
The Role of IT Capabilities in Enhancing the Supply Chain Resilience of Sri Lankan Apparel Exporters

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Abstract

The need for a resilient supply chain has become more prominent in the modern world today. Supply Chain Resilience (SCR) is a concept that has been vastly addressed in earlier studies. However, little is known regarding how information technology plays a crucial role in supply chain resilience and more recent studies have focused on its significance for an organization's survival and continuity. However, this research will examine the role of IT capabilities in achieving supply chain resilience of exporting apparel manufacturing companies in Sri Lanka. The main objective of this research is to study the role of the IT capabilities factor on exporting and apparel manufacturing companies in Sri Lanka to gain Supply Chain Resilience and used a qualitative approach to examine the data in which the target population will be 158 exporting apparel manufacturing companies in Sri Lanka. This study aims to advance the understanding of Supply Chain Resilience in terms of Information Technology (IT) capability and offer useful recommendations for Supply Chain industry professionals on the role of IT Capabilities in achieving Supply chain resilience. The study was conducted using thematic analysis and out of the population of 158 apparel manufacturers in Sri Lanka, the authors used a purposive sampling technique and conducted the study by interviewing 6 supply chain industry experts in 6 different companies. The results outlined the role of IT capabilities factor achieving supply chain resilience and this was mainly pointed out by the professionals by highlighting the facts such as digital transformation and connectivity, virtual training and knowledge sharing, IT-enabled supply chain operations, and regarding IT knowledge and interpretation. As a result of these facts being observed and with the past literature mentioned in the studies and further by the responses gained from the apparel industry supply chain professionals the authors of this study came up with the final interpretation that IT capability's role in the supply chain resilience is an enhancing factor of apparel manufacturing companies in Sri Lanka.

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01. Introduction

The apparel industry is a major contributor to Sri Lanka's economy, having achieved a record US \$5,591.49 million worth of exports, Joint Apparel Association Forum Sri Lanka (2022) contributing a major portion to the GDP of the country. Utilizing a global supply chain and establishing strategic partnerships with buyers and sellers worldwide have enabled Sri Lankan apparel exporters to achieve this significant level of success. However, it is also susceptible to supply chain interruptions caused by a variety of factors, such as pandemics, political unrest, and natural catastrophes. Supply Chain Resilience (SCR) is the capacity of a supply chain to recover from disruptions and either revert to its previous state or adjust to a new one that is acceptable (Christopher & Peck, 2004). However, recently organizations have found it is challenging to produce and deliver their products to customers during the past few years due to numerous significant events and enduring issues. Sri Lanka's apparel industry is no exception to this requirement, as there have been numerous disruptions due to political decisions and natural disasters (Abeysekara et al., 2019). To maintain a competitive advantage in the global market, Sri Lankan apparel exporters must take proactive measures to enhance their supply chain resilience. One of the most crucial aspects of a robust supply chain is IT (Information Technology), which is the ability of a business to acquire, integrate, and personalize technology and information resources to enhance and facilitate its goals and operations (Zhou et al., 2022). Information Technology (IT) can help organizations by delivering real-time transparency and visibility across the supply chain, which can facilitate quicker decision-making and response times in the event of disruptions.

02. Research Problem

Prior studies have indicated that IT capability influences SCR (Gu et al., 2021; Scholten & Schilder, 2015). In addition, the apparel industry is ever-changing in nature, in other words, it is an industry in which constant changes happen. Moreover, with the economic/financial crisis that Sri Lanka is currently undergoing, the companies in the manufacturing industry are facing material shortages, transportation issues, rising shipping costs, and facing inflationary pressures (Roshana et al., 2020). For instance, the covid-19 pandemic has highlighted the need for organizations to have an effective resilient Supply Chain (SC). Businesses in several industries, including the manufacturing sector, have been severely disrupted by the abrupt negative implications in demand and supply during covid-19. For example, Sri Lankan apparel companies lost their orders worth \$ 5 billion USD and they terminated at least 30 % of their employees after failing to pay employees' paychecks in May (Susitha, 2022). Moreover, for example, as per Abeysekara et al., (2019), the Sri Lankan apparel industry has experienced a significant lack of resilience in its supply chain. The industry suffered a major setback when the GSP+ tariff concession was withdrawn in 2010, leading to the closure of numerous garment factories and the loss of thousands of jobs. While some apparel firms managed to adapt by establishing operations in Kenya and Ethiopia to access the US market under the African Growth and Opportunity ACT (AGOA), the majority of bankrupted firms have struggled to recover.

Despite the significance of these disruptions, little is known about how they affect Sri Lankan apparel exporters' SCR. To better understand how IT capability might improve SCR among Sri Lankan clothing exporters, this study aims to examine the role of IT capability on SCR in this relationship. The results of this research will offer a deep understanding of achieving Supply chain resilience and the ability to withstand disruptions in the export clothing production sector in Sri Lanka. The results of this study will serve as industry standards and lay the basis for further exploration in this field.

2.1. Research Question

- What is the role of IT Capability on SCR of apparel manufacturing and exporting companies in Sri Lanka?

2.1.1. Research Objective

- To identify the role of IT Capability on SCR of apparel exporting companies in Sri Lanka.

03. Literature Review

In recent past years, several unanticipated events such as tsunamis, hurricanes, cyclones, earthquakes, epidemics, war and terrorist acts, and flood situations affected the global Supply chains. For instance, Covid-19 had a major impact on Supply chains across all industries, especially in developing countries like Sri Lanka. Moreover, it is widely acknowledged that all economic sectors have been greatly affected by these challenges. The markets in Sri Lanka are particularly susceptible to the detrimental effects of the several challenges mentioned above because it is an island nation and a tropical country (Abeysekara et al., 2019). SCR is the ability to quickly modify the SC to accept changes and disruptions while ensuring its smooth operation (Abeysekara et al., 2019). The performance of the SC is contingent upon the resilience and ability of industries to navigate challenges in both internal and external environments. Due to the volatile nature of the apparel industry, the problem is particularly serious for the apparel industry. Moreover, various indicators of agility, flexibility, and robustness (Wieland & Wallenburg, 2013) has been used in the past to evaluate SCR. Recent research has investigated supply chain risk management's impact on SCR and how it affects firm performance (Elbaz & Ruel, 2020; Mandal, 2021). SCR has a significant impact on service performance, according to Guo et al. (2021). In their investigation, Faruquee et al. (2021) split SCR into visibility, agility, flexibility, and recovery and looked at the effects of group problem-solving on SCR. Guo et al. (2021), found that SCR plays a crucial role in service performance. However, it has been found that there is a lack of research on IT capabilities in the Sri Lankan context. Therefore, the literature review will evaluate the importance of the role of IT capabilities, and SCR together.

IT capability is an internal resource that helps a company to create value (Abbaszadeh et al., 2019). Moreover, Gu et al. (2021) have shown that IT has transformed SC to reach various advantages such as coordination, enhancement in efficiency, reactivity, and competitive advantage. It has also enabled organizations to share knowledge and information across processes and organizational edges, develop sensing and data processing abilities, and collaborate during times of supply chain disruptions or disasters. For example, Dell utilized IT to blur the margins of firms with its suppliers and enhance its capability to realize and react to the threats and opportunities in the market (Nazir & Pinsonneault, 2012). Additionally, IT can

enable organizations to collaborate during times of supply chain disruptions and enhance an organization's resilience by ensuring the continuous functioning of IT activities within the business. However, further research is required to examine the extent to which IT capabilities enable companies to establish inter-firm capabilities that facilitate collaboration with their supply chain partners, resulting in the generation of business value (Bi et al., 2015).

Furthermore, Wade and Hulland (2004) classified IT capability into three types based on technology resources and information particular to the company, such as IT objects, IT knowledge, and IT operations. These are critical resources that firms may utilize to manage their marketplaces, consumer data, or activities of an organization's supply chain and information (Santhanam & Hartono, 2003). IT objects supports the procurement, processing, storage, distribution, and assessment of information (Tippins & Sohi, 2003). Additionally, Bi et al. (2013), stated that IT staff and tangible IT properties are important components of IT objects. IT operations is all about how well an organization uses IT to manage market and customer data, and how efficiently they can leverage IT resources to achieve their goals (Zhou et Al., 2022). Furthermore, (Bi et al., 2015) mentioned that IT knowledge gives understanding and competencies to support firms efficiently and effectively effectuate supply chain operations by helping business strategy and developing supply chain operations. Also, IT knowledge can help organizations, consumers, and suppliers in detecting and transferring significant information on a unique platform, as well as systematizing and standardizing figures (Zhou et Al., 2022).

The term SCR refers to a company's capacity to bounce back from setbacks and overcome failures and it particularly defines a system's capacity to adapt to rapid disruption events (Soni et al., 2014). Many experts have suggested that being agile and robust are key ways to attain resilience (Wieland & Wallenburg, 2013). According to Remko (2020), there is still untapped potential in the current research on SCR. Therefore, both the research and practice communities have expressed a desire for more literature-based investigations on this topic. In the world of supply chain research, the concept of resilience is often linked to the risks and vulnerabilities that come with managing a supply network. This is because there is a general understanding that certain types of risks can't always be predicted or prevented (Christopher & Peck, 2004). Furthermore, Faruqee et al. (2021) found several gaps in the current literature on SCR. These gaps include a lack of a complete definition of resilience and a shortage of suitable models and approaches for managing resilience. Unfortunately, there are few studies that provide a resilience framework for the apparel industry that considers IT capabilities, making it difficult to find relevant research. Moreover, only a few studies have examined the complexity perspective and those that have focused solely on supply-side lead time issues (Colicchia et al., 2010).

In a Supply chain, resilience is the capacity to respond swiftly to alterations and interruptions while maintaining operations. For instance, the European Union eliminated the Generalized System of Preferences (GSP+) tariff concessions, which had allowed the export of more than 7,000 commodities duty-free, in 2010. This had a significant negative impact on Sri Lanka's textile industry. Due to the loss of LKR 800 million in annual exports, numerous apparel manufacturers shut down, and more than 10,000 workers were laid off (Abeysekara et al., 2019). There is a limited amount of research available that has specifically investigated the connection between IT capability and overall firm-level performance (Hokey Min & Nicolas-Rocca, 2016). Therefore, the researchers will try to find the role of IT capability in the apparel industry to achieve SCR. Implementing IT can assist a company in efficiently managing

information-based procedures such as order processing, stock monitoring, and billing, as well as enhancing operational efficiency, resulting in quicker product development and replenishment cycle times. As a result, a firm investing in IT capabilities can immediately benefit from reduced inventory holding costs (Jin, 2006).

04. Methodology

In this study, the authors have embraced an interpretive philosophy and is based on the inductive approach which follows up a qualitative method. The authors of this study have conducted online interviews via Zoom and Microsoft teams with supply chain professionals of six apparel exporting companies in Sri Lanka, the observations have permitted them to construct concepts along with the information gathered from the observations in the interview process. Moreover, all the interviewees were employed in the apparel supply chain sector. The authors of the study have used a purposive sampling technique and reached out to industry professionals counting a total of 158 companies. However, as per the willingness of the different organizations, only six companies accepted and attended the interview process. The interviews were conducted using structured questions. The qualitative information collected was assessed thematically to reveal a detailed understanding of the study.

05. Data Analysis

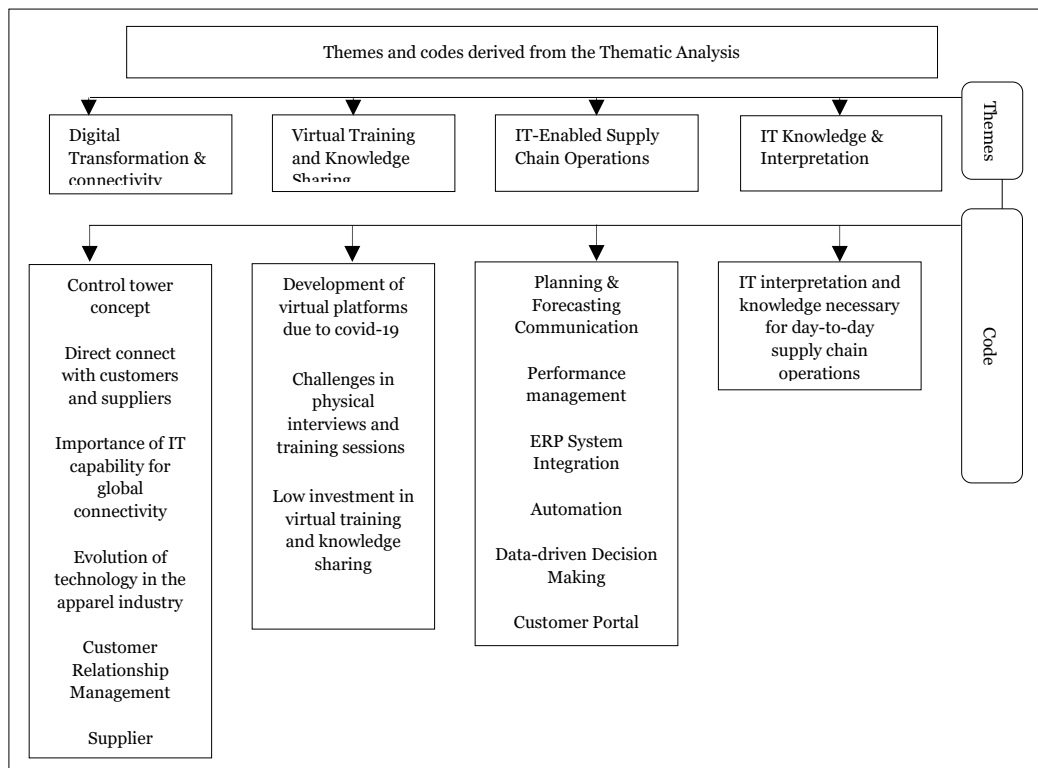


Figure 2: Derived Themes & Codes

Table 1: Respondents' Profile

Respondent	Profession	Experience
Respondent#1	General Manager	20 years
Respondent#2	Manager Supply Chain	10 years
Respondent#3	Deputy General Manager	15 years
Respondent#4	Manager Supply Chain	6 years
Respondent#5	Manager Supply Chain	10 years
Respondent#6	Assistant Manager	12 years

To identify the patterns and derive the themes, the researchers have used the Manual Thematic Analysis. Thematic Analysis is a qualitative research method that involves examining data to identify recurring patterns and themes. This technique provides a detailed overview of the data, allowing for a deeper understanding of various subjects through interpretation (Alhojailan, 2012). The interviews were conducted from March 2023 to April 2023 online through the platforms Zoom and Microsoft Teams. Later on, the recorded data were transcribed and with the information derived from the supply chain Professionals, the authors developed four (04) themes and twenty two (22) codes. The derived themes and codes are stated in the above mentioned figure 2.

This part consists of a brief discussion regarding a concept indicator developed for this study by the authors. Considering the themes and codes generated from the observations made throughout the conducted interviews. The authors of this study used questions related to IT Capability dimensions such as IT objects, IT knowledge, and IT operations in order to question the interviewees (Zhou et al., 2022). The responses gained are discussed in the results and discussion part.

06. Results and Discussion

According to the information obtained from the conducted interviews, themes and codes have been identified as shown above in figure 2 by the method of manual thematic analysis. Four themes and sixteen codes were derived from the analysis. In this chapter, an in-depth study of each theme is conducted and how export apparel companies can use IT capabilities to develop the resilience of their supply chain is also discussed.

Theme 01: Digital Transformation and Connectivity

It was evident that professionals that were interviewed highlighted new concepts like the implementation of control tower systems in their supply chain. *"it's very important & all data given work manage by IT, we used all our ordering / Reconciliation through system SAP & using Portal for fast communication will be implementing the Supplier chain tower on the discussion to cover a wider range of visibility & risks "* (Respondent#1). Moreover, the use of SAP for supply chain connectivity is a notable aspect of the IT capabilities strategy discussed in the interviews. In addition to SAP's ability to streamline order processing and inventory management, Control tower systems also offer real-time visibility and speed up decision-making. *"But in our ERP, we are using SAP as our ERP. So basically, based on our sales demand, it automatically calculates the raw material demand and supports us to place the*

PO (Purchase Order) directly. So, calculating the usage of the product so that support highly enables us to see that for future forecasters and identify the risk, and even they manage their minimum and maximum order level as well (Respondent#3). Furthermore, based on the response of respondent 02, it was mentioned that there has been a significant improvement in IT capabilities within the past decade or two. This is largely attributed to the increased utilization of digital tools such as email, Zoom, and Microsoft Teams, which have streamlined operations within the supply chain. "I think it's not just our company, but every company, because we are located on an island and our customers are all around the world. So, mainly, we connect with them through the network and all. Therefore, IT capabilities should be there. Because before we came to this high margin, when we started the apparel industry in 1985 or 1987, we were using fax and email very less. But now, after 20 years, in 2023, we have high technology, and IT capabilities should be there because we are connecting through the internet, email, phone calls, team calls, and everything. So, it's very important for us to have that IT capabilities" (Respondent 2). In the supply chain, these IT capabilities improve communication and collaboration, helping businesses to react quickly to disturbances and make smart choices. Furthermore, these facts show that information technology is playing a major role in business operations. It was mainly evident that an increase in digital transformation and connectivity leads to resilience in its supply chain operations.

Theme 02: Virtual Training and Knowledge Sharing

The theme of this discussion is knowledge sharing and virtual training, utilizing IT capabilities. To address the risks and disruptions in the supply chain, it is crucial for the members to share their knowledge with each other. One effective way to achieve this is through the utilization of IT tools, which enable efficient knowledge sharing. "We have regular monthly meetings in Zoom with our team to ensure effective communication. During these meetings, we discuss various topics, including quality levels, which are an important aspect of our operations." (Respondent 06). During the COVID-19 pandemic, apparel companies have been able to conduct remote interviews and virtual training sessions because of the usage of online platforms like Zoom and Microsoft Teams. These IT tools have demonstrated efficacy in promoting supply chain communication and collaboration, as well as assuring staff growth and development.

Apparel companies can utilize IT tools like PLM systems to effectively share knowledge with suppliers and obtain crucial details from them. This data can then be utilized in the future for various purposes. "Suppliers are currently updating the tech packs and other relevant information into the Product Lifecycle Management (PLM) system. Our goal is to gather all the necessary data from the PLM for future use, and we are making progress in that regard" (Respondent 05).

Traditionally, apparel companies used to conduct interviews and training sessions in person. However, due to the

COVID-19 pandemic, they were unable to continue with this approach. Instead, they started utilizing online tools like

Zoom and Teams to conduct interviews remotely. Moreover, they also adopted virtual training methods using these IT applications to ensure the learning and development of their employees.

“Before 2020, we used to conduct in-person interviews at our location for recruiting new personnel. We would ask candidates to come in for face-to-face interviews. However, due to the COVID-19 pandemic, our focus shifted towards implementing virtual interviews. Prior to the pandemic, all our interviews and training sessions were conducted in person, except for operational training” (Respondent 2). The use of technology to conduct virtual training sessions and share knowledge throughout the supply chain was underlined by professionals. Employees can develop their skills and abilities through virtual training programs, and best practices can be shared on knowledge-sharing platforms. The capabilities of their staff can be enhanced, and a culture of continuous learning and improvement can be promoted by Sri Lankan apparel manufacturing companies by utilizing IT capabilities.

Theme 03: IT-Enabled Supply Chain Operations

When companies use IT to manage their operations, they can utilize ERP systems like SAP to efficiently plan for demand and handle any supply chain disruptions. Additionally, they can also use SAP to communicate with their suppliers. *“But in our organization, we are using SAP as our ERP. So basically, based on our sales demand. It automatically calculates the raw material demand and supports us to place the PO directly. So, calculating the usage of the product, so that support highly enables us to see that for future forecasters and identify the risk, and even they manage their minimum and maximum order level as well (Respondent#3).* Companies may effectively plan for demand, determine raw material requirements, and control order levels by utilizing ERP systems like SAP. The results emphasize the significance of IT-enabled operations for successful demand planning, risk assessment, and supply chain coordination. *Digital technology, including the Internet and web browsers, enables remote interactions between individuals and businesses. This allows buyers and sellers to engage in digital interactions along their supply chain, eliminating the need for in-person meetings (Salo & Karjaluoto, 2006).*

In terms of communication, the importance of communication channels in supply chain management is highlighted in the interviews. *“It’s important that we focus on maintaining good communication throughout the company. In my department, procurement, we work closely with other teams such as development, bulk merchandising, marketing, and operations. It’s crucial that we communicate effectively with each other because we all play important roles in ensuring the success of the business. For example, we need to have knowledge about supplier capacity and booking to make sure we can meet the demand plan. Good communication and information sharing is essential for effective demand planning” (Respondent#04).* According to interviews, supply chain management requires effective channels for information sharing and communication. To coordinate efforts, satisfy demand plans, and reduce interruptions, effective communication across many departments and stakeholders is crucial. IT capabilities offer the infrastructure and resources required for smooth communication, ensuring that relevant data gets distributed on time.

Theme 04: IT Knowledge & Interpretation

To ensure that companies are better equipped to handle disruptions, it’s important for all members of the supply chain to have at least a basic understanding of IT and how it applies to their work. Without this knowledge, companies will struggle to adapt to unexpected challenges and won’t be as resilient as they could be. So, in short, having some IT knowledge

is crucial for building resilience in today's business environment. Digital technology, including the Internet and web browsers, enables remote interactions between individuals and businesses. This allows buyers and sellers to engage in digital interactions along their supply chain, eliminating the need for in-person meetings (Salo & Karajaluoto, 2006). In reality, it's not just about having advanced IT knowledge, but everyone should have at least some basic understandings of IT. This is important because it helps people adapt to different situations and challenges that may arise, regardless of their role or position. So, it's valuable for everyone to have some level of IT knowledge, even if they're not an IT expert (Respondent 02). According to the interviews, all supply chain professionals need to have at least a fundamental understanding of information technology and how it relates to their field of work. People can adapt to different problems thanks to this knowledge, which also helps them make wise decisions and contribute to the supply chain's overall growth potential. The results imply that investing in IT training and encouraging knowledge of IT among employees can enhance the organization's capability to use IT as a capability and respond to disruptions. Knowledge of IT enables people to analyze data, use IT tools, and cooperate more effectively, improving the performance and reliability of the supply chain.

Overall, the findings show that enhancing supply chain resilience depends heavily on IT capabilities. The supply chain's communication, cooperation, and decision-making are all improved through digital transformation, connectivity, virtual training, IT-enabled operations, and decision-making within the supply chain. In order to assure adaptability, agility, and competitiveness in a dynamic corporate environment, the findings highlight the significance of including IT skills in supply chain resilience.

07. Conclusion

In Conclusion, the authors of this study outlined the role of Information Technological capability of apparel manufacturing and exporting companies towards achieving Supply Chain Resilience by highlighting the importance of digitalization and IT knowledge of organizations. In which the industry professionals outlined that it directly affects the supply chain resilience and the overall performance of the organization. Furthermore, the findings highlight the importance of the fact that in industry today where industry 4.0 is evolving the need for IT-enabled supply chains. On the other hand, this study however considers supply chain resilience as a whole factor, and instead, this can be taken as internal and external supply chain resilience in order to further deepen the understanding of this study.

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