STUDY OF BARRIER IN COLD SUPPLY CHAIN MANAGEMENT SYSTEM

SOHAN SINGH[a1] AND VINEET GUPTA[b]

[a]Bhartiya Skill Development University, Rajasthan, India
[b]Department of Mechanical Engineering, Dr. K. N. Modi University, Rajasthan, India

ABSTRACT

Cold chain or cool chain indicates the series of actions and equipment applied to maintain a product within a specified low-temperature range from harvest/production to consumption. However, they face immense challenges given the nature of their operations. Surprisingly, the literature lacks research on the distinct intra- and inter-organizational factors intertwined to build resilience in these firms. The findings offer novel insights into research and practice including an optimal portfolio of barriers towards building resilience. The analysis reveals that most risks stem from the factors that are internal to the supply chain, thus necessitating a strong supply chain collaboration. The level of resilience and barriers varies considerably within SMEs depending on their size (small vs. medium) and location of nodes in the supply chain. Interestingly, the SMEs with consortium support demonstrate better resilience and performance.

KEYWORDS: SME, Cold Chain, Barriers, Resilience

Strong competition and a fast-changing business environment can leave firms within a supply chain being exposed to higher internal and external barriers.This exposure is often compounded by the barriers which are both internal and external to the supply chains [1]. In addition, as more integrated supply chains become with the higher level of interdependencies, the firm's susceptibility to the barriers increases not only from their own operations but also from the activities of their supply chain partners [2] Disruption to the flow of material or information caused by such issues can reduce firms' financial, market and operational performance [3] Correspondingly, research on supply chain resilience (SCR) has been gaining attention from the academics and practitioners alike. Despite several advances, the recent literature clearly shows the scarcity of research on the phenomenon of resilience in SMEs [4] involving PPSCs The PPSCs are involved in the production and distribution of fresh and processed foods from the point of production to the point of consumption. They are significant contributors to the global economy and social well-being. For instance, their contribution to gross domestic product is 4.8% in America and 17.8% in India (World Bank 2016). Likewise, their contribution to employment accounts for 9.3% of the total employment in America, 31% in Australia and 5–10% in some European countries (World Bank 2016). However, they are highly vulnerable to disruption due to shorter shelf life and increased weather-related uncertainties For instance, supply chain disruption caused by the 2016 flood in New South Wale, Australia, resulted in a loss of AUD 500 million fresh food supply (Australian Broadcasting Carporation (ABC) 2016). Given the globalisation, domestic PPSCs are now part of global supply chain network. Therefore, disruption at a point in the supply chain would have detrimental effects on the food supply for many other regions of the world. These circumstances highlight the need to build more resilient PPSCs. Clearly, this implies the presence of barriers to achieving the desired goals [5,6] These barriers can emanate from both internal and external environment, and their understanding is indispensable to exploit the full benefits [7] of being resilient. However, an empirically driven framework that could help to discern the potential barriers impeding some firms, particularly SMEs of PPSCs, in building resilience is yet to be found.

BARRIERS TO RESILIENCE

Barriers refer to the forces that inhibit the firms from accomplishing long-term goals. They can emanate from misalignment of objectives within and among the partnering firms. Barriers can obstruct firms from a quick reaction to disruption [8] and deemed daunting to success. Therefore, understanding and controlling the potential barriers is indispensable to achieve the essential objective of being resilient.

While literature in the area of strategic management highlights the impeding effect of barriers in achieving strategic goals [9], the literature in SCR lacks comprehensive empirical studies on barriers to building resilience. We believe, the study by Roberta Pereira, Christopher, and Lago Da Silva (2014) is the pioneer to

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describe barriers such as lack of visibility, collaboration and trust in building resilient procurement system. However, their research lacks empirical rigour and limited to specific context – procurement activities. Thus, the literature lacks broad empirical evidence on potential barriers in building resilience, particularly in SMEs of PPSCs.

METHODOLOGY

Consistent with the research questions of this study, an exploratory case study was employed to explore various factors involved in building SCR. The exploratory case study is considered an appropriate tool to gain the in-depth insight of a unique phenomenon in a real-life setting, where the focus of the study is mainly on what, why and how questions (Yin 2009).

The Industry Setting

The case study focuses on SMEs in Australian citrus industry (ACI). The citrus industry entails production, processing and distribution of a range of perishable products including mandarins, oranges, grapefruit, lemons and their juices and jams (Horticulture Innovation Australia Limited (HIAL) 2014). These food products are considered as one of the top industry exports (United States Department of Agriculture (USDA) 2015). The citrus industry contributes to the economy and society not only in Australia, which is one of the major citrus producers and exporters in Southern Hemisphere, but also in many other countries of the world such as, Brazil, U.S.A., Italy, Spain, China and India (USDA 2015). The ACI is dominated by a large network of SMEs including citrus producers, packers, processors (juice and jam manufacturers), wholesalers and retailers (Citrus Australia Limited (CAL) 2013; HIAL 2014). The SMEs in Australia are defined as consisting two main entities: small size firms, which have 5–19 employees; and medium size firms, which have 20–199 employees (Australian Bureau of Statistics (ABS) 2001) with the exception of producers (farmers), which are characterised by estimated value of agricultural operation which is between AUD 22,400 to AUD 49,000 for small businesses (ABS 2001). This is because most of the producers' employee seasonal workers and cannot be defined in terms of number of employees (ABS 2001). The ACI has global supply chain operations (HIAL 2014). However, tough market and supply chain conditions have led to businesses exiting the industry (ABS 2013). An action plan (2012–2017) by the Australian Government

emphasises research on supply chain-related issues within this industry (HIAL 2014). Therefore, SMEs from the ACI were found an interesting case to explore various factors involved in building a resilient PPSC.

Data Collection

The data were collected through in-depth semi-structured interviews. Grounded in the literature, an interview protocol was developed, following Creswell (2013). The interview protocol had a standard set of questions that were organised under the main topic, open-ended questions and probes to instil detailed information on potential risks, enablers and barriers to resilience and firm performance. The questionnaire was pilot tested with four executives of the firms within the ACI and improvements were incorporated as advised by Creswell (2013). Interviews were conducted between January and April 2015. Initially, contacts of participants were obtained from a national citrus industry association. In order to collect additional contacts, two industry forums were used to explain the objectives of this research and exchange contact information with the managers. All contacts were pooled, and knowledgeable respondents were selected using purposive (expert) sampling method as of Creswell (2013). The interview process started with the first interview and continued until no new information was forthcoming as advised by Strauss and Corbin (1990) and Yin (2009). This process led to 30 interviews at each level of a supply chain including 9 producers, 5 packers, 4 wholesalers, 3 processors, 5 retailers. One interview was conducted with (each of) representative of the industry association, government department, consultancy firm and a transport service company (see Appendix 1). All interviews were recorded except for four, where the participants were reluctant to recording, hence, extensive notes were taken as advised by Creswell (2013). The interviews with respondents lasted between 30 and 60 min till the saturation point as advised by Yin (2009). Also, company reports and websites were used for the purpose of triangulation as suggested by Yin (2009).

Data Analysis

The data were analyzed using content analysis. The unit of analysis was at a firm level within the supply chain. The ability to investigate a subunit that is embedded within a large case is the powerful method and better corroborate with a phenomenon (Baxter and Jack 2008).

The interviews were transcribed verbatim and themes were analysed using open, axial and selective coding following Strauss and Corbin (1990). In order to hasten the analysis process and observe the relationship between categories more vividly, the content analysis was conducted using NVivo 10 software. An inductive approach, following an iterative bottom-up process to data analysis, was adopted as of Creswell (2013). As suggested by these authors, the textual data were sorted into codes and categories/constructs. The relationships between various constructs emerging from the data analysis were presented through the theoretical framework and propositions. In order to ensure trustworthiness of the findings, the four principles of Guba (1981) and Guba and Lincoln (1994) were followed:

1. Credibility: the participants were asked to review the interview transcripts and provide feedback on any misunderstandings or omissions;
2. transferability: diverse participants were chosen to represent variations in the type of positions, responsibilities and regions. Besides, this study clearly provides all information including number of organizations, number and type of participants, data collection procedure and interview period;
3. dependability: the codes developed were compared with the codes by the other researchers for the same transcripts. The inter-code comparison was found satisfactory with 82% similarity; and
4. conformability: the findings were supported by quotes, regular review of data and analysis procedures to avoid judgmental bias.

CONCLUSION

Current literature shows that a holistic framework, which is exploring the link between diverse actors involved in building a resilient supply chain, particularly for SMEs of PPSCs, is not yet found. Based on an exploratory case study, this paper examines the concept of resilience in SMEs and provide empirical research findings using SMEs of PPSC, which are under pressure due to the nature of their operations, as a basis for the analysis. The sampling, geographical and cultural limitations suggest special cautions in extrapolating the findings of this study This paper explores a range of barriers to building resilience in SMEs, which can be tested through a large-scale quantitative analysis on a supply chain network. A future research can collect data from the entire supply chain, the data can be grouped into various categories and tested using multivariate data analysis advised by Hair therefore, we suggest a new empirical study to validate the findings of our proposed scheme for those enterprises.

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