2010), Das (2001), and Wernerfelt (1986) did not argue any significant relationship with uncertainty or risk and transactional governance. Williamson (1991) defined some supply chain risks, i.e., internal and external risks, and these can be reduced within transaction through the adaptation of governance. The higher the internal risks, the greater the likelihood of the corporate governance forming with high levels of vertical integration. But, external risks are still ambiguous as to the types of governance to adopt for reduction (Stranieri et al., 2017). Based on the above arguments, the TCT focuses particularly on SCRs for the effective implementation of SCRM.

2.2. Knowledge-based view

The KBV of the firm is based on the process of acquiring and organising valuable knowledge to further strengthen the resources and sustain a competitive advantage (Nonaka et al., 1994). Grant (1996) further suggested that an effective organisational mechanism and Synchronisation are important to exploit valuable knowledge. Further research indicates that KM is an important factor for creating and sustaining supply chain structures (Cheng, 2011; Spekman et al., 2002) and is also valuable for effective SCRM. In fact, the knowledge-based view has also reached growing interest in information technology, information systems and innovation management (Nonaka et al., 1994; Santoro, Vrontis, Thrassou, & Dezi, 2018). Thus, Knowledge management regards the identifying and leveraging of knowledge to foster innovation processes. Recent literature suggests that the KBV of the firm is appropriate theoretical background to explain open innovation processes (Vanhaverbeke and cloodt, 2014), in which firms try to have the right internal and external resources in place to create an information sharing mechanism through information technology and innovative services.

Theoretical and extant literature of the KBV suggests that KM may assist firms to move better in areas of new market knowledge through information system and intelligence networks to create supply chains which are more efficient and to develop supply chain risk management strategies to reduce supply chain risks. According to the studies by Grant (1996) and Spekman et al., (2002), they contended that KM potentially bestows a competitive advantage amongst supply chain managers, because it is expected that the KM amongst them will improve the supply chain for effective risk management. Further, Ellinger et al., (2015) argued that, magnificently coping with the complexities within the supply chain will lead to foreseeing disturbances or the reduction of risks.

With the continuation of Ellinger et al. (2015), they argued that KM is focused on developing organisational capacity and contended that continuous improvement assists firms to develop mechanisms to know about the complex environment, identify risks earlier, and prepare for effective SCRM.

The present study has considered that the knowledge-based view is informative to the field of SCRs' literature as well. The researcher will link the knowledge-based view into the present study and analyse how KM across the supply chain can improve SCRM. Based on the above arguments, the KBV is particularly focused on KM as having a moderating effect between SCRs and SCRM.

3. Methodology

The theorization of SCRM is based to identify some of the major concepts that combines to form a theoretical frame work. The development of conceptual frameworks involves a detailed literature review and then from that literature, addressing different aspects of SCRM. The specific purpose of the research design is to justify the evidence and to enable the researcher to respond to the research problems and questions. The purpose of this research is to validate the conceptual model and explain the risk factors in this context. The quantitative method technique has been suggested for this study. The conceptual framework has been developed by using the recommendations of the previous studies and theoretical support, and propositions have also been suggested for further studies. These propositions can be tested by adopting or adapting instruments having high validity and reliability. The study of (Akhtar, Salleh, Ghafar, Khurro, and Mehmood, 2018) suggested that these conceptual models empirically can validate and measure these variables and their relationships with the structural equation model which is one of the most reliable techniques to measure the relationship between concepts and to test propositions. The proposed research design has been given in Figure 1.

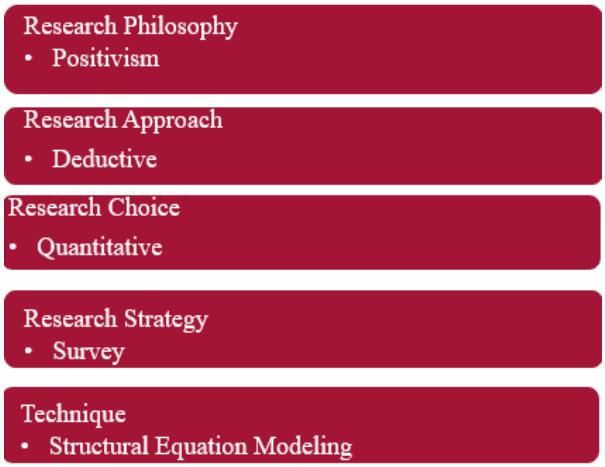

Figure 1. Proposed Research Design

4. Conceptual framework of knowledge management in SCRM

4.1. Supply chain risks

The researchers are showing more interest in the supply chain within the field of operations management (Kern et al., 2012). The supply chain puts emphasis on outsourcing, minimising inventory, being on time, and most importantly it is focused on integration with the firm, developing a much leaner SC. In a world without supply chain risks, such initiatives lead to the most cost-effective operation models with economic benefits for the entire supply chain. However, extreme leanness can also lead to more fragile supply chains (Kleindorfer and Saad., 2005).

Supply chain risks can be categorised in many different ways and from different perspectives, such as from a corporate governance or financial risk agenda, or even in terms of a multi-level complex system and environment volatility (Christopher and Peck, 2004; Norrman and Jansson, 2004). One simple classification can be external (emanating from factors external to the chain) and internal risks, for instance, in such classification can be natural disasters (external) and supplier quality problems (internal) (Kumar, Tiwari, & Babiceanu, 2010).

To identify the risks in the supply chain, the researcher has adopted two methods; in the first phase, extant SCRM literature was used to extract the SCRs. Further, these risks were cross-verified by taking input from supply chain experts. An occurrence of any SCR, i.e., supply risk, process, demand, environmental, and financial risks, can disturb the whole SC. A detail of these risks is given below.

a. *Supply risk:* Suppliers play a critical role in the supply chain, because, mostly, firms depend on outsourcing and rely heavily on them. Supply failures increase the risk of poor quality, delays, product validity, market turbulence, etc. Therefore, it is vital to reduce the upstream and downstream risks of the supply chain (Prakash et al., 2017). For instance, upstream risks are suppliers being unable to deliver supplies (Norrman and Jansson, 2004), input supply quality, and competency (Lockamy and McCormack, 2010). In the study of Norrman and Jansson (2004), they elaborated the perfect example of the supplier failure of Nokia and Ericsson. The researchers further suggested that firms must rely on multiple suppliers for survival.
b. *Process risk:* The process risk is a kind of internal risk originating from the inside of the firms (Prakash et al., 2017). These risks are, machine failure, technological advancement, logistics and infrastructure, management decisions, labour strikes, and quality assurance measures. Recently, because of labour strikes in the Maruti Suzuki plant in India, production was discontinued for almost a month (Shenoi, Dath, & Rajendran, 2016).
c. *Demand risk:* Demand risk is mostly related with the requirements of the product in the market. For instance, the risk that exists in the supply of products from the manufacturer to the end user. It also includes the risk of the desuetude of the products, shortage of stocks, and over inventory (Ali Diabat, 2011). For example, Walls ice-cream was launched in Pakistan during a holy festival, demands increased suddenly, and the firm was unable to meet the requirements and failed to survive in the market for a long time. Market saturation causes an effect on the variation in orders, i.e., insertion, expediting or volume changes, which makes it difficult to predict the demand and increases high demand risk (Jie Chen, 2013). The changes happen because of a shorter product life cycle or a new product in the market (Manuj & Mentzer, 2008). They may also be “provider-induced”; for example, some company offers a sales promotion and order batching, which are the main reasons for an increase in the demand variations (Lee, Padmanabhan, and Whang, 1997; Taylor, 2006).
d. *Environmental risk:* These are the exogenous risks to the firms that can affect one echelon individually or the whole supply chain. Examples are, economic crises, natural disasters, terrorism, political instability, cultural grievances, and weather (Samvedi et al., 2013). Such disasters severely impact on the supply chain depending on where they strike. If a major trading partner in the chain suffers, then all supply chain members will be severely impacted (Kumar and Bhat, 2014).
e. *Financial risk:* Financing is required in every level of the business of the firms. For instance, investment is needed in inputs and to improve production practices; but unfortunately, funds are not always accessible or affordable (Nyamah et al., 2017). Producers cannot accept the financial risk of borrowing to upgrade unless the premium market is assured (Jaffee, Siegel, and Andrews, 2010). Mostly, risks are more concerned with decisions to borrow, because very few firms have the ability to repay the loans (Edmond, Feng, Daniel, and Joseph, 2014). Due to this, financial risk could affect production, market access or purchasing of inputs/seeds (Patrick and Ullerich, 1996). In the study of (Shou et al., 2013), they argued that disruption in the finances has an effect on the financial abilities of the firm and destabilises the planned operations in processing.

4.2. Key focus aspects of Supply Chain Risk Management

In the literature of SCRM, different aspects have been discussed, for instance, risk identification, risk assessment, risk mitigation strategies, risk monitoring, and contingency plans. The present study will consider three aspects, i.e., Risk identification, assessment, and risk management strategies. Kern et al., (2012) validated theoretically and empirically the interdependence of these three aspects and received significant results.

a. *Risk identification:* Some researchers (Behzadi, O'Sullivan, Olsen, and Zhang, 2017; Sodhi et al., 2012; Tummala and Schoenherr, 2011) have argued that SCRM is initiated with risk identification. With the risk identification, the SCRM can trigger any risk management activity with the purpose of discovering all of the related risks (Kumar & Bhat, 2014). Risk identification implies that early forecasting is required to judge the severity of the risk and thus, if it will be further assessed or not (Kern et al., 2012). A holistic approach is required for the proper implementation of risk identification (Septiani, Herdiyeni, and Haditjaroko, 2016), the prevention of risks, and better strategies to reduce potential risks, and continuous screening is needed.
b. *Risk assessment:* After the proper identification of the risk, the researcher proposes the risk assessment (Kilubi, 2016; Wagner and Bode, 2008). The risk assessment is the evaluation of the probability of risks and an estimation of the affect in case a risk event unfolds (Hallikas et al., 2004; Harland et al., 2003; Kleindorfer and Saad., 2005. This will help to assess the necessary in-depth knowledge about the early disturbance in the supply chain and the expected risks identified in order to efficiently prevent them or at least reduce their impacts; and, it will be helpful for risk management strategies (Zimmer et al., 2017).
c. *Risk mitigation strategies:* Risk mitigation strategies are developed to reduce the negative impact of risk on the firms' performances (Jüttner al., 2003a; Tang, 2006). The purpose of the proper implementation of SCRM is to measure the occurrence of risk and its severity, and to develop strategies to reduce the impact of SCRs (Lavastre and Gunasekaran, 2014). Delays often arise when it is difficult to respond to the changes in the market due to a lack of flexibility and knowledge, and because of other issues like poor quality in the process or from suppliers, as well as the difficulty of penetrating the international market, and logistics challenges (Jahre, 2017). The intensive consideration of the identified risks with extensively assessed formation is, thus, important to develop the relevant risk mitigation strategies (Li et al., 2015). After the identification of the risks, then it is important for the prevention of the risks, and these strategies should be effective and suitable for each specific risk (Kamalahmadi & Parast, 2017). Strategies can be effective when proper identification and assessment have been made carefully and accurately; because, risk mitigation strategies mostly rely on the understanding derived from the proper implementation of the initial steps (Li et al., 2015).

4.3. Knowledge Management

The business world is changing from an era of natural resources to an era of knowledge. The world is moving away from natural resources to that of knowledge which is based on research and development, skills and education (Freidman, 2005; Gulbranson & Audretsch, 2008). The basic economic resource is no longer capital, natural resources as well as labour, but rather knowledge (Jelenic, 2011; Khan, 2014). Knowledge has been considered as one of the most important and highly valued assets and commodity (Bhojaraju, 2005; Hegazy & Ghorab, 2014). Xue, (2017) stated that knowledge has become the main source in organizations. Knowledge and the capability to create and utilize the knowledge, are now a centre to transform the global economy. Knowledge has emerged as the main source of economic growth of organisations in the global economy as it is the basis of innovation (Khan, 2014).

Organisations are able to gain, maintain and leverage their knowledge resources by turning to knowledge management initiatives and technologies (Kankanhalli, 2005). Thus, the main goal of knowledge management is to enable the organisations to be aware of their knowledge and shape that knowledge, so that they can effectively and efficiently use the knowledge to further strengthen organisations (Alavi, Leidner, & Kayworth, 2006; Xue, 2017).

The supply chain is a multi-objective system (economic, productive, strategic, environmental, social, etc.) crossed with a variety of flows (financial, material, information, technology, etc.). In such a complex system, the management of the processes of adoption, creation, storage, transfer, sharing, and application of knowledge appears to be the necessary response to the new challenges posed to the SC by globalisation and supply chain risks (Cerchione & Esposito, 2016). Knowledge management is essential in the growing field of supply chain management because multiple sectors are involved within the firm. According to (Chow et al., 2005), KM can be defined as the set of activities that enables the creation, storage, distribution, and application of knowledge in organisations. Indeed, there is a growing interest in the role of KM in the field of supply chain management. A firm's KM capabilities can enable the organisation to manage disruptive events (e.g., parts not being delivered due to a supplier strike) or uncertainty (e.g., parts not being delivered in the expected time frame) in the supply chain (Cantor, Blackhurst, Pan, & Crum, 2014).

The present study describes KM with three different dimensions, i.e., knowledge acquisition, knowledge conversion and knowledge application (Abd Rahman, Imm Ng, Sambasivan, & Wong, 2013; Cantor, Blackhurst, Pan, & Crum, 2014; Hegazy and Ghorab, 2014; Hult, Ketchen, & Slater, 2007; Nonaka et al., 1994). These dimensions are sufficiently broad to permit complete analysis of organisational KM (Abd Rahman et al., 2013). Disruption, i.e., supply failure or uncertainty in the supply chain, can be managed through KM (Cantor et al., 2014). Moreover, lack of research on some dimensions of KM (such as acquisition, conversion and application) in supply chain (Cerchione & Esposito, 2016). So, the present study will provide a major contribution in SCRM and KM research. This study considers three dimensions of the knowledge management, i.e., acquisition, application and conversion.

a. *Knowledge Acquisition:* Acquisition of relevant knowledge enables the firm to understand the market trends and improve its supply chain for sustainability and competitiveness (Afolayan & White, 2016). KA is described in different ways, for instance, obtain, seek, generate, collaborate, and capture. All these are common terms for the acquisition of knowledge (Abd Rahman et al., 2013). As further elaborated by Akhavan et al., (2018), extracting and sharing expertise and experiences from different knowledgeable workers to solve a particular problem and develop understanding for its prevention is another definition. Modifying existing expertise and efficient acquisition of new knowledge are major implications for acquisition (Inkpen & Dinur, 1998). The managers emphasise not to rely, only on the quality of products, but also prefer the advancement and modification of the product, based on the customers' needs at the desired cost (Shakerian et al., 2016). For instance, firm owners require knowledge regarding the performance of outsourced suppliers for manufacturing (Cantor et al., 2014). Because of the knowledge acquisition, the managers will know about the SCRs in the market with existing resources. The collaboration with and capturing of the knowledge from different forums of the market can strengthen the SCRM to improve the performances and reduce the SCRs.
b. *Knowledge Conversion:* In the knowledge conversion process, firms can make use of existing knowledge which is more helpful. In the study of Hegazy & Ghorab (2014), they elaborated that knowledge conversion is the competency of the firms to integrate, share, merge, bind, and codify. Specific knowledge in the particular field may reside in the different departments within the organisation (Abd Rahman et al., 2013). Synchronisation of the knowledge with other firms and experts may taper the redundancy and improve the consistency for the reduction of excess volume (Bouncken & Kraus, 2016). With knowledge conversion, sharing of risk and, strategies, and the prevention of risk with different forums will increase the firm's capacity to manage all

the risks and disturbances. The integration amongst all trading partners, supply chain managers, and firm owners can aid in the development of an effective SCRM process for better performance.

c. *Knowledge Application:* Knowledge application is described by Abd Rahman, et al. (2013) as persuasion, usability, and practising of knowledge. It is basically the capacity of the firm to apply knowledge. Notably, the outputs of the implementation of knowledge has had little attention paid to them (Ouyang, 2015). Wong and Radcliffe (2000) argued that knowledge application becomes the basis for continuous learning and novelty. It is noteworthy, that the implementation of this for the persuasion of supply chain partners and the usefulness of their experiences will lead to knowledge about the risks and help firms to develop strategies for the reduction of SCRs. The practice of using the expert's knowledge for the benefit of value creation and the suggestions for effective practices in the firms, need accurate information to analyse the market scenario in order to reduce the risks and disturbances in the supply chain.

4.3.1 Implementation of Knowledge Management with an Information System

In the current dynamic environment, firms increasingly have to heighten internal knowledge management with information system in order to manage inward and outward flows of knowledge exploiting and exploring external opportunities (Ziemba, Jankowski, Wątróbski, and Becker (2015). Here, knowledge management and information system refers to the ability of an organisation to explore both internal and external knowledge, and to retain knowledge over time within the firm (Santoro et al., 2018). Accordingly, when adopting an open innovation approach, firms tend to build up collaborations with their supply chain partners with their own ecosystem acquiring, conversing and applying of knowledge management (Wang et al., 2015; bogers et al., 2016). Santoro et al., (2018), stated that the role of technology is crucial in removing the boundaries to communication and knowledge flows and therefore can be considered a process of knowledge management.

In fact, modern firms are increasingly developing and implementing information and communication technologies (ICTs) in several business processes in order to increase their efficiency and innovativeness through new methods of knowledge flow and data information gathering (Giudice and Strub, 2011; Giudice and Peruta, 2016). Therefore, knowledge management can be strongly supported by advanced ICTs. In detail, applying knowledge management, means to have an Information system with reference to managing the organisational knowledge and to improving the creation, storage, transfer, and application of the knowledge (Haghighi et al., 2013).

The present study proposed three main components of information systems for effective knowledge management according to the components proposed by Santoro et al., (2018). So that, organisation can benefit from its dissemination.

- IT infrastructures, for instance, physical technology, that help in managing knowledge effectively, i.e., hardware, software components, extranet, intranet and LAN (Soto-Acosta and MeronO-Cerdan, 2008).
- Collaborative technologies, including discussion forums, social media, shared databases, document repositories, and workflows (Merono-Cerdan et al., 2007).
- The ICT adoption, which can integrate different collaborative technologies, and which uses orientation regarding three primary implementation aims (Bafoutsou and Mentzas, 2002; Lopez-Nicolas and Soto-Acosta, 2010): (a) The ICT informative orientation aims at providing commercial information to several stakeholders, across organizational and functional boundaries; (b) the ICT communicative orientation allows cost reductions and interactions with chain partners within and outside the organisation; and (c) the ICT workflow orientation, through which electronic processes within corporate technologies are established.

Traversing the current knowledge-economy era, knowledge management is being significantly affected by the technological processes and collaborative actions between supply chain members. In this context, the information system offers businesses new opportunities and dimensions to improve their knowledge management practices and increase knowledge flow through advanced ICTs.

4.4. Knowledge management in supply chain risk management

The study of Hult, et al. (2007) identifies that the implementation of KM in the supply chain, plays an efficient role for the reduction of uncertainty. Their findings are similar to those of Hult et al. (2004) which related that knowledge advancement occurs in the supply chain structure where the members are synchronised deliberately. With the continuation of Moorman & Miner's (1997) findings, it increases the financial performance of new products in less time, and the strong knowledge sharing process permits the firm to overcome the risks in the supply chain.

Ellegaard (2008) found that, with the implementation of KM with the trading partners and concerned knowledge workers, firms can easily identify the expected disturbances in the supply chain, which may be caused by SCRs. Craighead, et al. (2009) found that knowledge management has a positive influence over a firm's responsiveness to external risks. A study of Jüttner and Maklan (2011) found that knowledge in risk management was proved to impact the supply chain resilience by improving the supply network. Cantor, et al. (2014) presented some significant findings and showed that stakeholders insisted that supply chain managers mitigate risk with knowledge management. Zhang et al.'s (2018) studies found that the implementation of the KM capabilities weakened the negative risk effects of the social system, technical system, and project management, respectively, on business processing outsourcing projects.

The above discussed studies show that, up till now, knowledge management has been used to know about the market scenarios and the information of trading partners and supply chain managers from different firms to know about the uncertainty or risks. However, the efficient implications of KM on the SCRs and SCRM are still lacking.

In this research, there is a need to ensure that the knowledge assets are used effectively to achieve multiple objectives, including; gaining the visibility of opportunities to introduce the novelties in the marketplace, as well as to, respond to potential risks in the external and internal environments. Hence, it is very important for a firm to acquire, share, and assimilate data and information with a view to create new knowledge about risks that exist in its supply chain (du Plessis, 2007). Stated differently, a firm needs to systematically select, distil, and deploy knowledge to identify and respond to risks that exist in its supply chain and develop effective SCRM to overcome all kinds of disruptions in the supply chain (Cantor et al., 2014).

The effectiveness of SCRM is heavily dependent on the intangible capacity of the management. However, KM has been ignored and there is less research in the area of SCRM (Cantor et al., 2014; Rodriguez & Edwards, 2014). The development of KM in SCRM is linked with efficient risk governance, and firms need to change their behaviour and systematically support SCRM.

Akhavan et al., (2018) provided that effective risk management faced issues with implementation, for instance, "environmental complexity" and "individual cognitive constraints". Environmental complexity happens because of a lack of knowledge management, with the concerned trading partners, about the identification of the risks and the firm's aptitude to manage them. Individually, constraint means that it would be difficult to acquire, apply, and convert knowledge into a useful form for the firm.

4.5. Interconnection of the constructs

4.5.1. SCRs and SCRM

According to the TCT advanced by Miller & Folta, (2002), and the empirical findings of Stranieri et al., (2017), there is an inconsistent relationship between the level of uncertainty and hierarchical transaction governance. In contrast, previous studies have found that there is a relationship between uncertainty and risk management (Cardona, 2013). Thus "governance matters" and applying a proper structure of risk management are important parts of the overall process of the optimisation (effective allocation) of resources (Bachev, 2012). For instance, in a supply chain with high risks related to environment, demand, supply, etc., some previous studies (Behzadi et al., 2017; Edmond et al., 2014; and Nyamah, et al., 2017) have demanded effective SCRM to reduce SCRs.

However, there is a visible research gap of studies dealing with the interconnectedness or interrelationships of supply chain risks and SCRM (Prakash et al., 2017). Also, very little attention has been paid to explore the relationship between SCRs and SCRM. The present study will address this gap by proposing a conceptual framework of SCRs and SCRM. Noteworthily, the significance of this relationship is inconsistent in different sectors. A few studies have shown strong positive relationship between uncertainty and risk management, but there are other studies that have shown a negative relationship between these two (Shenhar et al., 2002; Soin & Collier, 2013). On the bases of the TCT, the following propositions have been proposed:

Proposition-1: There is a relationship between SCRs and SCRM.

Proposition-1a: There is a relationship between SCRs and RI.

Proposition-1b: There is a relationship between SCRs and RA.

Proposition-1c: There is a relationship between SCRs and RMS.

4.5.2. Knowledge management moderates the SCRs and SCRM

According to Samuel, et al., (2011), knowledge increases the ability of the firm to synchronise between product development and procedures with the knowledge workers; however, KM converts all databases, intellectual capabilities, and information into useful knowledge and helps with the implementation for strategic levels.

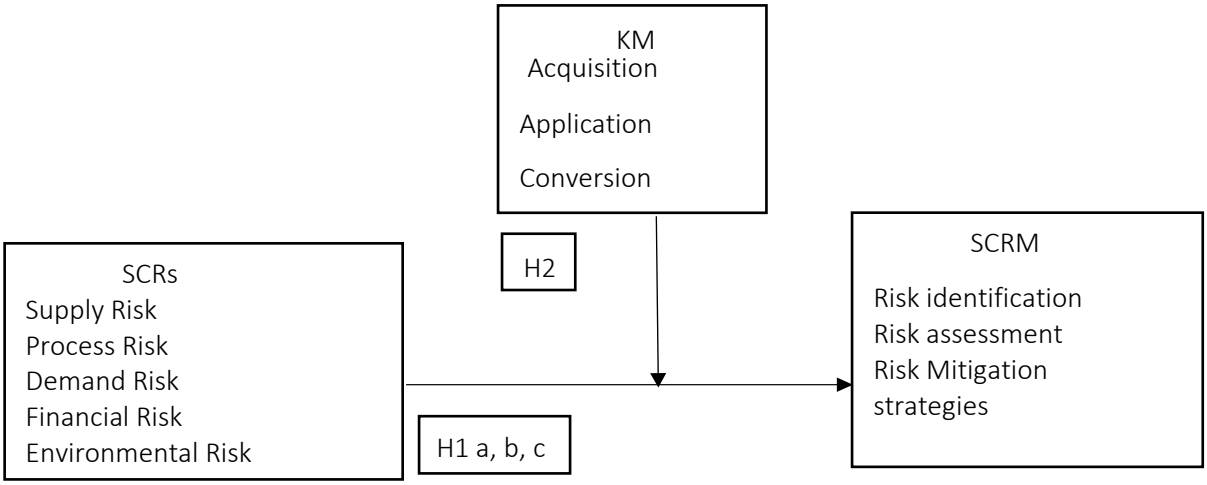

Figure 2. Conceptual Framework of Knowledge Management in Supply Chain Risk Management

Current supply chain management researchers have focused on the operational issues, i.e., managerial, supply chain and networking, and organisations facing difficulties in understanding the managerial issues, now that the concept has been developed that companies are surviving due to individual motivation and preferences for common practising (Samuel et al., 2011).

This research suggests that KM capabilities can help provide efficient SCRM in the field of supply chains for better management of the SCRs. Abd Rahman et al., (2013) used KM as the moderator between an individual and process skills and organizational effectiveness. The results showed that organisational effectiveness improved with KM as the moderator. Recently, in the study of Zhang, et al., (2018), they implemented KM as the moderator between business process outsourcing risks and business processing outsourced projects (reduction of cost and increase of the sustainability of the firm). This research was an early attempt to integrate risks and knowledge management. The researchers indicated that risks negatively affect outsourced projects. The researchers have further suggested that effective risk management happens with the implementation of KM.

The present research uses KM as the moderator between the SCRs and SCRM. Previously, there was an inconsistent and weak relationship between them. Researchers (Singh et al, 2017; Vedel and Ellegaard, 2013; Zhang et al., 2018) have argued that KM is important for effective SCRM. Based on the above arguments and the KBV theory, the following proposition has been proposed.

Proposition 2: KM moderates the relationship between SCRs and SCRM.

5. Conclusions

The results of the present study can be assumed to provide an application to the existing theories of transaction cost theory and knowledge-based view by constructing the conceptualised research framework of the identified model variables and will contribute towards the scarce literature in the field of supply chain risk management. The present research has shown that the use of knowledge management is critical not just to understand but also to manage these risks. For this purpose, KM can be an effective way to strengthen the relations with the SC members and trading partners. The present study will validate the supply chain risk management model. To date, there is yet any explanatory model to represent the holistic approach of KM between SCRs and SCRM. Tsoukas (1996) viewed knowledge as a “de-centred system” and “not self-contained”. Thus, further empirical studies on KM can be an indicator of SCRM improvement. Knowledge management will play a moderator role between the SCRs and SCRM in this study. Knowledge management enables an organisation to manage its own knowledge effectively by providing an organization’s individuals with a common vision to achieve interaction with SC partners and stakeholders. The implementation of knowledge management in SCRs will further strengthen the SCRM because the proper identification, assessment, and accurate strategies are required for effective SCRM, and the effectiveness will increase the performance of the supply chain. For instance, efficient SCRM will reduce the SCRs and increase the performance.

Previously, there was a negative relationship between SCRs and supply chain performances. With mediating and proper implementation of SCRM, it will also increase the performance and reduce the negative impacts of the risks. The implementation of KM in the supply chain will lead to knowledge about the risks and early identification of disturbances which will help to manage their disruption. Nonetheless, supply chain managers or stakeholders must recognise the importance of the implementation of SCRM in the organisation to reduce all types of risks. Unfortunately, many firms do not implement SCRM or just slightly focus on it to manage their risks just from the pressure of stakeholders and, therefore, have not received significant results. Researchers can use KM as a moderator and further strengthen the relationship of the SCRs and SCRM.

The present study suggests that practising organisations could utilise this model to strengthen the SCRM in their firms or organisations and businesses. An empirical study should be conducted on the different products of agribusiness, i.e., the fresh fruits and vegetables of agropreneurs, because it's complex in nature and has a sensitive supply chain due to perishability, size, products, and nature of the agropreneurs, for example, independent and contract farmers.

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