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Supply Chain Digitalization, Resilience, and Performance in the Apparel Sector of Sri Lanka

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Abstract

This study examines how digitalisation and resilience practices are adopted in the Sri Lankan apparel supply chain and how they affect the performance of the supply chain. The research seeks to comprehend the effects of digital tools, predictive systems, and organisational strategies to improvement in efficiency, visibility and risk management and countering technological adoption barriers. The three main goals were to determine the main digital and resilience practices rolled by the apparel manufacturers, determine their effect on the performance of the supply chain, investigate issues in the implementation, and make practical recommendations to firms and policymakers.

The qualitative research approach was integrated and the collected data were semi-structured interviews and surveys conducted among key personnel of the chosen apparel manufacturers in Sri Lanka. The analysis of the data was an inductive thematic one, which allowed pointing out the common patterns, challenges, and performance outcomes. It was also based on the developed theoretical models, such as the Resource-Based View, the Technology-Organisation-Environment model, and the Contingency Theory to explain the results and place them in the context of the literature.

The results show that companies that spent on ERP systems, automation, predictive analytics, and digital visibility have a higher accuracy rate, shorter cycle time, and disruption response. Multi-sourcing, scenario-based forecasting, and supplier monitoring are some of the resilience practices that enhance continuity of operations and preparedness to risks. The adoption is however limited by lack of skills, change resistance, cost, and lack of technical capability. Companies that systematise training, build a digital culture based on leadership, and imbue resilience as an ongoing work principle will deliver better results.

The study has been both theoretically and practically relevant as it has shown the synergistic impact of digitalisation and resilience on the performance of a supply chain in an emerging economy setting. Industry implications are the focus on capabilities, systematic training on digital skills and team system ecosystems. To policy makers, industry wide transformation can be expedited by supporting the adoption of digital using financial incentives, training at sector levels, and standard frameworks. Comprehensively, the paper demonstrates the importance of the critical role of digital and resilience integration in improving global competitiveness and agility in the operation of the Sri Lankan apparel industry.

KEY WORDS: Supply Chain Digitalization, Resilience; Supply Chain Performance; Apparel Sector; Sri Lanka

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Abbreviations

ERP : Enterprise Resource Planning

IoT : Internet of Things

TOE : Technology – Organization – Environment Framework

RBV : Resource-Based View

CT : Contingency Theory

1 Introduction

The apparel industry in Sri Lanka is a vital part of the national economy yet it experiences the consistent threat through the global uncertainties and interruptions in the supply chains. Companies in turn react to this by using digital technologies to enhance efficiency, visibility, and coordination within their supply chains. Yet, little is known about how the digitalization affects performance, and the way in which resilience mediated this association in the Sri Lankan context. The given study will be based on a qualitative approach to examine the perceptions and experiences of supply chain professionals in order to gain a better insight into how digitalization can contribute to resilience and the overall supply chain functioning in the apparel industry.

1.1 Background of the study

It is well known that the apparel industry is one of the biggest business in Sri Lanka with great earnings of foreign exchange and thus employment of a significant portion of the population. The industry has over the years expanded to be a large export based industry, providing the world markets with top quality clothes. Regardless of this achievement, the international business environment has grown very dynamic and competitive where supply-chain performance and responsiveness are key factors in enhancing competitiveness. The supply chain of most apparel companies has been vulnerable to global factors like changes in demand, political instabilities, increased cost of production, and unforeseen disasters like natural pandemics(Castañeda-Navarrete et al., 2021). These distortions typically lead to the production and delivery delay, increased operation costs, and failure to align with the demands of global consumers and the great need of more flexible and adaptable supply chain activities(Castañeda-Navarrete et al., 2021).

The idea of supply chain digitalization has become one of the biggest to resolve these issues and improve the performance of operations and coordination, not mentioning the overall

performance. The process of introducing and adopting the new technologies, including Enterprise Resource Planning (ERP) systems, Internet of Things (IoT) devices, blockchain systems, cloud computing, and big data analytics into the supply chain processes, is called digitalization (Morawiec & Sołtysik-Piorunkiewicz, 2022). The technologies will assist the companies in monitoring and controlling the current processes in real time, enhance the transparency, and communication with suppliers and customers and enable a better inventory and logistics management. To provide an example, digital tracking systems can give the managers information about the functioning of the production or distribution process at its initial stages, and predictive analytics can be used to anticipate the change in demand and disruption of the supply chain (Souza, 2014). It has been established that digitalization has been an efficiency-enhancing factor in the international textile markets and a competitive advantage where a firm can react quick to the market forces as well as demand.

Together with the process of digitalization, the concept of supply chain resilience has been progressively becoming an issue of concern among researchers and practitioners. Resilience refers to the ability of a supply chain to predict, harmonize, adapt and recuperate malfunctions along the chain and even go further to deliver operations and functions (Ponis & Koronis, 2012). The apparel supply chains are highly inter-related and complex to maintain the operations of the business in unfavorable conditions. Resilience is also essential in such conditions. Companies that build resilient supply chains are in a better position to deal with risks, ensure reliability in delivery, and secure a relationship with the global purchaser, which is essential in the long-term competitiveness (Ajayi, 2025). Supply chain resilience can be considered on a variety of planes such as flexibility of sourcing and production, strength of logistic chains, cooperation with partners, and the capacity of rapid restructuring to handle sudden events.

Resilience and digitalization are becoming considered to be closely related. Although digital technologies would offer tools to promote visibility, monitoring, and decision-making, resilience would ensure that firms can make use of these tools effectively in disruptions

(Abdallah, Phan, & Matsui, 2016). Digitalization has the potential to enhance resilience through the facilitation of quicker communication, enhanced predicting, and more coordination among supply chain partners(Ivanov, 2018).

Although these ideas are known worldwide, only a few empirical studies investigate the effects of the supply chain digitalization on performance with an attempt at the mediation of the resilience concept with regard to the context of Sri Lanka (Bandara & Oruthotaarachchi, 2025). The majority of researches in the local apparel industry targets such quantitative metrics as lead time saving, cost-effectiveness, or delivery consistency, but does not consider the views and experience of workers directly engaging with supply chain activities. The perception of the employees is of special importance because it helps to comprehend how digital tools are in fact applied and how they impact the processes of decision-making, cooperation, and problem-solving within the supply chain. Qualitative research may be used to produce these insights, and investigate the experiences, challenges and perceptions of the participants in a detailed way, which will provide a more comprehensive view of how digitalization influences resilience and performance(Morawiec & Sołtysik-Piorunkiewicz, 2022).

Moreover, the Sri Lankan garment industry has companies with different sizes, export nature, and complexity in their operations (Amarathunga & Champika, 2023). Small and medium enterprises might encounter more challenges with switching to digital technologies than bigger exporters such as access to limited resources, the absence of technical knowledge, or change inhibited. In the same way, the organizational culture, leadership strategies, and exposure to past disruptions may have an effect on how resilience is perceived and how it affects performance (Suryaningtyas, Sudiro, Eka, & Dodi, 2019). Qualitative approach can enable the researcher to delve into such differences that form subtleties that can never be seen by quantitative researches alone.

The research, hence, aims at exploring the perceptions of supply chain scholars in the Sri Lankan clothing industry regarding the digitalization implication of the supply chain

effectiveness and the mediating effect of resilience. The research helps to gain more insight into the process of digital tools adoption, the way they support resilience, and how they eventually affect performance outcomes, including flexibility, the reliability of delivery, and customer satisfaction. It is believed that the findings will be valuable to both theory and practice because they help bring practical solutions to the problem of how to use digitalization to create resilient supply chains, and they will also help advance the theoretical knowledge on dynamic capabilities in a developing-country, local environment.

In general, the study focuses on a significant research gap by integrating two modern themes, namely, digitalization and resilience into the situation of the Sri Lankan apparel industry, providing important insights to managers, policymakers, and researchers who may consider enhancing the performance of supply chains in the situations of uncertainty and disruption.

1.2 Problem Statement/ Identification

Sri Lankan clothing industry is an industry that forms the backbone of national economy as it plays a great role in providing employment, foreign exchange earnings and export income (Abeyruwan, et al., 2024). The industry has over the decades established itself as a trusted supplier of global clothing markets with a focus on quality, timely delivery, as well as, on meeting international standards (Abeyruwan, et al., 2024). The industry however works within a growing complex and volatile global environment with supply chain being susceptible to various types of disruptions. Such interruptions might be macroeconomic fluctuations and changes in exchange policies, natural disasters, labor strikes, and the crisis caused by the pandemic. The uncertainty not only impacts the operational capability of the apparel companies, but also endangers the capacity of these companies to fulfill the expectation of the foreign consumers and this puts the competitiveness and market share in danger (Abeyruwan, et al., 2024).

To manage the said issues, supply chain digitalization is progressively turning into a contemporary trend that not just a few apparel companies in the international market are

adopting as a way of optimizing its business and securing a competitive advantage (Sachin & Bandara, 2021). The technologies that are used in the supply chain operations are Enterprise Resource Planning (ERP) systems, Internet of Things (IoT) systems, blockchain systems, big data systems, cloud computing systems, and radio-frequency identification (RFID) systems (Sachin & Bandara, 2021). These technologies allow the organizations to see the work in real time, enhance the coordination with the suppliers and distributors and make the decisions basing on the data. Preferably, the digitalization ought to provide a window to streamline the supply chains, lowering the cost of the operations, enhancing the lead time as well as customer satisfaction. In the case of clothing businesses, digitalization can entitle it to be able to adapt promptly to shifts in demand within the planet, make the buying process easier and to manage the stock.

Though these advantages are bright and promising, the experience of the Sri Lankan apparel industry can indicate that the introduction of digital technologies is still uneven and fragmented. A lot of companies adopt digital systems in remote locations like planning production or warehouse without a complete integration throughout the supply chain. Specifically, small and medium-sized enterprises are limited by such factors as limited finances, lack of technical competence, and organizational resistance to change. In companies where digitalization is more developed, there are still concerns about the practicality of such technologies in improving the performance of the entire supply chain. Little is known about the perception of the employees and supply chain professionals about the influence of digital tools on the operational results and whether the use of digital tools adds any value to resilience and adaptability during disruptions (Rathnayake, Malsha, Dissanayake, & Gunathilaka, 2020).

Uncertainty has brought about supply chain resilience as a critical element towards performance sustainability (Bandara & Oruthotaarachchi, 2025). The term resilience means that what a supply chain is able to do is to predict possible disruptions, absorb shocks, adapt to new situations, and reestablish operational stability with little to no loss of performance. When it comes to the resilience of Sri Lankan apparel companies, one must not only be able

to keep delivery times and the cost-effectiveness intact but also to preserve the long-term relationships with the foreign buyers (De Silva, 2025). Nevertheless, although the theoretical connection between digitalization and resilience is generally acknowledged, there is a lack of empirical data on the topic in Sri Lanka (De Silva, 2025). The question is whether or not digitalization contributes to a more resilient practice in a specific way, what processes are affected, and how they go to improve the supply chain performance. Lack of such knowledge deprives firms of investing on digital technologies without understanding its potential or the ability to develop adaptive capabilities that can be used in sustaining operations in case of disruption.

In addition, the majority of the previous studies about digitalization and resilience of the supply chain in Sri Lanka were quantitative and based on the objective performance indicators, including the lead time, cost effectiveness, or the reliability of delivery (Samarasinghe, Ariadurai, & Perera, 2015). Although these measures are great in offering thoughtful insights, they do not usually consider subjective experiences and perceptions of the employees who are at the front line in the management of the processes in any supply chain. This data on such perceptions is significant as employees are the most common users of digital devices and the core of the decision making process, problem solving and cooperation with supply chain partners. Their observations can narrate of practical challenges, barriers, and enablers, that influence the effects of digitalization and resilience to the performance outcomes.

The other important criterion is the diversity of businesses in the industry of Sri Lankan apparel. Companies vary in terms of size, export focus and technological maturity and advancement of supply chain (Keenavinna & Wickramarachchi, 2025). Consequently, the impact of digitalization on the performance and resilience may be different in various organizations, and there is not likely to be a universal solution that can provide valuable advice. The exploration of these differences within the context of the most stringent qualitative study would contribute to the uncovering of the plethora of information on the use of digital tools,

the formation of resiliency, and how both of these factors affect the performance of operations in various organizational contexts.

To conclude, it is possible to say that the Sri Lankan apparel business finds itself in a dilemma where it has to resolve two simultaneously. On the one hand, the global environment is threatening the Sri Lankan clothes business with numerous challenges on a global scale, on the other hand, the Sri Lankan clothes business has to integrate the digital technologies into the performance. There is a gap in research in the existing literature review of the impacts of the supply chain digitalization on resilience and performance based on the perceptions of the supply chain professionals. Qualitative inquiry study will be the only tool through which this gap will be filled and this study will entail perceptions, insights and lived experiences of the employees who will have to endure the digital systems as part of their day to day lives. Through these insights, this paper shall endeavor to give a closer insight of how digitalization leads to resilience and ultimately, performance of supply chain. This is likely to impact the management practice, inform the adjustment to digital technology, and provide strategic implications of creating resilient supply chain that would help to maintain the competitive advantage in the market that is very volatile in the global market.

1.3 Research Questions

1. How does supply chain digitalization influence operational performance in buyer-supplier interactions in the Sri Lankan apparel sector?
2. How do supply chain resilience practices support digitalization in enhancing operational performance during disruptions?
3. What challenges and best practices do buyers and suppliers encounter when implementing digitalization and resilience initiatives?

1.4 Research Objectives

1. To examine how supply chain digitalization influence operational performance in buyer- supplier interactions in the Sri Lankan apparel sector.
2. To explore the role of supply chain resilience practices support digitalization in enhancing operational performance during disruptions.
3. To identify the challenges and best practices do buyers and suppliers encounter when implementing digitalization and resilience initiatives.

1.5 Justification of the study

The Sri Lankan clothing industry is an essential part of the national economy, but it is working in a very unstable international environment where the disruption of supply chains is a common occurrence and is unpredictable. Although it is accepted in the global literature that digitalization and resilience of supply chains play a crucial role in improving operational efficiency and competitiveness, empirical evidence on the interaction of the two concepts is scant in the local clothing setting. The majority of the historical studies conducted in Sri Lanka have been based on quantitative data of performance, with little consideration of the visions of the employees directly involved in managing and executing supply chain activities. It is critical to get to know these points of view because the insights of employees can give us a practical understanding of how digital technologies are employed, how resiliency is developed, and how these two concepts can impact the ultimate performance in the real world.

Practically, the research has an application implication to managers and policymakers. The perception of the employees can be utilized to help the firms comprehend how they can be the barriers and enablers of productive digital adoption, becoming more vulnerable to resiliency and improvements in their supply chains that is aligned with the local environment and constraints.

Besides, the study addresses a significant gap in the literature on developing countries because the resource constraint, the challenges linked to the implementation of technology, and various organizational competencies are also capable of influencing the effectiveness of digitalization and resilience initiatives. The study offers evidence-based recommendations towards creating adaptive, efficient, and resilient supply chains in the apparel sector of Sri Lanka by emphasizing on context-related aspects and practical experience so as to maintain sustainability and competitiveness in the long term.

1.6 Scope of the study

This research aims at the apparel industry in Sri Lanka and the study is on understanding how supply chain digitalization affects the performance and how supply chain resilience mediates the effect. It focuses on those employees who are directly engaged in the supply chain activities such as managers and employees of production, logistics, procurement and distribution departments. The method of research is qualitative, as it relies on in-depth interviews that will help to obtain detailed information about how digital technology is being implemented, how the resilience is built, and how both aspects contribute to the operational success of digital technologies in the form of reliability of delivery, flexibility, and efficiency of operations.

1.7 Chapter Structure

Chapter One provides the introduction of the study and gives a background of the study, problem statement of the study, objectives of the research, research questions, justification, scope of the study, and limitations of the study.

Chapter Two is a literature review on the existing literature on supply chain digitalization, resilience, performance, and theories.

Chapter Three gives a description of the research methodology which is that qualitative approach, sampling and the data collection methods and the analysis procedures.

Chapter Four provides the results and comments on the findings with references to the patterns of responses, themes, and information obtained after the interviews with participants.

Chapter Five ends the study through recapping the major findings, offering practice and policy recommendations, discussing limitations and laying out future research possibilities.

2 Literature Review

The chapter examines the available literature regarding the supply chain digitalization, resilience, and performance concepts to gain a holistic interpretation of the relationship between these concepts in the apparel industry. It investigates the role of digital technologies in the operation processes, the role of resilience as an aid to flexibility in disruption, and the role of both in the performance results. The existing gaps in the research and defining the conceptual and theoretical framework that underlies the current research are also identified in the review.

2.1 Conceptual Review

2.1.1 Apparel Industry in Sri Lanka

Textile clothing is one of the most influential sectors of the national economy because it is the key export in terms of revenue, generating jobs, and development of industry in Sri Lanka (Abeyruwan, et al., 2024). The industry has undergone transformation to become a global apparel center that is characterized by quality, ethical standards, and creativity over the last 40 years since it started as a simple manufacturing center. It contributes a significant percentage of all the export income in the country and it also directly and indirectly employs hundreds of thousands of workers and a big percentage of them are women (Lanka, 2020). The significance of the industry is also determined by its connection with the global value chain, whereby it provides the garments to the major international brands and retailers in the United States, the European Union and other major markets (Gereffi, Frederick, & Gereffi, 2010). Sri Lankan apparel industry has become an important participant in the world textile and fashion supply chain, due to this international orientation.

The reputation of the Sri Lankan apparel industry as a reliable producer, adhering to ethical standards, and sustainability in their manufacturing methods are the foundation of the success of the Sri Lankan apparel industry. The local initiative, which is experimented under the Joint

Apparel Association Forum (JAAF) focuses on the labor rights, environmental responsibility, and gender equality making Sri Lanka stand out among the numerous other low-cost producing clothes countries (Ahmed & MacCarthy, 2021). Apparel manufacturers have over the years invested a lot of technology, automation, and designing capabilities to address the demands of the top international brands. This has assisted the industry to be up the value chain; contract manufacturing as opposed to offering entire service solutions like design, product development, and supply chain management.

Nevertheless, with these strengths, the industry experiences several challenges with regard to its reliance on the international markets. Its long-term sustainability is still being challenged by factors like changing demand, increasing cost of production, international competition as well as macroeconomic uncertainty(Samarasinghe et al., 2015). The recent world events, such as the COVID-19 pandemic, highlighted the weaknesses of the supply chains, breaking the production and logistics chains. A large number of clothing firms had their orders canceled, faced raw material crises and labor issues. These issues have revealed that there should be more flexibility, visibility, and risk management in supply chain (Kavindi, et al., 2021). Consequently, the stakeholders in the industry have been increasingly adopting the concept of digital transformation and resilience-building to ensure continuity in their operations and competitiveness.

The trend that is observed in the apparel industry of Sri Lanka represents a slow shift to digitalization and a sustainable environment. The most successful companies are implementing new technologies like Enterprise Resource Planning (ERP) systems, Internet of Things (IoT) applications, and data analytics in order to improve the efficiency and traceability of the supply chain. SMEs are also just starting to learn the digital tools although their pace is slow as they have financial and technical limitations. Simultaneously, the industry is increasingly becoming focused on resilience by diversifying suppliers, regionalizing production, and developing workforce (Koswatte, 2015). These emerging practices explain why the industry has been making efforts to cope with the swiftly changing global business

environment without losing its competitive advantage. Sri Lanka apparel industry, thus, is at a crossroad, with the necessity to adopt digitalization and resilience as its key to long-term performance and the continuation of its international image.

2.1.2 Supply Chain Digitalization

Supply chain digitalization could be defined as the process of changing the conventional operations of the supply chain to accommodate digital technologies that drive efficiency, visibility, and cooperation in all value chain activities (Ahmed & MacCarthy, 2021). Simply put, it entails application of technology to gather, process, and disseminate information in a smooth and seamless channel between suppliers, manufactures, logistics partners, and consumers to aid in decision-making based on data and prompt response (Kaup, Wiktorowska-Jasik, Smacki, & Baszak, 2024). This idea goes beyond mere automation and aims to establish networks with each other where data continuously flows in real-time so that firms can detect disruptions early and proactively respond and gain operational resilience. Digitalization allows supply chains to be intelligent ecosystems with every element dynamically communicating with others to streamline production, distribution, and customer service.

The Enterprise Resource Planning (ERP) system is one of the basic technologies that enhance this change(Lengnick-Hall et al., 2004). The ERP integrates a number of functions, these functions comprise procurement, inventory management, production processes, and finance in a single system that is ensured to offer consistency and transparency in management of data (Faccia & Petratos, 2021). In case of ERP, redundancy can be eliminated and planning accuracy can be improved, resources are controlled in real time. ERP regarding supply chains assists in the effective coordination between the departments, in such manner there is harmony within the organization in relation to the order, materials and delivery information(Lengnick-Hall et al., 2004). This is time saving, wastage is reduced and responsiveness towards customers is enhanced.

The other demand pressure of supply chain digitalization is the Internet of Things (IoT). IoT also means the use of smart sensors and RFID tags and GPS tracking devices that gather data about the physical objects such as raw materials, machines, and transportation machines (Khan, et al., 2022). This technology allows companies to trace the positioning, condition as well as the functionality of products and machineries in actual time. As a case in point, the sensors can track the temperature and humidity when handling of sensitive goods or anticipate the malfunction of production lines before leading to delays (Khan, et al., 2022). This type of permanent presence increases quality control, inventory control and predictive maintenance, and saves cost and results in greater reliability.

The other technology that supports the digitalization of supply chains is blockchain technology as it offers transparency and traceability of different stakeholders. It provides a decentralized online registry whereby all the transactions are stored securely and they cannot be changed (De Filippi, 2016). This has been a significant concern particularly in worldwide provision of cloths where they are required to guarantee and confirm the genuineness of crude materials, work rules and nature rules as a method of preserving brand esteem. Using blockchain, an enterprise will have an opportunity to establish the end-to-end visibility of a product life cycle and origin fiber to the retail shelves, and keep companies responsible and trustworthy towards each other (Ahmed & MacCarthy, 2021). This transparency decreases fraud and mistakes and improves adherence to the ethical and sustainability standards which are being demanded among international customers in an increasing number.

Cloud computing is an important concept that can be used to support collaboration in a supply chain through the provision of a flexible and scalable platform of data storing, dissemination of data, and data analysis. The cloud-based systems allow the supply chain partners in different regions to access the same information on real time information and organize quicker decision-making(Giannakis et al., 2019). It means that to the Sri Lankan apparel exporters, they will have faster communication with their foreign clients, will be able to track their orders much easier and plan their production efficiently (Bandara & Oruthotaarachchi, 2025). Cloud system

exists and can be easily scaled hence allowing the enterprise (SME) to evade the thick investments on IT infrastructure particularly to individuals with limited finances.

In the clothing sector, predictive models would help in forecasting the demand at the seasonal level, manage the purchase of fabrics as well as planning the production in a more accurate manner (Thomassey, 2010). The intelligent decision-making is also the use of AI, such as searching potential bottlenecks or suggesting most optimal logistics routes in changing market conditions. It implies that the companies will be in a position to switch to proactive rather than reactive supply chain management that can boost customer satisfaction and efficiency (Thomassey, 2010).

Digitalization has a number of ways in which it transforms activities within the supply chain. One of the most striking ones is real time visibility (Chauhan, et al., 2022). Traditionally, firms were utilizing periodic reports or manual updates so as to track the performance of their supply chain. Since the introduction of digital tools in the form of IoT and cloud-based dashboard, now managers can literally see the whole process of operations in real-time. This will be in a position to enhance the situational awareness that will make the companies recognize the deviations early enough and initiate corrective measures early enough (Chauhan, et al., 2022). It also allows better predicting of demand, as the real time data of the inventory, orders and sale trends will help the business to better predict the production process and adjust the supply to the market changes.

Moreover, digitalization encourages using data in order to make decisions (Hobfeld, 2017). The managers are not required to rely on their experience or guesses, but get an opportunity to examine the real-time performance indicators to take strategic decisions. It results in better utilization of resources, cost control and being more customer responsive(Kohtamäki et al., 2020). The enhanced collaboration is the other notable deliverable as open and reliable relationships among the stakeholders are enhanced by shared online platforms(Kohtamäki et al., 2020). One such example is that manufacturers, suppliers, and logistics providers can work

out timeframes or production schedules on common digital platforms without any communication barriers and delays. Such a partnership also enhances the sustainability of supply chains, since they can recuperate within a short period in instances of disruption.

The digitalization has become a new attribute to supply chain competitiveness globally. Many of the pioneer industries have adopted industry 4.0 principles, where automation, interconnection, and intelligent systems are included in the workflow (Bhattacharya & Bansal, 2025). The sustainability revolution in the world has also led to increased reliance on digital solutions with businesses using technology to monitor carbon emissions, optimally manage resources and sustainability performance reporting (Al-Khouri, 2013). This has been a digital accelerated change in the clothes business particularly through the application of 3D designing, virtual prototyping, digital order management systems and so on (Al-Khouri, 2013). These inventions have reduced production cycles, wastages and responsiveness to the fluctuating fashion trends.

According to Abeyruwan, et al. (2025), The digitalization has emerged as a new means of survival in the international market and this is increasingly being regarded as one of the avenues to remain competitive in the apparel industry in Sri Lanka. The trends that have been embraced by the large apparel groups in order to improve production planning and supply chain coordination include ERP, IoT, and data analytics (Abeyruwan, et al., 2025). There are also the companies that track the work of the factory, the logistics flows and export paperwork with the assistance of digital dashboards in real-time. However, smaller firms are also slow due to the lack of finances and technical capabilities. Most small and medium manufacturers still use manual system in respect to production schedule and inventory control and that is why they are constrained in their response to global market changes. Thus, one of the issues is the digital divide in the industry.

Despite the numerous advantages, there are several challenges which hamper total digitalization of supply chain. The higher systems such as ERP, IoT or blockchain are very costly

thus accessible to the smaller companies (Parikh, 2018). In addition, digital systems cannot be implemented and maintained because of inadequate technical background and skilled human resources. Organizational resistance to change is also a major cause since when the employees are accustomed to doing things in a certain way, they would see the introduction of technology as an interference or danger (Ahmed & MacCarthy, 2021). Data security problems, lack of standardized technology frameworks and poor infrastructures also complicate the process.

These barriers apply particularly well to the Sri Lankan case, where access to capital or skilled digital professionals is not very high. The majority of firms are forced to employ external consultants or offshore software providers and it is an additional cost on top of dependence (Khan, Niazi, & Ahmad, 2011). The variables that are also influential to the adoption speed are the culture and managerial. Leadership commitment, employee training, and innovation openness are the keys to successful digital transformation (Zhou & Li, 2024). These enablers make sure that the digitalization initiatives are not in isolation, and therefore it does not give desired performance outcomes.

2.1.3 Supply Chain Resilience

In recent studies resilience is interpreted as a strategic ability that is necessary enough to keep the firm functioning even in times when there is an interruption of normal conditions(Morawiec & Sołtysik-Piorunkiewicz, 2022). The central point is that in the circumstances of pressure a healthy supply chain makes no failures but adapts itself, preserves the major functions and recovers the performance within the shortest time.

Resilience is an opportunity that is regarded as the core aspect of supply chain management since disruptions are becoming common and unexpected. Musella (2023) revealed that corporations have encountered numerous types of disruptions including international pandemics, scarcity of raw materials, shifts in trade policies and delayed transportation. These might disrupt the production and delivery chains (Musella, 2023). Resilience is therefore

concerned with the designing of systems that will be able to endure and survive these conditions without drastic performance degradation (Musella, 2023).

Barasa, et al.(2018) stated that resilient organisations react to the disruptions in a systematic manner and employ existing plans and available resources. Subsequently, they are restored quicker and tend to upgrade their systems in accordance with the acquired experience. The next achievement of the supply chain in resiliency is based on this cycle of anticipation, response, and recovery(Barasa et al., 2018).

Flexibility is one of the key resiliency dimensions. Flexibility enables a company to switch the quantity of production, alter the sourcing alternatives, and modify logistic activities within a short time period (Stevenson & Spring, 2007). Practically, this may translate to having more than one supplier of the key materials, or having elastic production lines which could be used in the manufacture of various products (Stevenson & Spring, 2007). Das (1995) underlined that flexibility provides organisations with options in case of failure of the normal procedures (Das, 1995). Flexibility in the apparel industry may include moving to another factory, the use of alternative material, a change in the order priorities to satisfy the urgent needs of customers. Agility is the other resilience dimension that has been mentioned in the recent researches. The speed at which a supply chain is able to respond to abrupt changes is called agility(Gligor et al., 2019). Flexibility is an option whereas agility is making sure that that option is implemented quickly. Yusuf, et al., (2004) defined agile supply chains as the supply chains with real-time information, decisions made fast and ability to transfer the resources fast(Yusuf, 2018). To illustrate this, in the international apparel industry, agility assists the companies to modify their production strategies whenever there is a change in fashion or a request by customers that comes up abruptly. It also assists in reducing the effect of breakages like closure of the ports or delays during transportation.

Another major attribute contributing to resilience is redundancy. It is keeping capacity either in the form of inventory or alternative suppliers that can be mobilised in case of failure by the

primary channel (Sheffi, 2007). Even though redundancy is cost increasing, as it is mentioned by Mackay, et al., (2020), it offers the insurance against the uncertainty(Mackay et al., 2020). In the case of the apparel companies, redundancy might be understood as maintaining safety stock of some important materials such as fabrics or contracts with various logistics companies. This will provide continuity in case one route or supplier goes out of business. The point is that a certain amount of planned overcapacity is required to offer stability in the long run.

The concept of adaptability is often listed in the abstract as a long-term type of resilience. It entails how a firm is capable of changing with the change in the market or environmental circumstances (Beermann, 2011). Adaptive supply chains are made thought of previous disruptions and adjust the structure. To provide an example, a clothing company that suffered shipping delays may recharacterize its distribution system in the future by introducing regional warehouses. Adaptability then has not only to do with crisis responses but also better adoption of business models to fit in the future.

Teamwork is also very vital in the development of resilience. Boonlua, et al., (2023) indicated that close relationships with suppliers, logistic partners, and customers will help to more rapidly react and respond to disruptions. Information distributed freely will enable everybody to make plans collectively, eliminate duplication of their efforts and minimise delays(Boonlua et al., 2023). In the apparel industry, the issue of collaboration may imply the exchange of production plans, demand, and transportation programmes. This assists companies to deal with complexity in the international network where suppliers and buyers are placed in various locations. Trust is also formed through collaborative relationships and hence, solving problems together during a crisis is less difficult(Cao et al., 2008).

Another important dimension that is noted by Somapa, et al., (2018) is the visibility. Visibility implies visibility at all levels of the supply chain and with timely information(Somapa et al., 2018). Understanding where their materials, products as well as the resources in real-time

means that the company can make effective decisions during a disruption (Somapa, Cools, & Dullaert, 2018). The role of technology can be very significant. The use of digital tools (sensors, tracking systems, data analytics) helps to increase the visibility of inventory, shipments, and supplier performance by providing accurate information (Alonge, et al., 2023). Visibility in the apparel sector aids brands in tracking the progress in production and will identify the possible delays at the initial stage. It also enhances transparency that facilitates the efficiency and adherence to ethics.

In the apparel industry, the concept of resilience has become particularly more significant because of its vulnerability to world shock and external risks. The business relies on long lead times, international supply chains and sourcing points. This has been revealed through the occurrence of events such as the COVID-19 pandemic, geopolitical tensions and even natural disasters which have demonstrated the weakness of these systems (Abeyruwan, et al., 2025). When ports became closed or capacity transportation fell, the apparel manufacturers were in grave conditions to satisfy orders. De Costa, et al., (2023) indicated that companies whose supply chains were resilient were in a position to transfer the production, re-allocate the schedules and serve the customers despite the hitches.

Resilience has been associated with a persistent competitiveness in the majority of studies. Whenever a company is capable of functioning in times of uncertainty, it will end up being seen as a reliable and trustworthy company. International customers are willing to deal with suppliers that can perform even in a challenging environment. In the case of apparel companies that are concerned, such consistency tends to come in the form of long-term agreements and superior market standings (Abeyruwan, et al., 2025). Resilience also increases operational learning and innovativeness(Suryaningtyas D, 2019). Disruptive company experiences provide effective knowledge of its flaws and strengths. The learning also assists them in redesigning the processes within the supply chain to make them more efficient and strong. These constant improvements lead to increased performance even during the stable time(Suryaningtyas D, 2019). Regarding apparel companies, the experience of numerous

disruptions in the past may mean more precise forecasting, more effective communication with suppliers, or the implementation of new digital tools. Resilience, therefore, is a mechanism of defence and an innovating force.

According to Ajayi (2025), digital technologies have become significant facilitators of resilience. Cloud computing tools, IoT gadgets, and analytics enhance the visibility, communications, and speed of making decisions. The combination of these tools would allow the firms to recognise disruptions beforehand and respond more effectively (Ajayi, 2025). The digital dashboards can assist managers to follow orders and materials within the world networks in real time. The information assists them in making alternative plans or remodelling production prior to delays. The digital integration is becoming more and more famed in the Sri Lankan apparel industry as a means of resilience against uncertainties of the global market.

However, it is also stated in numerous literature that resilience constructions are challenged. The barriers are often high, in terms of cost, presence of skilled personnel and access to technologies, particularly among small and medium-sized companies (Arendt, 2008). Other organisations are reluctant to invest in resilience as the benefits do not necessarily come quick and with ease. Some people find it hard to find a compromise between efficiency and resilience as storing additional stocks or having numerous suppliers may cost more money (Arendt, 2008). However, studies indicate that these costs are not as important as the long-term advantages of resilience, which include continuity, customer loyalty, and minimised losses.

Resilience is also perceived as a competitive ability that gives rise to the long-term sustainability. Some of the abstracts tell us how resilient companies can better incorporate sustainability objectives since they already take long-term stability and mitigating risk into account(Barasa et al., 2018). Sustainability and resilience tend to take on similar meanings in the clothing industry. They reduce risk exposure, but also consolidate brand image; ethical

sourcing, local development of suppliers and strategic transparency through digital-based impact. A sustainable and compliant supply chain will be more predictable and resilient.

The concept of resilience is specifically applicable in the case of the Sri Lankan context since the apparel sector has been facing a life and death situation in the world market. This is because the export-oriented manufacturers in the country are exposed to challenges like changes in demand, political unrests, and disruption of supplies. The recent researches point out that the Sri Lankan clothing companies are now developing resilience via supplier diversification, regional manufacturing centres and enhanced online linkages with foreign consumers (De Costa, et al., 2023).

2.1.4 Supply Chain Performance

The supply chain performance is used to describe how a supply chain can provide products or services in an efficient, reliable and to a level that can satisfy or even surpass the customer expectations. It is a sensitive aspect of the capability of a supply chain in the management of its resources, information and processes to meet operational and strategic objectives. Performance is also regarded as a way of gauging how well any organisation transforms its inputs into valuable outputs without creating any form of fragile coordination among the various partners of the organisation (Austin, 2013). The modern competitive business environment is requiring high performing supply chains in the process of attaining profitability, customer satisfaction, and sustainability.

The notion of supply chain performance has separated itself in its previous form of measuring the performance controlling cost and time. In the traditional form, performance was measured in terms of the lead time, reliability of the delivery, and level of inventory (Chan, 2003). The contemporary researches however highlights the fact that performance is a multi dimensional construct that entails operational effectiveness, flexibility, responsiveness, and innovation. It also entails the customer outcome like their satisfaction, trust, and loyalty (Abdallah, Phan, & Matsui, 2016). An efficient supply chain is not only effective in the operations of the supply

chain, but it is flexible to market variability and it can provide stable values delivery regardless of the uncertain environment (Abeyruwan, et al., 2025).

One of the elements of supply chain performance is operational efficiency. Efficiency aims at ensuring that there is reduced waste, minimised costs, and efficient use of the available resources. In the case of firms that streamline their operations, they are able to deliver products cheaply and within a shorter time. It is specifically valuable when it comes to the apparel sector where rivalry is very stiff, and consumers expect new lines to be introduced regularly (Austin, 2013). Efficiency in supply chains improves bottlenecks in production processes, better use of resources and promotes delivery in time. They also improve the level of coordination in the production, procurement, and distribution units and make sure that there is the flow of material between the suppliers and their customers (Romano, 2003).

Responsiveness is the other significant element of performance. Responsiveness is the feature of a supply chain to respond to fluctuations of demand or supply. Being responsive becomes a very important factor in a globalised market which has a high rate of consumer preference change, particularly in the fashion relevant fields. The apparel companies should have the capacity to modify the production timetable, alter styles, and reorient logistical tasks on an instant basis (Abeyruwan, et al., 2025). The supply chains should be responsive based on the principles of effective communication, data sharing, and making decisions in real-time, which is progressively sustained by digital technologies. Disruption can be converted into opportunity where a responsive supply chain responds swiftly than the competitors.

Flexibility is a concept that bears close relationship with responsiveness but it entails the structural capacity of the supply chain to transform its configurations (Chan, 2003). Flexible supply chains have a chance to change suppliers, adjust manufacturing ways, or resort to alternative shipping paths in case of disturbances. Flexibility leads to the performance in itself since it eliminates the expensive delays and continuity (Thomassey, 2010). Flexibility can be applied in the apparel industry where operating in various regions where sourcing is the norm,

firms can switch suppliers in response to material availability and changing costs. Flexibility in designing networks by companies is better placed in order to deliver on time schedules even in unprecedented events (Austin, 2013).

Another important performance dimension is Reliability. It is the capability of the supply chain to fulfil the commitments involving quality of products, quantity and time of delivery. Dependability is especially needed in industries that are export oriented such as the apparel where buyers all over the world rely on tight schedules (Chan, 2003). A sound supply chain improves business relationships, creates customer confidence and improves brand reputation. It also minimises the number of contingency plans that are usually expensive like emergency shipping or overtime production. High reliability will be an assurance to other countries that the company is a reliable manufacturer, and hence may result in repeat orders and contracts.

Modern supply chains have also become performance driven through innovation. Innovation is the adoption of new technologies, practises, and new approaches of managing business to enhance operations (Thomassey, 2010). Enterprising Supply chains are demand forecasted by predictive analytics, logistical management through digital tracking systems, speedy and precise production processes through automated processes. Innovation improves visibility, and cuts off uncertainty (Abeyruwan, et al., 2025). The digital sampling, virtual prototyping, and smart inventory systems are some of the innovations used in apparel industry to enhance responsiveness and decrease time-to-market. Innovation is not only a way of enhancing short term performance, but also enhances the capacity of the company to go with the times in the future.

One of its measurements of the supply chain performance is customer satisfaction. Another aspect is that an organisation can perform efficiently but its performance is never complete without satisfying its customers. The performance is evaluated by the customers based on the quality of products, the time in which they are delivered, and the quantity of the products which is provided to the customer at the right time. Customers are also more concerned with

transparency and ethical conduct in the apparel business and it has been included in performance assessments (Heikkilä, 2002). Smooth running supply chains that bring value to the customers generate customer confidence thereby resulting in repeated business and long-term relationships.

The increasing complexity of global supply chains has triggered the growing attention to the integrated performance measurement systems (Giovannoni & Pia Maraghini, 2013). Firms are becoming more and more evaluative of how the whole supply chain works as a synergised network rather than measuring each constituent function. This holistic perspective involves monetary, operational and relational performance(Khan et al., 2023). Financial outcomes involve reduction of costs and profit margins, operational outcomes involve lead time and quality, relational outcomes involve collaboration and relationships with suppliers. The principle is that the enhancement of a given area should not jeopardise the other one, e.g., cost reduction should not impact the delivery, or customer satisfaction (Chan, 2003).

Technology is a key driver in optimising performance of the supply chain. The emergence of the use of digital tools has transformed the way firms conduct their businesses. ERP systems unify given different business functions, whereby information flows among departments are intact (Bhattacharya & Bansal, 2025). The technologies of Internet of Things allow to monitor production and logistics in real-time (Alonge, et al., 2023). Cloud computing will assist partners in sharing their data, and big data analytics will assist in demand prediction and streamlining inventory. Decision-making with the help of artificial intelligence applications helps to identify the patterns and predict threats (Austin, 2013). Collectively, these technologies are designing data-driven supply chains that are more accurate, fast, and synchronised in functioning. In the case of the apparel industry, which is sensitive to the demand dynamics and changes in fashion trends, such abilities in the digital domain are the key to high performance.

Sustainability is another factor of performance that is frequently mentioned in recent research. The modern supply chains are supposed to perform efficiently and in addition, be

responsible (Al-Khouri, 2013). The social performance and environmental indicators have now been incorporated into the overall performance. The apparel businesses are forced to cut down on the waste, lower the emissions, and perform ethical labour conduct(Ahmed & Maccarthy, 2021). In general, sustainable supply chains are more resilient and can perform better on a long term basis due to the ability to deal with reputational and compliance related risks. The inclusion of sustainability in performance objectives assists companies to be competitive in the world market as consumers are becoming more conscious of responsible production.

Teamwork and cooperation between the partners of the supply chain will also play a crucial role in ensuring good performance. When manufacturers, suppliers and distributors collaborate, they will be able to minimise inefficiencies, coordinate the production strategies and distribute risks (Zhou & Li, 2024). Teamwork relations enhance quality of information and responsiveness. In the clothing industry, this partnership is carried out to the dissemination of production plans, the co-ordination of shipments, and joint product development with the consumers (Austin, 2013). Strong partnerships between the company and other suppliers are outlined by high performance supply chains being defined by trust, transparency and mutual benefit. These type of relations minimise conflicts and facilitate a smoother operation at the international borders.

Although there is an increasing amount of knowledge about the factors behind supply chain performance, most organisations still have obstacles to performance. Such issues as lack of digital integration, lack of fragmentation, poor data quality, and poor collaboration across departments are common(Chauhan et al., 2023). Financial constraints, inadequate technology and skills shortages are other impediments that are significant in developing economies. Such challenges tend to create time delays, exorbitant expenses and underperformance. Solutions to these obstacles involve investment in technology, training as well as process alignment. Leadership dedication and organisational culture as well are significant in helping to achieve performance enhancement programmes.

Supply chain performance in the case of the Sri Lankan apparel industry is directly related to the competitiveness of the country in its export globally(Brusset & Teller, 2017). Fashion production, to a greater extent, is dependent on getting fashion timely and to the international markets. Thus, any delays or wasted efforts would translate to loss of contracts and other profitability. A large number of Sri Lankan apparel firms are currently working on the opportunities to increase their performance through the use of digital technologies, optimization of logistics, and expansion of cooperation with the international buyers (Al-Khouri, 2013). Digitization of supply chains enables the companies to track the production process on-site, optimise inventory control, and promptly react to changes in demand. These advancements are essential in sustaining the image of the country as a good exporter of apparel (Abeyruwan, et al., 2024).

2.2 The relationship between Supply Chain Digitalization, Resilience, and Performance

The concept of supply chain digitalization, resilience, and performance is a trend, at which they are regarded as mutually complementary aspects that can determine competitiveness and sustainability of businesses that perform in multi-dimensional and unforeseeable markets. The idea of digitization could be defined as the area of integrating the advanced technologies into the supply chain processes to enable tracking the actions in real time, making decisions with references to the information, and ensuring the effective coordination of the members of the supply chain (Abeyruwan, et al., 2025). Supply chain resilience is a trait which predicts, responds and recovers disruptions without causing a break in the chain activities (Al-Khouri, 2013). Performance is a gauge of execution of a supply chain with respect to accomplishment of cost, time, quality, pliable and contented customer of a supply chain. Empirical studies suggest that resilience can be positive through digitalization since such a process enables information to be received on time (Ajayi, 2025), it facilitates cooperation, and response in response to changes, which consequently could be useful in terms of supply chain

performance. The relationship between these three constructs is not therefore sequential per se, but is multidimensional and situational.

The supply chain that uses digital technologies alters the past processes and operations. The level of real-time visibility of the supply chains in the process of digitalization enables the firms to monitor inventory level, manufacturing level, transportation level as well as the performance of vendors. Such visibility will ensure the managers can make the most localised decisions within a small timeframe, anticipate potential disruptions, and maximise allocation(Somapa et al., 2018). This revolution is characterised by the use of data in decision making. The capability of companies to collect, manage and act upon data derived in the supply chain would enable the companies that will be capable to identify the nature of the bottleneck, predict demand shifts and react to operational changes in real-time (Abeyruwan, et al., 2025). This current asset base of empirical research indicates that digitally integrated supply chains are quite efficient, lower cost of operations, and coordination also high particularly in an industry where the globe systems are intricate such as manufacturing of apparel. Digitalization not only leads to more efficient operation management, but to transparency as well, which leads to trust and collaboration among the partners of the supply chain.

Digitalization can be used to create resilience as it responds to several important issues. One, which is digital tools, predictive analytics and sensors and cloud platforms assist firms to sense the dangers that are looming even before it turns serious (Ajayi, 2025). The delay/ shortage or quality issues as the case in point can be detected early by monitoring a production line or shipment tracking which allows acting in advance before these events occur. Second, digitalization is a facilitator of the rapid response mechanisms (Abeyruwan, et al., 2024). The instantaneous information-sharing devices and automatic alarms can help the firms to synchronise the remedial efforts with suppliers, logistics companies and distributors. Third, the digitalization will be accompanied by faster recovery after disruption (Abeyruwan, et al., 2024). The combination of the historical data and the prediction models requires firms to achieve

simulation of various disruption scenarios and the most suitable recovery strategy. Empirical studies have shown that the greater the number of digital organisations the better placed they are to reorganise, cope with alternative sourcing and maintain the same degree of customer service more so in terms of coping with the crisis.

It is also crucial that the relationship between resilience and performance is identified. Agile supply chains also guarantee continuity in the operation in cases of uncertainty and therefore the product, production schedule and customer expectations are met(Yusuf, 2018). Empirically, the findings reveal that resilience is related to higher delivery reliability, reduced lead time and lower cost overruns in case of any disruption. The performance is directly connected with some of the primary dimensions of resilience (Alonge, et al., 2023), flexibility (Das, 1995), agility (Yusuf, Gunasekaran, Adeleye, & Sivayoganathan, 2004), and redundancy. Agility offers fast response of decision and process reconfiguration. An inventory or supplier networks provide a buffer to any unexpected events (Ahmed & MacCarthy, 2021). The above features contribute to the enhancement of the supply chains by reducing the adverse influence of the disruption, and maintaining the same standards of the services.

Digitalization supports the concept of resilience and vice versa. Digitalization provides the instruments and the facilities to execute the identification of the threats and the reaction to the threats, but resiliency determines the efficiency of the instruments that are deployed to achieve high performance even in a time of stress(Yusuf, 2018). There is empirical evidence that digitalization alone is not the key to improved performance. To fully harness on digital tools, firms must develop resolute capacity that encompasses flexible processes, agile planning as well as dynamic networks (Stevenson & Spring, 2007). An example is that a tracking system will identify a delayed shipment as it happens and still discontinue performance without already-stipulated contingency plans or production schedules that go with the flow adaptively (Ahmed & MacCarthy, 2021). The intermediary between the digitalization and performance relationship is therefore resilience. It ensures that the usage advantages of technology implementation are realised considering the operational results.

The impacts of the digitalization on performance are many-dimensional. The findings of efficiency have been introduced in empirical studies on a regular basis. The use of online applications will reduce instances of human error and process streamlining since more resources are wasted creating operations that cost less (Ahmed & MacCarthy, 2021). The enhancement of coordination is also present. Intra- and inter-departmental communication can be made simple using integrated systems and enable the company to make decisions irrespective of time constraints used to formulate business strategies and synchronise production and distribution efforts (Ajayi, 2025). The other dimension is responsiveness. Digitalized supply chains can adjust the demand variances and supply uncertainties in a short duration of time hence reducing stockouts and delays (Ahmed & MacCarthy, 2021). The apparel industry is highly dynamic in terms of fashion and their production cycle is very short and hence such responsiveness directly influences competitiveness in the market (Ahmed & MacCarthy, 2021). The experience confirms that companies that have incorporated the concepts of digitalization and resilient managerial activities manage to operate in the chaotic environment with the guarantees of customer satisfaction and trust.

The resilience and performance are supported by the digitalization through one of the most important factors maintenance and visibility (Chauhan, et al., 2022). It is through digital channels that there is a two way of information between the suppliers, manufacturers and distributors leading to minimization of any misalignment and improvement in coordination. Visibility enables the managers to be informed about the potential bottlenecks or disruptions and put preventive or corrective measures in place early enough (Thomassey, 2010). It is empirically proved that the companies that enhance the visibility of the supply chain and its integration are better placed to respond to the shocks, maintain the saliency of deliveries, and maintain the consumer confidence (Ajayi, 2025). The idea of collaboration with the help of digital system is a process in a complex supply chain, such as the production of clothes in Sri Lanka, all parties are working in harmony and inefficiencies are reduced, thus efficiency results much better.

Adaptability is another fundamental aspect that is related between digitalization, resilience, as well as performance. Observing experimental evidence, companies that have digital use and adaptive processes are able to transform and modify the functioning with the unexpected changes without significant losses (Ajayi, 2025). The concept of adaptability may be seen as the re-organisation of business operations and the reallocation of resources, or a change of sourcing policy, based on real time information. Digital technologies enable flexibility since they provide companies with accurate information and predictive analytics, and resilient practises allow companies to act on such information in the most efficient way (Austin, 2013). The combination of these capabilities plays out as one of the reasons of continued performance particularly in such supply chain scenarios where supply chain is frequently interrupted or performance is not predictable in such cases.

The empirical studies also reveal the relationship between the digitalization, resilience and performance is affected by firm sizes, maturity of technology, as well as complexity of supply chain (Ahmed & MacCarthy, 2021). Smaller resource base and worse technological infrastructures of big-box companies provide higher chances that these corporations will develop more extensive integration of digital systems and will create enhanced resilience. They can invest in advanced analytics, IoT-based manufacturing lines, and cloud-based group working technologies, through investment in which improves performance outcomes. The smaller firms will be able to be more selective to the digital tools, and the latter can limit their opportunities to develop a full resilience (Morawiec & Sołtysik-Piorunkiewicz, 2022). The organisational culture, abettion by leaders, and competencies of organisational employees also influence processes of how effectively digitalization and resilience will be enacted and translated into performance improvement.

External environment is the other determinant that has been highlighted in the empirical studies. The global supply chains are affected by the geopolitical forces, trade policies, economic cycles and natural disasters (Al-Khouri, 2013). The relationship between the digitalization-resilience-performance is strengthened under the high uncertainty level. Firms

that perform better in the more stable settings will be able to get performance gains in the area of digitalization in small steps, but firms vulnerable to the changing environment will be forced to act as vulnerable so they can fully enjoy the benefits of the technology adoption. The competing advantage in the fashion industry necessitates the development of competitive, digital supply chain under the influence of varying needs in the global market, seasonal shipment, and lack of sourcing, among other problems in sourcing regions (Ajayi, 2025).

Control of digitalization, resilience, and performance cannot be viewed as the independent variables, which is rather categorical in the empirical literature (Khan, et al., 2022). As opposed to them, they belong to a more holistic system, in which technology enables information flow, resiliency the adaptability capacity, and performance the output of communication. This holistic view is particularly relevant to qualitative studies that are aimed at unveiling the opinions and lives of supply chain specialists.

There are also problems and drawbacks of empirical empirical literature in terms of critical discussions. Digitalization endeavours might not lead to performance enhancement in the occasion that it is introduced in a de-centralised manner or without supporting processes. Resilience cannot just occur due to technology but there have to be organisational practises, process redesign and employee touchpoint. Comparisons like cost and scarcity of expertise and opposition to alteration may become an obstacle toward the creation of robust, digitalized supply chains (Ivanov, Dolgui, Das, & Sokolov, 2019). Those that fail to acceding to such may be spending so much money on technology without the need to discern a difference in performance. The results of the empirical research demonstrate that the companies which correlate the process of digital adoption and implementation with strategies of resilience-building have the largest improvements in the outcome of operations.

The qualitative evidence also suggests that the relationship between digitalization, resilience and performance is situational and dynamic. Complexity of the products, the supply chain, and the demand pattern in the market have more or less effect on the adoption of digitalization in

the apparel industry (Abeyruwan, et al., 2024). The businesses that produce high-fashion goods and go through a shorter lead time are more benefited by digital presence and predictive analytics, but the low returns are more marginal in the case of ordinary products. On the same note, resilience practises are tailored towards vulnerabilities of the respective supply chains. Redundancy, flexibility and agility are applied depending on two issues like magnitude of production, geographic location and customer anticipations. It is within this contextuality that the need to carry out subtle, qualitative studies is emphasised since insights into the mechanisation of relationship between digitalization, resilience and performance are obtained therein (Koswatte, 2015).

Alternatively, empirical research has also indicated that resilience is a mediating factor whereby one variable is digitalization and performance is the other variable. The digital technologies provide the capabilities to feel, monitor and foresee but the resilience determines the application of the applied capabilities as real life (Abeyruwan, et al., 2025). When the companies have robust policies and recovery mechanisms of digitalization in place, the benefits of digitalization become even stronger. Even without resilience, the digitalization can become better than nothing (enhancing the information flow and monitoring), without it being converted into proven performance benefits (Ajayi, 2025). This mediation comes out with the legitimacy of totality approaches that involve taking up of technology and building out capabilities. Finally, the literature also stresses that the combination of the focus on resilience and digitalization can lead to sustainability and competitiveness in the long term. Those companies that invest into digital systems and resiliency can still operate even in the circumstances of unpredictability and reduce the likelihood of costly disruption to a minimum and gain customer trust on the international scale (Ahmed & MacCarthy, 2021). The abilities of the apparel industry translate into quality of the products, timely deliveries and customer satisfaction.

2.2.1 Literature Gap

Despite a significant amount of literature available regarding the subject of the supply chain digitalization, supply chain resilience, and supply chain performance in the apparel market, there still remains a number of gaps which can be addressed by the current research. Despite the fact that the literature reviewed has highlighted the use of digital solutions such as ERP, IoT, and cloud computing, as well as blockchain to enhance efficiency, visibility, and coordination (Abeyruwan et al., 2025; Ahmed and MacCarthy, 2021; Ajayi, 2025; Alonge et al., 2023), not many studies on it have been conducted at the level of the Sri Lankan apparel companies. The focus of most studies is large apparel companies that already made investments in highly developed digital systems (Abeyruwan et al., 2025; Bandara and Oruthotaarachchi, 2025; Wijesinghe et al., 2024), but smaller business organizations comprise a significant portion of the sector and prefer using manual operation due to the economic and technical constraints (Abeyruwan et al., 2025). It denotes the digital divide that has not been researched effectively on the issue of resilience and overall supply chain performance.

The literature also indicates that with digitalization, it is now possible to achieve visibility in real-time, make decisions that are data-driven, and collaborate more effectively (Chauhan et al., 2022; Ajayi, 2025; Thomassey, 2010). However, no empirical studies are available on how these digital capabilities can be translated into actual operational and customer related performance of the Sri Lankan apparel companies. Though the international study suggests that online tools can make the work more efficient and more responsive (Ahmed and MacCarthy, 2021; Kohtamaki et al., 2020), the referenced studies do not provide any direct data associated with the local situation, where any disruption is the norm, and export is something that is heavily dependent.

They have introduced such dimensions as flexibility, agility, redundancy, adaptability, teamwork, and visibility as vital capabilities in managing disruptions and identified resilience as such (Yusuf et al., 2004; Mackay, Munoz, and Pepper, 2020; Abeyruwan et al., 2025; Somapa

et al., 2018). Nevertheless, a lot of the literature is theoretical or international examples and as such, the knowledge gap on how the Sri Lankan apparel firms utilize the resilience practices in their day-to-day operations still remains. Moderating role of resilience in the relationship between digitalization and performance has been advanced (Ajayi, 2025) but there is limited empirical data of the mechanism in the real world environment in Sri Lanka. It is hence unclear that resilience is a full mediator of relationship or that other environmental circumstances such as size of firm, technological maturity and supply chain intricacy play a key role.

In literature, performance measurement is multidimensional, covering such dimensions as efficiency, responsiveness, flexibility, reliability, innovation, customer satisfaction, and sustainability (Abdallah, Phan, and Matsui, 2016; Austin, 2013; Al-Khouri, 2013; Abeyruwan et al., 2025). Even though these dimensions are theoretically well-advanced, there are minimal empirical studies on the concurrent position of digitalization and resilience on each of the performance dimensions, especially, on small- and medium-sized apparel firms that are resource-constrained. In addition, the literature has identified the current challenges as a lack of cooperation, data quality, and organizational resistance to the technology (Abdallah, Phan, and Matsui, 2016; Ahmed and MacCarthy, 2021), but few studies have investigated how these challenges affect the relationship between digitalization, resiliency, and supply chain performance in the Sri Lankan apparel industry in a systematic manner.

Also, contextual factors lack empirical implications. The size of firms, the intensity with which the external environment is integrated, and the level of technology adoption are factors that have an impact on the effectiveness of digitalization and resiliency practices (Ahmed and MacCarthy, 2021; Morawiec and Sołtysik-Piorunkiewicz, 2022). However, it is not common to examine how these factors interact with digital and resilience initiatives to determine performance of the Sri Lankan apparel industry. In the example, smaller firms may selectively become the users of digital tools and this prohibits the advantages of resiliency practices (Abeyruwan et al., 2025), and the impacts of the uncertainty of global supply chains, such as

the shift in trade policy and geopolitical instabilities, have not been studied in a comprehensive manner (Al-Khouri, 2013).

Finally, the gaps that have been identified in the literature are directly connected to empirical research of the current study. To begin with, there is a need that the localized empirical research should be conducted on the introduction of digitalization in the apparel companies in Sri Lanka and the effects of its application on both the sustenance and performance. Second, one should investigate the mediating role of resilience on digitalization and performance on the specific constraints on the operations and resources of the Sri Lankan firms. Third, the interplay between the impacts of digital tools, resilience practices and contextual issues of firms on multi-dimensional performance is under-researched. Filling the gaps will provide viable information on how supply chain performance can be enhanced particularly in the small apparel companies that are operating in the global market more so during uncertainties in the markets.

The chapter has assessed the literature available on the digitalization of the supply chain, resilience, and performance and has paid attention to the relationship among them. Digitalization brings the opportunity to view supply chains in real time, make decisions using data and improve effectual coordination, whereas resilience ensures an opportunity to react, foresee, and recuperate once disruption takes place. Both literature point out that digitalization and resilience as a combination have an impact on operational performance, efficiency, and competitiveness. Nevertheless, there are gaps in the perception of the employees, contextual differences in the developing economies and sector related dynamics within the apparel industry. This is the reason as to why these gaps are addressed to justify the current qualitative study.

3 Theoretical Framework

The apparel industry has been experiencing severe uncertainties in the globe and locally, and this has justified the use of strategies to enhance the performance of the supply chain. The complexity of global supply chains and long lead times and susceptibility to geopolitical, economic and environmental shocks have put in the limelight the digitalization and resilience as key characteristics that drive operational effectiveness and competitiveness (Abeyruwan et al., 2025; Ajayi, 2025). Digitalization guarantees that supply chain partners would be seen in real-time, use the data to make decisions and that they are better coordinated, but resilience would enable organizations anticipate, respond, and recover when something goes wrong without causing a disruption in operation.

Even though the literature has been expanding on the interest on those domains, there have been minimal studies that have become empirical in the Sri Lankan context, although more attention has been made towards the theoretical foundation or global examples (Abeyruwan et al., 2025; Alonge et al., 2023). Moreover, the in-house manual operations and limited digital infrastructure that are so far relied on often creates inconsistencies in the performance metrics and strength among other smaller apparel companies that constitute a considerable portion of the industry (Morawiec & Sołtysik-Piorunkiewicz, 2022). One should know how these companies leverage the available resources, online tools, and resilience practice to generate ideas on how to improve the efficiency, responsiveness, and sustainability of the operations.

The theoretical framework of the given study is built using three already developed perspectives that are considered as Resource-Based View (RBV), the Technology-Organization-Environment (TOE) Framework and Contingency Theory. Both enter with a different mind to realize the interaction between digitalization and resilience in order to enhance supply chain performance. RBV concentrates on the strategic significance of resources, especially digital tools, as one of the means of competitive advantage(Lubis, 2022). TOE concentrates on the organizational, techno, and environmental contexts which influence the introduction and

adoption of digital technologies. The Contingency Theory focuses on the conditions and the organizational uncertainties that define the effectiveness of the resiliency practices.

By synthesizing these theories, it is hoped that this paper will provide a detailed perspective of how supply chain digitalization and resilience are applied to the Sri Lankan garment industry, particularly in the environments with limited resources. The framework will enable the qualitative exploration through the application of an in-depth interview which will capture subtle information on managerial practices, decision making process and how they operate. The approach allows investigating the complementary relationship between digitalization and resilience extensively to influence the result of performance (efficiency, flexibility, responsiveness, reliability, innovation, and customer satisfaction.

3.1 Resource Based View (RBV)

Resource- based View (RBV) is another theoretical approach offering an explanation of how companies leverage their internal resources in achieving a sustainable competitive advantage. At the fundamental level, RBV indicates that resources, be it tangible or intangible, get to be strategic use when they enable firms to create unique capabilities that can hardly be imitated by the rivals. The mentioned supply chain management environment resources are not the only material resources, yet technological infrastructure, organizational knowledge, human capabilities, and managerial skills(Lubis, 2022). Such coordination and efficient use of these resources will be significant in any multi-faceted industry such as the apparel industry with the market being dynamic and where the global interdependences will need an effective and flexible mode.

The Sri Lankan apparel industry is the area where the RBV framework could be employed to understand how the companies could utilize their resources, such as digital technologies, human resources, and their knowledge of the functioning to serve the performance of their supply chain(Susitha et al., 2025). The commodity of digital tools is that it creates a real-time visibility, making sure that the suppliers and distributors are coordinated and that data is

encouraged to be used in the decision-making process. With such tools correctly implemented, it will indicate that the firms will predict the disruption of the process, optimize production timelines, and respond quickly to changes in demand. The technology is the strategic property, not utility, of the firms, and with the help of technology, the companies transform mundane operations into the ability to create competitive advantage(Susitha et al., 2024).

RBV underlines the disparity in the resources of firms. Big clothing companies may possess an advanced online platform, automated manufacturing line, and highly synchronized supply chain business processing, which makes them be able to maintain consistency in their performance even in the situation of interference(Lubis, 2022). The smaller companies on the other hand tend to be resource bound and have to rely on manual processes and simple technology. Nevertheless, RBV school of thought suggests that small resources when applied strategically can produce a good amount of value(Lubis, 2022). To highlight the example, the operational reliability and responsiveness can be improved by the means of the selective use of digital tools to trace the inventory or simply trace suppliers even in the conditions of limited resources. The secret is the possibility to schedule the resources according to the organizational goals and utilize them to enhance the most significant supply chain processes.

A factor of relevance in RBV is complementarity of resources and organizational processes. There is no need to think that digital tools on their own lead to improved performance. They may be incorporated into the business procedures and decision making processes and this is their efficacy. Only in the case when managers prepare schedules in advance and foresee the hypothetic bottlenecks, redistribute resources, and alter the production schedules, digital systems can introduce the visibility as a strategic advantage to the organization(Susitha et al., 2025). Speaking of the same, without human knowledge and skills, it cannot be possible to interpret the insights of the data, organize the supply chain processes, and provide a reaction to unpredictable disruptions with timely response.

The other aspect of sources of competitive advantage brought out by RBV is the inimitability and uniqueness of resources. The presence of some firms whose resources are relatively scarce, valuable and difficult to replace enhances the possibilities that they will enjoy advantage of performance compared to the rest. This can be either as proprietary software systems, specialized production knowledge or networked supplier bases in the apparel industry. The competitors will barely be able to imitate such resources in the short-term perspective and allow the firms to respond to global uncertainties with increased efficiency(Susitha et al., 2025). When it comes to the smaller apparel companies in Sri Lanka, it is what can be enhanced or incorporated to build resiliency and carry on with the performance in the wake of the disruptions.

Furthermore, RBV is more oriented towards sustainability and the long-term value creation. The resources are not just handy in the short-term operations but also can assist in the long-term competitiveness(Susitha et al., 2024). Digital tools and human expertise and organizational knowledge are helpful in continuous learning, process improvement, and innovation in the supply chain. This in the long-run forms the resilient and flexible ability that helps the firms remain relevant in the unpredictable market conditions.

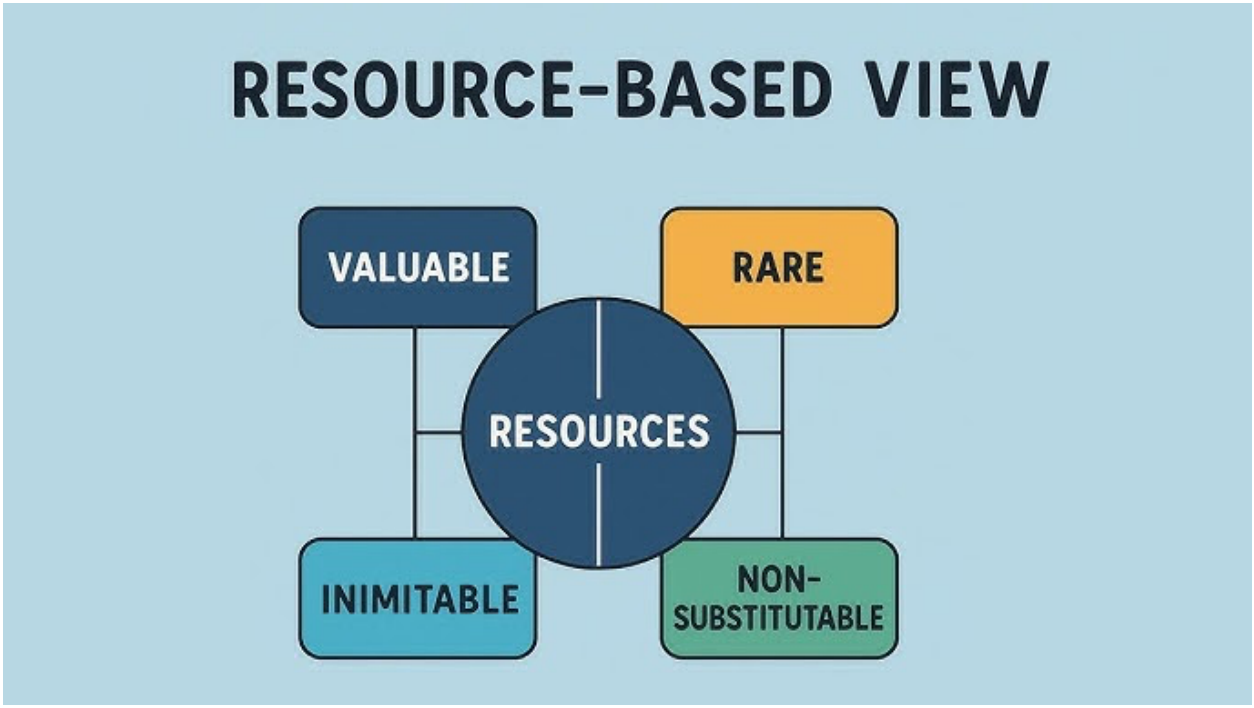

Figure 1 Resource Based View

Source : (Lubis, 2022)

3.2 Technology – Organization – Environment Framework (TOE Framework)

The TOE framework provides a comprehensive view of the knowledge of the way the apparel manufacturers in Sri Lanka can use digital technologies and how that use can strengthen the supply chain and its functioning. It explains digitalization not as the decision that involves particularly technical decision making, but as the outcome of the interaction between technological opportunities, organization resources and environmental forces(Lakmali et al., 2019). The three dimensions are synergistic and the dimensions that the firms evaluate the digital tools, internalize preparation of change, and respond to outside demands of the highly competitive and volatile global market. Digital transformation as a strategic practice in the line of sight is pegged upon a greater context of operation and institutionality of the apparel industry.

Digitalization is built on the background of the technological conditions. Existing differences exist in the availability of higher systems to the apparel companies, integration with existing processes and complexity of the technology(Bolonne & Wijewardene, 2020a). The technologies that are easy to integrate are in such a way that the barriers of implementation can be low and the firms can digitise their operations without creating unreasonable disruption. Application of planning software, data sharing system, automated tracking, and real time analytics can be used in the apparel business where speed and accuracy is essential in order to ensure that a greater degree of visibility and coordination is maintained. These systems allow companies to respond quickly as a result of customer orders, allow the movement of materials to be followed far more precisely and reduce the number of cases of delays that cause inconvenience in production cycles. The path of digitalization is a viable path to enhancing the power of a firm that has been adequately equipped as regards technology, as in the event of quality information and exposure, it will be easier to anticipate risks, re-align sourcing and stabilize operations in volatile conditions(Lakmali et al., 2019).

Also, the organizational factors are significant as no advanced technology can be used to create value without the positive internal environment. The digital transformation is going to be attained relying on the readiness of the management to make investments in digital technologies, encourage innovations, and distribute resources. A culture of rewarding technological advancement will be instilled and resistance to change among the employees will be eased by the new leadership that will allow experimentation and learning. The staff has a training and skill influence as well(Bolonne & Wijewardene, 2020b). Digital transformation in most Sri Lankan apparel firms entails the employees shifting towards manual and paper based operations to the utilization of data made decisions. The teams use the new systems due to confidence and competence that has been instilled in the firms by investing in training. It is also important to have good internal communication and cooperation as digitalization requires integration in product development, sourcing, manufacturing and logistics.

Environmental influence also plays a role in the process of digitalization that the firms are engaged in. The apparel manufacturers in Sri Lanka are located in the global supply chains where customers need speed of supply, transparency and standardization of quality. The market needs drive the companies to adopt technologies that will render them more visible and reliable. Competitive pressure also leads to continuous improvement in companies as they compete against one another by differentiating regarding better service and efficiency. Regulatory requirements, sustainability norms and industry norms exist which add an extra layer to guide and accelerate adoption(Bolonne & Wijewardene, 2020b).

When combined, the technological, organizational, and environmental dimensions of the TOE framework enable achieving the overall image of how the digital transformation proceeds along with the apparel industry. Digitalization is a smart response to its internal competencies and the external pressure and not an improvement of the work(Bolonne & Wijewardene, 2020a). The play between these dimensions determines a seamless successful and organizationally achievement-oriented adoption. A company that has innovated technologies and possesses weak internal structure is unable to gain full benefits of digitalization. Similarly, good internal capabilities are not necessarily converted into any meaningful change where the technological environment is not the same as that of full scale where the forces of the external environment are not that strong to change anything(Lakmali et al., 2019). The strength of the TOE model is that it can be used to understand such interaction and provide evidence of how the combined preparedness of all three dimensions can result in more resilience and improved performance of the supply chain.

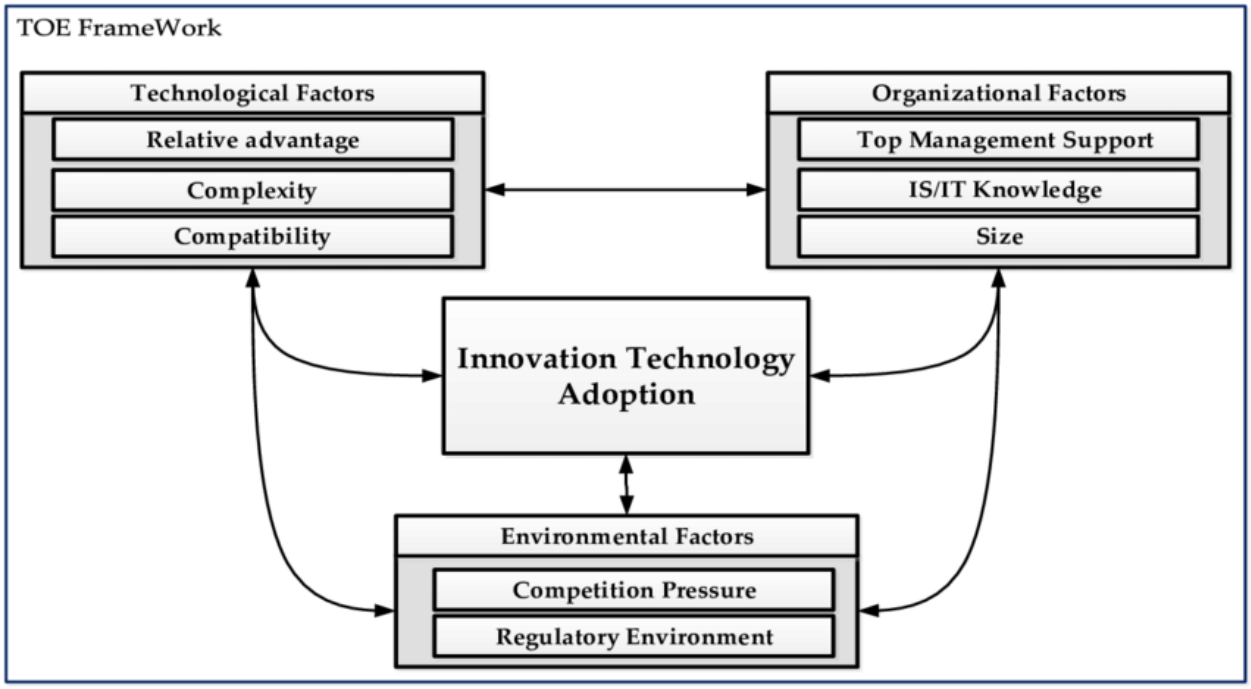

Figure 2 TOE Framework

Source: (Lakmali et al., 2019)

3.3 Contingency Theory

The contingency theory provides an excellent context of the explanation as to why the apparel companies in Sri Lanka have mixed outcomes concerning the issue of supply chain digitalization, resilience building, and performance improvement. The primary notion of the theory is that there is no optimal way to organize or manage a supply chain. Instead, the effectiveness of practices is based on how well they fit the current situations that the firm is performing. This perception particularly fits the apparel industry case in which market uncertainties, customer needs, operational limitations, and resources are varying greatly among companies. The contingency theory can therefore be applied to comprehend more how the digital tools or resilience plans, which have proved to be effective in one level of implementation, may only show marginal results in another level of implementation(Piosik & Karmańska, 2023).

The apparel sector is characterized by diverse circumstances, and they affect the abilities of companies to accept and implement the digitalization. Large exporters tend to be well connected with buyers, have higher potential to invest, and established compliance system, which allows them to implement a high-tech solution and integrate it into their habit. Less finances, professionalism, and skewed technological infrastructure can be lacked by smaller companies and influence the extent and scope of digital adoption(Piosik & Karmańska, 2023). The contingency theory clarifies this point by stating that differences do not mean that a person manages poorly, but only represents signs of varying facts of context. Digitalization and performance relationship is therefore fixed on the quality of the technological choices compared to performance and environmental details of the company(Niemand et al., 2021).

The theory also contributes to the explanation of the response variation between firms in Sri Lanka to the external pressure such as compliance requirement of buyers, global sourcing transformation or demand variation. As a way of aligning themselves to the environment, firms adapt their structures, processes and technologies to the pressure. Those which align their supply chain strategies to the kind of uncertainty that they face are seen to have better performance and are more resistant to disruptions. The contingency theory further reinforces that the success of the digitalization initiative cannot be seen out of contextual realities and that one size fits all approach would not be able to offer uniform results in the apparel sector(Lakmali et al., 2019).

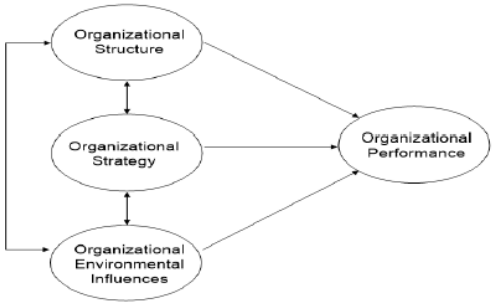

Figure 3 Contingency Theory

Source: (Piosik & Karmańska, 2023).

4 Research Methodology

This chapter describes the methodology followed to examine the role of digitalization and resilience in supporting the performance of supply chains in the apparel sector of Sri Lanka. The research is based on a qualitative research design which aims at recording detailed information about the practitioners who are at the forefront of supply chain activities. The chapter identifies the research philosophy, approach, and design, and then gives the information about the participant selection, data collection, and procedures of the interviews. It also explains the steps taken when analyzing data and the precautions taken to guarantee credibility, dependability, and ethical integrity. It is to outline a clear and stringent methodology that substantiates validity of the findings of study.

4.1 Research Approach : Qualitative

The qualitative research approach will be utilized in the proposed research to create a holistic image of how digitalization and resilience determine the performance of the supply chain in the Sri Lankan apparel industry. The qualitative approach will applicable because the study focus on investigating the views, experiences, and lessons that were learned by individuals who were directly engaged in the administration of supply chain processes. Digital transformation and resilience building is a process, which is context-specific and, therefore, cannot be described in numerical terms and is complex(Veluswamy et al., 2013). It must be the case that the data employed in understanding how decision makers make sense of disruptions, adopt digital tools and gauge performance outcomes, should be rich and descriptive in nature and reflect lived realities of practitioners.

The qualitative method is also appropriate in the present situation of the research questions as the study aims to unveil how and why there are certain digital practices and resilience strategies that emerge in the apparel companies. These are subjective interpretation questions, organizational routines and judgments that can be made in a setting that can be

analyzed effectively through simple conversation with the respondents(Veluswamy et al., 2013). Qualitative approach provides some leeway to explore more in areas that may not be seen through structured or quantitative approach(Teherani et al., 2015). It will allow the researcher to view the supply chain problems, the internal functions and responding behaviours in a comprehensive and situational manner.

The concept of supply chain digitalization and resilience is rather novel in the Sri Lankan apparel industry, and empirical research on the subject is limited and does not reflect the relationship between the two phenomena in practice. Qualitative approach is therefore viable when researching an under-explored issue where new knowledge, patterns and meanings would be created during data collection(Teherani et al., 2015). This flexibility will help the researcher to modify questions to fit emerging themes that may emerge unexpectedly but can be able to understand the phenomenon at a deeper level. This exploratory orientation will suit the complexity of adopting digital, diversity of resilience strategies and the realities of operations as they influence performance of different apparel companies.

In addition, the qualitative research offers the subjects an opportunity to share their experience using their own words, which will be required in the subject being influenced by the organizational culture, decision making styles, resource constraints, and various exposure to disruptions. Digitalization and resilience might represent different things in different companies basing on their size, structure and market positioning. Allowing the freedom of the participants to share their opinions will assist in developing a complex and organical interpretation of these differences. By accessing the concept of supply chain managers, operational staff and the representatives of the whole apparel industry, the study can generate an image of the implementation of digital tools, resiliency building and its influence on performance results.

4.2 Data Collection : Semi structured interview

The data of this study was collected through the semi structured interview in an effort to find out the experiences of individuals involved in supply chain operations and perceptions and operational practices of individuals to comprehend the operations in Sri Lankan apparel industry. The interview manual was premised on the correspondence to the research questions and to develop in-depth data on the subject of digitalization, resilience, and performance outcomes. Semi structured interviews were considered appropriate because it allows the participants to elaborate what they experienced at their own will(Roshaidai & Arifin, 2018), but on the other hand it covers all the areas of the research that were relevant and addressed uniformly.

The sample was spread across the geographical location, and the accessibility was not equal to various apparel companies; it is why the interviews were conducted with the help of Zoom and phone calls. Application of Zoom offered video based conversations to individuals who deemed their desired context more engaging than the use of telephone calls which was considered in the case of those with low internet connection or tight schedules. These distance and internet-based options made it easier, minimized logistical challenges and attendance was not required through traveling or face-to-face meetings.

To collect data, apparel companies whose operational structure and digital maturity represent different levels were sampled. In these companies, 9 interviews were conducted with the respondents who had a direct connection in the respective roles of the supply chain such as procurement, manufacturing planning, logistical coordination, inventory and communication with suppliers and digital operations. The range of the positions gave a comprehensive overview on how digitalization and resilience can be portrayed in different positions within the chain of supply.

The participants were selected by the study using the convenience sampling method. The access to the supply chain professionals in the apparel sector in Sri Lanka can be limited in

various aspects relating to the policy of confidentiality, the severe working conditions, and gatekeeping by the organization. The convenience sampling also allowed the researcher to deal with people who were accessible(Roshaidai & Arifin, 2018), available and willing to participate in the research as well as ensure that they had the necessary experience and relevance to the research aims.

Each interview opened with the introduction of the purpose of the study, information on the confidentiality and requests to request permission to record the conversation. The participants were told that the information they will be collecting will be utilized in a purely academic setting, and will be kept confidential. The interview protocol affected the flow of the interview that started with background questions and shifted to the themes of digital tools, resilience strategies, operational issues, and reflections on supply chain performance. Probing questions were also used when it was appropriate to bring out deeper or clarify new thoughts.

The interviews took between 15 and 25 minutes depending on the depth of the responses and even the breadth. All the interviews were conducted in English and the researcher took to make short notes during the interview to supplement the recorded data. Once the completion was done, the transcribing of each interview was also done word by word to be specific to the coming analysis processes.

Only 3 participants out of 9 gave their consent to have the interviews recorded. According to the interview protocol, the recordings were only kept until the research was granted approval and submitted. Participants were also informed that the recording would be kept confidential and would only be utilized in the analysis and destroyed at the end of the study.

4.3 Respondents' Profile

The sample of respondents included 9 participants who represented various managerial and senior-level roles that comprised of merchandising, production, materials management, and supply chain oversight. The participants are all well-versed in managing supply chain

operations with 2-25 years of experience that offers substantial information on the usage of digital solutions and resilience planning. The respondents belong to various apparel corporations, making sure that the variety of views on operational practices, integration of the technologies, and strategies will be provided. The table below captures the main details of each of the respondents such as the company which they are members of as well as their designation and years of experience which helps in validating the findings and relevance of the findings presented in the discussions below.

Table 1 Respondents' Profile

Respondent	Company	Designation	Experience (Years)	Date of Interview	Time of Interview
1	Jay Jay Mills	Manager – Merchandising	7	10/11/2025	11:00 AM
2	Hirdaramani	Senior Merchandiser	7+	13/11/2025	12:08 PM
3	Jay Jay Mills	General Manager – Merchandising	12	10/11/2025	9:15 AM
4	Jockey	Manager – Materials	2+	12/11/2025	4:02 PM
5	Hirdaramani	Manager – Supply Chain	25	13/11/2025	10:00 AM
6	Hirdaramani	Assistant Manager – Production & Supply Chain	15	13/11/2025	2:30 PM
7	Ritz Clothing	ERP Analyst	2	17/11/2025	11:30 AM
8	Brandix	Sales Manager	3+	12/11/2025	3:00 PM
9	CCL	Head of Product Development & Supply Chain	23	12/11/2025	1:00 PM

4.4 Research Approach : Inductive

The study research design is inductive research, which is appropriate in exploratory qualitative research and in accordance with the study aim to learn the impact of the digitalization and resilience on the supply chain performance in the Sri Lankan apparel industry. Inductive approach further allows patterns, ideas and discoveries to emerge directly out of the data rather than commencing with some type of predetermined hypothesis. Since the research is based on investigating the meaning-making of digital tools by practitioners, the coping with disruption, and the perception of the result of performance, it is important to mention that the findings would be the natural outcome of the experience of the participants rather than the procession steered by already available theoretical assumptions.

The inductive reasoning is concerned with creating knowledge basing on the ground and involving voices, observations and interpretations of other voices particularly those who are directly concerned with the phenomenon(Roshaidai & Arifin, 2018). This suits the case in question in the present study, where digital transformation and resilience practices are heterogeneous in apparel companies and the effect of how these practices impact the end results of the supply chain is not well established either. The fact that theories and explanations emerge out of the data supports in favor of a more natural and context-based explanation of how the digital tools are adopted, how the resilience capabilities are built, and how they influence each other in terms of day-to-day operations. This will ensure that the facts about the supply chain professionals are central in the development of insights (Roshaidai & Arifin, 2018).

The inductive approach is particularly applicable in those fields where theoretical constructs are inadequate or where what is of interest is dynamic and complex and thus, yet to be fully understood. The digitalization practices adopted by the companies in the Sri Lankan apparel industry differ depending on the resources, preparedness to technology, and organizational culture. Similarly, resilience plans are modified based on disruptions such as inefficiency in

supply, delay or external shocks. As these practices are not a priori, inductive approach provides the latitude of finding details, new trends, and individual responses that may not have been defined in the existing models.

It is also one of the ways by which the researcher can analyze the subjective connotations that are attributed to digitalization and resilience. Depending on their roles, duties and experiences, the way people perceive technologies might differ (Roshaidai & Arifin, 2018). They may also not be similar in their performance perceptions in terms of the strain of the operations, customer demands and organisational priorities. The inductive approach helps to further and deeper comprehend the research topic as it allows the respondents to describe their perception and engagement with the stated notions (Roshaidai & Arifin, 2018).

Moreover, employing an inductive approach helps the research formulate findings that can define the theory and practice. Since the research is concerning a relationship that has not been thoroughly researched within the Sri Lankan garment industry, new themes may represent a new way of engaging digitalization and resilience, or represent some practical problems and complements that were previously not documented. This provides it with a strong theoretical foundation on which it can expand and provide recommendations that are based on the reality of the situation with supply chain operations within the industry.

4.5 Research Purpose : Exploratory

This study is an exploratory research because it aims at examining the extent of embracing digitalization and resilience practices and their effects on the performance of the supply chain of the Sri Lankan-based apparel industry. Exploratory research is highly suitable when the previous researches have not sufficiently covered the same or by the mere fact that the phenomenon under study is not properly covered (Roshaidai & Arifin, 2018). In the context of the apparel industry in Sri Lanka, the current understanding of the field does not give information on the application, integration, and effects of the digital tools and resilience strategies on the outcomes of the operational activities and supply chain performance.

The exploratory research method allows the study to examine the perceptions and experiences of supply chain experts in a contextual way (Roshaidai & Arifin, 2018). By collecting profound information regarding the adoption and utilization of digital tools in the domains of ERP systems, predictive analytics, or IoT platforms and the way firms plan and respond to disruption, the study finds the trends, opportunities, and challenges which are not necessarily present in the existing studies. It, too, provides the possibility to explore the role of the resilience practices, such as flexibility, redundancy, or agile plans in supporting performance when faced with disruption, and the role of the resilience practices in interacting with the utilization of digital technologies.

Besides, exploratory research is flexible in its data collection and analysis that is very important in this situation when dealing with complex and changing phenomena (Hunter et al., 2019). The emerging trend and operational realities the study is centered on enable the researcher to have a holistic picture of supplychain practices in different companies. Through this, one can recognize overall strategies, difficulty-specific to situations, and key findings, which will form the appropriate background to the future research and the articulation of the effective recommendations that will be employed by the industry stakeholders.

In line with an exploratory approach, the study is not aimed at testing any hypotheses but getting up to useful information and developing a deeper understanding of how digitalization, resilience, and supply chain performance interrelate to one another. It also vacates the area of bringing up more contextual factors in decision-making which could be size of the organization, availability of resources or market forces. Lastly, the given research study has both theoretical and practical implications because it addresses the research gaps, informs the industry practices and guides the future research that will allow enhancing the efficiency and competitiveness of the supply chain in the Sri Lankan apparel industry.

4.6 Data Analysis : Thematic Analysis

The data collected was analyzed through the thematic analysis after conducting 9 interviews with the supply chain professionals working in apparel firms in Sri Lanka. This methodology presupposed the identification, analytical descriptions and explanations of patterns and themes that emerged in the responses of the respondents on the issue of supply chain digitalization, resilience practices, and the effects thereof on the performance. The thematic analysis was particularly suitable in this research, as it allowed the researcher to get the perspectives, experience, and insights of the involved people in their own words and provided a subtle understanding of the phenomena in research (Antony et al., 2022).

The interviews transcripts were analyzed in the analysis and significant concepts were coded and categorized into important themes. These categories represented the similar patterns in the implementation of the digital tools, in the creation of resiliency practices and the impact of these two on the performance of the operations during periods of disruption. This thematic analysis was repeated and, therefore, the researcher was able to revise and refine themes as new information became visible and retained the analysis on what the participants had gone through in their lives.

It was also possible to investigate the relationship between digitalization and resilience in the life of the supply chain by using the thematic analysis. The research was at a place to identify common practices, issues and measures that the apparel firms used to enhance supply chain performance through sorting the data into distinct themes. In addition, the methodology was a systematic way to contrast experiences and compare them to each other, in different companies and positions, with the identification of specific and general insights that defined the results of the supply chain.

Overall, thematic analysis provided a deep and versatile methodology into the complex process of digitalization and resiliency of the Sri Lankan apparel industry. It also ensured that the findings reflected the facts on the ground, and perceptions of the stakeholders in the

industry, which helped in the aim of the study to analyze how the digital and resilience initiative was being executed to optimize performance of supply chain under varied conditions.

Having performed the thematic analysis, the themes and their categories underpinning the themes identified were then analyzed in terms of the theoretical perspectives of the Resource-Based View (RBV), Technology-Organization-Environment (TOE) framework, and the Contingency Theory. To reveal the mechanisms of observed results, each theme was mapped to these theories. As an example, the digitalization tools were viewed through the lens of RBV as strategic resources, and TOE emphasized the role of technological readiness, organizational capacity, or environmental pressures in the adoption. The Contingency Theory served to put into perspective how the resilience practices and performance outcomes were influenced by firm-specific conditions. This mapping gave a systematic insight into the way themes were converted into quantifiable supply chain outcomes.

4.7 Reliability and Validity

Reliability and validity were considered to be the significant issues in order to discuss the quality and credibility of such qualitative research. Reliability was the correctness of the study in its capability of getting the right insights on the participants. In this research, reliability was ensured through the adoption of a similar interviewing protocol to all the 9 participants of Sri Lankan based apparel companies. The same format used in all the interviews which included the question and procedures reduced the chances of differing the data collection and offered the chances of obtaining similar responses when faced with the same conditions.

Validity in this research was considered to mean that there was accuracy and reliability in the results. The information obtained about online interviews, MS Teams, and telephone interviews was not permitted by the researcher to be misleading in terms of the reflection of the experience and perception of the participants of the digitalization of the supply chain, its resilience, and performance. The thematic analysis was applied methodically in such a manner that the patterns and the key themes that were reoccurring could be recognized and the

findings formulated as per the actual answers of the people as compared to what can be conjectured by the researcher.

To increase the validity even more, the researcher maintained sufficient records of all interviews including audio tapes and transcripts which were edited and cross-compared during the coding and developing of the themes. The process helped in justifying the perceptions of the subjects.

5 Results and Findings

This chapter displays the analysis of the primary data obtained on the interview of the supply chain professionals in the Sri Lankan apparel industry. The aim is to investigate the role of digitalization and resilience practices in the performance of a supply chain. The data gathered is systematically presented and analyzed to establish patterns, trends and knowledge across various organizations. Individual interview questions are discussed in order to see how digital tools, operational strategies, and adaptive measures contribute to improving efficiency, continuity, and responsiveness. The results offer the basis of the interpretation of the interaction of the three concepts of supply chain digitalization, resilience, and overall performance.

5.1 Analysis of Interview Data

The follow-up interviews that shall be conducted in comparison with this research are given in this section. These were nine respondents, who are the representatives of various apparel organizations in Sri Lanka and are in management or senior positions that are directly linked to the supply chain operations. The obtained information in the form of the interview was analysed manually and it concentrated on the potential to evoke the veritable information on digitalization, resilience practice and the potential effect they would exert on the performance of operations at the sales point of contact with suppliers.

Thematically, the qualitative data were critically examined and the same was developed according to the six steps model suggested by Braun and Clarke (2006). This strategy helped to make sure that no patterns, nuances and critical observations which were employed by participants were overlooked. It was studied in the following way:

1. **Step 1 -Familiarisation of Data**: the data in each of the interviews was read several times, to get a general idea of the answers achieved by the

participants. The observations that occurred as time lapsed were also noted down, particularly original patterns and remarks.

2. **Step 2- Generation of initial codes**: The key concepts and important phrases were highlighted and manually coded. The codes were generated through both inductive and deductive approaches, where the real-life experience of the participants was used inductively, and theoretical framework was used deductively, and satisfied criteria of support of the research objectives of digitalization, resilience, and supply chain performance.
3. **Step 3 -Theme searching**: Codes were evaluated and organized under broader themes which were reflective of patterns that were apparent in many of the interviews. It has been proved using code correlation to determine the relevancy of the code and also to determine whether it was a good representation of what the participants underwent.
4. **Step 4- Reviewing themes**: The themes were narrowed down by sequencing some ideas and comparing them to original transcripts. Re-authentic and re-relevant data extracts of support were re-authenticated and re-relevant.
5. **Step 5 -Naming and defining themes**: The final themes were named in accordance with their clarity in their ability to reflect the most important results. The subjects that were evolving were:

- **Digitalization Tools and Operational Efficiency**- capturing will entail the ERP systems, IoT, predictive analytics, dashboards and impact on the order management, inventory management and real-time decision making.
- **Resilience Practices and Adaptive Capacity** - is concerned with flexibility, redundancy, agile planning, and proactive supplier management and provides assistance to operations in times of disruption.
- **Impact on Supply Chain Performance** - displays the way the lead time, cost control, product quality and customer satisfaction were enhanced by means of collaborative actions, digital and resilience actions.

- **Challenges in Implementation** - resistance to change, cost, system integration problems and continuous training are some of the issues.
- **Best practices and Future Recommendation**- to define the schemes of collaborations, optimization of processes, and strategic implementation of digital tools to create long-term resilience and achieve maximum performances.

6. **Step 6 -Report preparation**: The report was made on the basis of the following themes and the necessary support was given with direct quotes of the participants in order to render it authentic and rich. These descriptions were based on the overall experience and personal reflections, which gave the complete overview of the research questions.

The thematic analysis showed that the digitalization and resilience processes support one another since digital tools can be employed to monitor the risk in real-time, anticipate and foresee it, and resilience practices can be employed to provide flexibility of operation and risk minimization. Respondents continued to reiterate the point that their buyer-supplier relationship, their long-term orientation, and their use of technologies as digital ones helped to maintain performance even during the disruptiveness as in the shortage of materials, geopolitical issues, or even the volatile market.

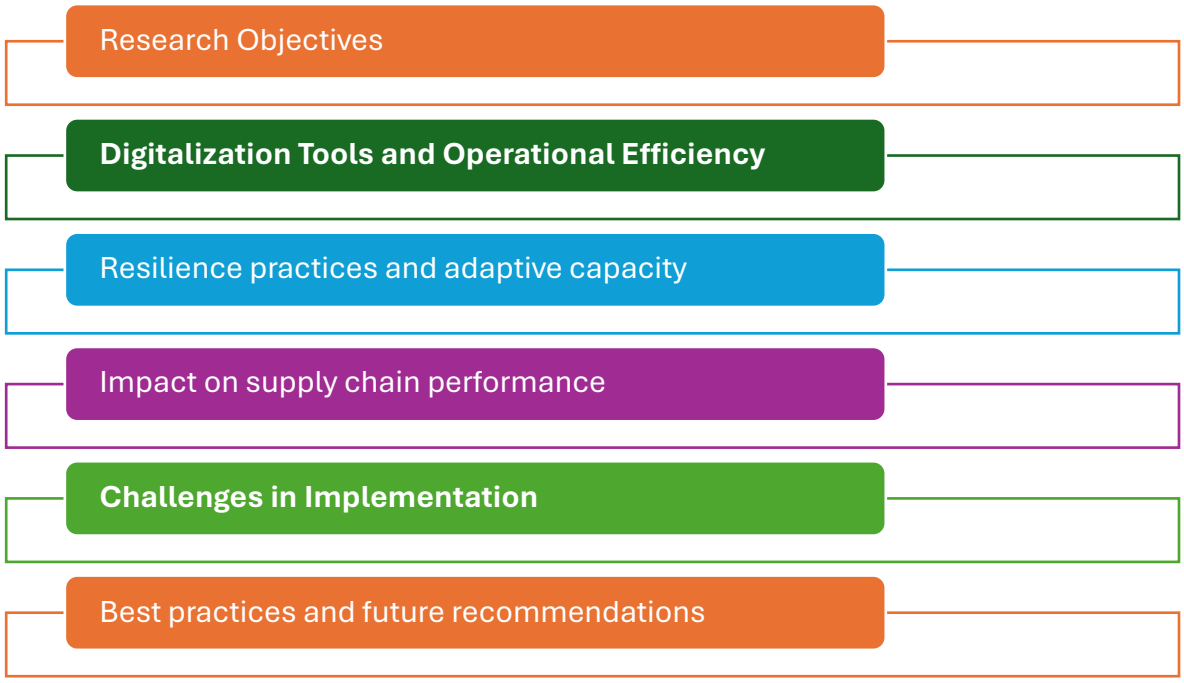

Figure 4 Flow chart structure for theme mapping

Thematic analysis of the follow-up interviews has been carried out to examine the influence of supply chain digitalization, practices used in supply chain resiliency, and operational strategies on buyer-supplier relations and performance in the Sri Lankan apparel industry. The discussion aimed at understanding the views of participants on both the normal business practice and the reactions to interruptions as a wealth of qualitative information about the current practice, challenges, and opportunities.

After coding of the transcripts of the interviews, five broad themes were formed. Digitalization Tools and Operational Efficiency indicate the presence of ERP systems, IoT, predictive analytics, dashboards and their implications on order management, inventory control and real-time decision-making. Resilience Practices and Adaptive Capacity includes things like flexibility, redundancy, agile, and proactive supplier management in order to continue to run operations in the event of disruptions. Impact on Supply Chain Performance brings about betterment in lead time, costs, product quality, and customer satisfaction. Challenges in Implementation

determines the issues related to resistance to change, costs, system integration, and training requirements whereas Best Practices and Future Recommendations presents the insights concerning collaborative practices and strategic digital adoption as long-term performance.

5.1.1 Digitalization Tools and Operational Efficiency

This theme provides an emphasis of the ability of digital tools like ERP systems, Internet of Things, predictive analytics, and dashboards to improve operational efficiency in buyer-supplier relations in the Sri Lankan apparel industry. One of the biggest improvements in supply chain performance highlighted by the respondents was real-time monitoring, order and inventory management, quick decision-making, and accuracy, which demonstrates the significance of digitalization.

The first code that was identified under the digitalization tools and operational efficiency was **ERP and System Usage**. The following quotes were classified under this code as there is a direct reflection of system usage, integration and digital tracking to supply chain operations.

“Here we are mainly using system called NOW (Network Oriented World) for all purchasing management, warehouse management and planning purpose.” (Respondent 1)

“Our operations are supported by ERP systems such as AX, which integrate procurement, production, inventory, and logistics data in real time. We also use PLM to manage product development.” (Respondent 2, Interviews 2025)

“We use ERP systems NOW for order management, production tracking, and inventory control. Additionally, we use BREEZE for product development and approvals, and Power BI dashboards / Excel-based trackers for monitoring.” (Respondent 3, Interviews 2025)

“We use SAP ERP, RFID-based tracking, barcode scanning, and a custom production monitoring dashboard.” (Respondent 5, Interviews 2025)

“We use Oracle ERP, PLM systems, and real-time production monitoring (IoT sensors).” (Respondent 6, Interviews 2025)

“Microsoft Dynamics ERP, RFID in warehouses, and supplier EDI connectivity.” (Respondent 7, Interviews 2025)

“WFX – workflow from product development to order execution; HRIS – manages HR, admin, finance functions; GTAS – central reporting and analytics platform consolidating product development, planning, inventory, quality, production, logistics, and financials.” (Respondent 8, Interviews 2025)

“ERP systems, barcoding, inventory management software, and sometimes predictive analytics for forecasting.” (Respondent 9, Interviews 2025)

Respondents are well-informed about the use of ERP and digital tools associated with them as the foundation of operational efficiency. They can offer a complete visibility of the supply chain operations, both in procurement and production as well as inventory operations and logistics. The particular systems might be different, but the role is the same: the correct and timely decision-making is made possible. The respondents underscored that these platforms enable managers to make orders, check on production, and inventory control to reduce delays and errors. The performance monitoring, collaboration with suppliers, and risk management are also supported using such tools as dashboards, PLM, and IoT sensors. The responses indicate that ERP systems do not only enhance operational efficiency, but also enhance the responses capability of the organization to disruptions, establishing a basis of incorporating the resilience practices.

The next code that was identified under the digitalization tools and operational efficiency was **Real time tracking and Monitoring**. The following quotes were classified under this code.

“Digital tools help us track and manage our supply chain in real-time. We can monitor daily operations such as production output, material stock in and out, and supplier payments.” (Respondent 1, Interviews 2025)

“With systems like ERP and analytics platforms, we can access real time data, monitor performance indicators, and make faster, more informed decisions.” (Respondent 2, Interviews 2025)

“Digital tools have significantly improved visibility, accuracy, and speed in decision-making.” (Respondent 3, Interviews 2025)

“Digital systems help maintain transparency from order placement to shipment and reduce communication delays.” (Respondent 6, Interviews 2025)

Live tracking and monitoring became one of the most important details of the efficiency of work. The respondents added that the ability to access data promptly enables problem-solving in advance, make decisions more quickly, and communicate between departments and suppliers. Real time monitoring of materials, orders and production output will minimize delays, miscommunication, and increase the overall visibility of the supply chain. Multiple respondents mentioned that dashboards, IoT, as well as ERP monitoring modules are useful in enhancing efficiency and responsiveness by increasing accuracy and transparency. This is also very resilient, in that the managers are able to know the possible disruption quickly and make changes. Real time tracking bridges the digitalization and efficiency of operations enabling organizations to foresee complications and respond in time.

The next code that was identified under the digitalization tools and operational efficiency was **Forecasting and Analytics**. The following quotes were classified under this code.

“Digital tools have had a significant positive impact…we can now access real-time data, monitor performance indicators, and make faster, more informed decisions.” (Respondent 2, Interviews 2025)

“They allow better forecasting, reduce manual errors, and enhance coordination among departments and suppliers.” (Respondent 3, Interviews 2025)

“Digital platforms allowed us to analyze buying trends and sales performance in real-time…helped anticipate demand and plan production and inventory.” (Respondent 8, Interviews 2025)

One of the benefits of digitalization in the supply chain operation is forecasting and analytics. The respondents said that availability of real-time and correct information allows them to plan and make proactive decisions. Forecasting tools are incorporated in the ERP systems, or are independent analytics systems and are used to aid in anticipating delays, monitoring inventory levels and manufacturing schedules. An example is that real-time analytics enabled certain organizations to restructure deliveries in the event of disruptions to avoid delays and keep performance at the delivery level. Forecasting is also less prone to human error by utilizing automated data processing and making predictions. The respondents pointed out that analytics integration is not only efficient in terms of operations but also supplements resilience efforts because managers could act in advance to deal with all possible supply chain problems. On the whole, the present code demonstrates direct connections between digital tools and informed planning, cost control, and on-time delivery.

The next code that was identified under the digitalization tools and operational efficiency was **Decision Support and Quick Actions**. The following quotes were classified under this code.

“It will help us to taken decision fast…better and clear communication with all the supplier and all other department.” (Respondent 1, Interviews 2025)

“Digital tools…we can now access real time data…make faster, more informed decisions.” (Respondent 2, Interviews 2025)

“Digital tracking tools help us detect risks early and take corrective action quickly.” (Respondent 3, Interviews 2025)

“When a buyer changed specifications last minute, the PLM system updated all departments instantly, preventing miscommunication and rework.” (Respondent 6, Interviews 2025)

“Digital platforms provide real-time visibility…Resilience practices ensure operational flexibility to act on these insights.” (Respondent 8, Interviews 2025)

One of the significant advantages of digitalization that is noted in the interviews is decision support. The respondents stressed that with the instant access to the correct data, the managers can make more informed decisions faster. This involves the re-scheduling of production, supplier problems or redistribution of resources whenever there is a disruption. Some of the respondents mentioned certain examples, including the instant updating of the PLM systems to avoid misunderstanding or the early detection of risks through tracking tools. Digital tools can help to make timely and accurate decisions since they eliminate reliance on manual reporting. Resilience is also enhanced with this rapid response, which helps the supply chains to become responsive to unanticipated issues. Taken altogether, these findings demonstrate that the approach to decision support with the help of digital tools is at the center of operational efficiency, which is consistent with organizational objectives to reduce delays, manage expenses, and enhance overall performance.

The next code that was identified under the digitalization tools and operational efficiency was **Digital Integration across functions**. The following quotes were classified under this code.

“I play a key role in managing the end-to-end apparel supply chain…coordinating with sourcing, work study, TPD, and production teams to ensure on-time sample development, accurate costings, and efficient raw material utilization.” (Respondent 1, Interviews 2025)

“ERP systems such as AX…integrate procurement, production, inventory, and logistics data in real time.” (Respondent 2, Interviews 2025)

“Digital tools enhance coordination among departments and suppliers.” (Respondent 3, Interviews 2025)

“Cross-functional visibility in ERP and flexible planning modules support resilience.” (Respondent 5, Interviews 2025)

“We analyze supply chain processes and optimize ERP workflows…support procurement, inventory, production tracking, and logistics modules.” (Respondent 7, Interviews 2025)

“WFX…GTAS – central reporting and analytics platform consolidating product development, planning, inventory, quality, production, logistics, and financials.” (Respondent 8, Interviews 2025)

In the operations, digitization in the operations of the supply chain is necessary in terms of operational efficiency. The participants have always capitalized on the fact that, the ERP, PLM and analytics platforms assist to integrate procurement, production, inventory and logistics and introduce transparency and improvement of cross-departmental communication. The integration assists all teams in working with the same data thus reducing the number of errors as well as the loss of time through delays and giving coordinated response to operational challenges. Cross-functional visibility helps the managers to observe the performance activities in real-time, keep track of the resource allocation, and optimise the workflow.

Resilience is also a benefit of integration: decision-makers will be able to work holistically, rather than sub-optimally, in the case of disruptions. These integrated systems, according to the respondents, assist in the promotion of forecasting, assistance in the planning of production and integration of collaboration with suppliers. Overall, digital integration is not only a way of operational efficiency, but it is also the foundation of building a responsive and an active supply chain that would be capable of operating amid volatility and complex operational demands.

5.1.2 Resilience practices and adaptive capacity

The concepts of resilience practices and adaptive capacity became a domineering theme in all nine interviews as the respondents mentioned how their organizations projected, absorbed, and reacted to disruptions in the supply chain. The apparel supply chain, which is defined by changing lead times, geopolitical risks, shortages of raw materials, production changes, and unpredictability of demands, demands that firms learn to be structurally and behaviorally resilient. Resilience in the respondents was predominantly exhibited in terms of flexibility in planning, diversification of suppliers, risk reduction measures, safety stocks, and internal-external communication. The practices also allowed businesses to keep on achieving cost, time, and quality in the time of crisis like delays in fabrics, bottlenecks in shipments, congested ports, political upheavals and sudden changes in specifications.

The first code that was identified under the Resilience practices and adaptive capacity was **Supplier diversification and Backup Sources**. The following quotes were classified under this code.

“We do not rely on a single supplier and cross-develop materials with alternative suppliers to ensure uninterrupted supply, so we can shift production or sourcing if something goes wrong.” (Respondent 1, Interview 2025)

“We maintain multiple approved suppliers and develop backup sourcing options for key raw materials to reduce dependency on any single supplier or region and ensure continuity during uncertainties.” (Respondent 2 , Interview 2025)

“Supplier diversification, dual sourcing, and redundancy in critical materials allow switching between suppliers or activating alternatives immediately when delays or disruptions occur” (Respondent 3, Interview 2025)

“We maintain a pool of secondary suppliers, negotiate buffer lead times, and pre-book raw materials for repeat orders to avoid operational interruptions during disruptions” (Respondent 5, Interview 2025)

Supplier diversification has been found to be one of the effective resilience practices in all the organizations. This way of not relying on one supplier is a form of insurance in that the companies will continue operating even in case there are disruptions caused by delays, insufficiency of supply, geopolitics, and even quality. The interviews show that the practice of diversification is not just a risk management strategy but also a proactive strategy that is incorporated in the day-to-day operations. Cross-development of material, maintaining a number of approved supplier and pre-booking of the raw material to make repeat order assists companies in switching swiftly without disrupting flow of production. Backup sourcing alternatives enhance the supply chain by establishing backup alternatives that may be activated immediately when the primary suppliers encounter difficulties.

Other methods that were pointed out by the respondents as minimizing vulnerability during disruption are buffer lead times and pre-negotiated arrangements. In case of international operations, it is beneficial to have suppliers in locations where there are various locations in order to reduce susceptibility of localized risks. Moreover, diversification allows increasing the cost competitiveness as firms can analyze the work of suppliers and choose the most stable and affordable variants. Such strategy helps to keep schedules of delivery, quality standards, and customer relations intact even in pressure situations. Altogether, the diversification of

suppliers is near the center of the adaptive capacity, as it allows companies to be stable and to sustain the production processes and to satisfy the customers in unpredictable conditions of supply.

The next code that was identified under the Resilience practices and adaptive capacity was **Flexible and Agile Production Planning**. The following quotes were classified under this code.

“These practices help us stay strong during disruptions through flexibility, backup suppliers, and quick planning, allowing fast decisions and smooth operations even in difficult situations” (Respondent 1, Interview 2025)

“Flexibility in production and sourcing allows shifting production between facilities and adjusting schedules quickly, minimizing downtime when facing delays or sudden order changes during disruptions.” (Respondent 2, Interview 2025)

“Flexible capacity planning, agile production planning, and the ability to switch production between factories help manage unexpected disruptions with minimal delays.” (Respondent 3, Interview 2025)

“Flexibility, agility, and innovative thinking support us in facing unprecedented situations and help maintain operational continuity during disruption” (Respondent 4, Interview 2025)

The other significant element of resilience is flexibility and agility in production planning. The necessity to modify production schedules, change facilities, and implement quick decisions whenever disruptions took place were mentioned constantly by the respondents. Flexible capacity also helps organizations to reassign workloads and prioritize urgent orders without necessarily shutting down the organization. Agile planning is used to assist teams in reacting to unexpected changes, such as material delay, last-minute buyer requirements and logistical issues.

The interviews indicated that flexibility is not only restricted to production activities but also sourcing, sequence of orders and allocation of resources. Rapid planning helps businesses to repackage schedules and prevents expensive schedule slippage. When uncertainties arise, agile responses assist in ensuring that workflow is stable, lessening downtimes, and ensuring that customer requirements are not compromised as well. Some of the respondents associated agility with creative thinking and teamwork, which indicates that resilience is not strictly functional but more cultural. Agile companies promote real-time communication, problem-solving and fast cross-functional alignment. Quick and confident adjustment enables the teams to safeguard the performance in the case of disruption. On the whole, flexible and agile production systems enable the organizations to be responsive to deal with volatility by preserving cost, time, quality, and service promises.

The next code that was identified under the Resilience practices and adaptive capacity was **Safety stock, Buffering and Redundancy**. The following quotes were classified under this code.

“We maintain safety stock levels, use alternative suppliers, and constantly back up system data to ensure operations continue even when disruptions occur suddenly” (Respondent 5, Interview 2025)

“Safety stock, backup suppliers, proper risk assessments, and clear communication channels help manage uncertainties and maintain operational stability during disruptions” (Respondent 9, Interview 2025)

“We maintain thresholds for raw materials and production capacity, avoiding running at full capacity to ensure enough flexibility and buffer to manage internal risks.” (Respondent 8, Interview 2025)

The safety stock and buffering are the necessary shock absorbers of the supply chain. Respondents cited the practice of holding low quantities of raw materials and not operating at full capacity so that there is always a buffer when disruptions occur. These practices give

organizations the breathing space that they need to adapt within a short time without the need to interfere with production timelines. Buffer stocks ease the magnitude of disruptions caused by shipment delays, shortages in materials or difficulties on the supplier side. The interviews suggest that redundancy is strategically constructed in various domains, which will be material, suppliers, production capacity, and system back-ups. Through these redundancies, the organizations can still be guaranteed that there are constant operations in case of any unforeseen condition. Safety stock helps maintain continuity of production and gives time to the teams to restructure source arrangements or change schedules.

Digital visibility also goes well with buffering. Since stock levels or capacity limits are managed through ERP systems, they will be in a position to restore inventory when the indication of risks is monitored and/or reallocate materials. All these practices contribute to stability in operations and reduce the effects of disruption. They help in enhancing the on-time delivery, low costs and maintaining the quality of the products even in volatile times. In the context of organized redundancy and safety stock management, firms become highly resilient internally which contributes to the overall performance of the supply chain.

The next code that was identified under the Resilience practices and adaptive capacity was **Proactive Risk Management and Early warning practices**. The following quotes were classified under this code.

“We take a proactive risk management approach with regular reviews of supplier performance, safety stock, alternative transport options, and close communication to anticipate issues early.” (Respondent 3, Interview 2025)

“At Hirdaramani, risk assessment, scenario planning, identifying critical suppliers, and monitoring lead times through ERP systems help respond quickly to unexpected changes.” (Respondent 2, Interview 2025)

“Our company practices demand scenario planning, supplier scorecards, redundancy in critical materials, and avoids running at full capacity to manage risks effectively.” (Respondent 8, Interview 2025)

“Real-time dashboards and early-warning alerts allow anticipating risks, monitoring performance, and taking corrective action quickly to minimize operational disruptions.” (Respondent 7, Interview 2025)

The development of adaptive capacity is based on risk management and early-warnings systems. The structured methods that were mentioned by the respondents include scenario planning, supplier scorecards, performance monitoring, and constant risk assessment. The practices can be used to detect possible problems in the organization at an early stage and address them adequately before they become problematic. Live dashboards and notifications promote transparency and deliver the right information about delays, shortages, or process exceptions in time. An advance communication with suppliers and undertaking of internal teams also builds resilience. Having frequent reviews and monitoring, what is being interrupted is foreseen and not responded to. Scenario planning assists organizations to be ready to various contingencies that can take place and therefore, they can change their sourcing, logistics and production plans as per the arising risks.

The insights of the respondents demonstrate that resilience is not just the recovery, it is preparedness and anticipation. Digital tools are additive to these practices as they provide information that is required in informed planning and quick response. Collectively, the proactive risk management and the early-warning system will provide a basis of continuity that will allow organizations to continue being stable, minimize downtime, and protect the commitments of the customers. The focus on real-time tracking and the systematic risk analysis reveals the developed attitude to uncertainty management in the contemporary supply chains.

5.1.3 Impact on supply chain performance

The integration of resilience practices and digital tools has an enormous effect on the supply chain performance. Digitalization gives a precise real-time insight into the operations, allows taking timely decisions, interdepartmental coordination, and track materials, production and deliveries. The practice of resilience, including the flexible planning, sourcing to multiple suppliers and contingency, enables the organization to keep its performance when disrupted. When combined, these methods enhance accuracy of orders, less lead times, timely delivery and quality of the products. An insight into the interaction of such factors can give a clue on the efficiency of operations, responsiveness, and overall effectiveness of the supply chain management in dynamic and unpredictable operating environments.

The first code that was identified under the Impact on supply chain performance was **Enhanced order accuracy and Operational visibility**. The following quotes were classified under this code.

“When we used digital tools for the Supply chain it always support us in many ways. Specially time taken to get the details in accurately. It will help us to taken decision fast. Also better planning with forecasted details. Also better and clear communication with all the supplier and all other department. Like Stores / Logistic team / Planning Team / Merchandising team.” (Respondent 1, Interview 2025)

I believe digital tools have had a significant positive impact on the overall performance of the supply chain. They have greatly improved visibility, accuracy, and responsiveness across all stages from procurement to delivery. (Respondent 2, Interview 2025)

Digital tools have significantly improved visibility, accuracy, and speed in decision-making. They allow better forecasting, reduce manual errors, and enhance coordination among departments and suppliers. Overall, digitalization has led to improved on-time delivery, reduced lead times, and better customer satisfaction (Respondent 3, Interview 2025).

Digital systems help maintain transparency from order placement to shipment and reduce communication delays(Respondent 6, Interview 2025).

Improved accuracy of order and operational visibility are some of the most important advantages of digitalization in supply chains. ERP systems, dashboards and automated alerts provide real-time monitoring of the operations, thereby centralising operational data to minimise errors caused by latent or incomplete information. The sourcing, production and logistics visibility allows prompt corrective measures to be taken when there are discrepancies that will ensure smooth operation of the workflow. Operational transparency promotes that there is good communication between departments and enhances the coordination of the suppliers, reducing delays and miscommunication. Proactive decision-making is also largely driven by accurate and timely information, where the managers are in a position to respond to changes in demand or may be in disarray within a short time. Enhanced visibility, in addition to increasing the internal efficiency, has the added benefit of increasing customer confidence as it is known to provide reliability in order fulfillment and quality of products. The digital tools along with resilience practices are integrated to enhance flexibility, as the supply chain is resilient and flexible enough to absorb disruptions without disrupted operational stability. In general, the elements of accuracy, transparency, and real time insight contribute to the effective wholesome performance of supply chain operations and make processes more reliable, efficient, and customer-oriented.

The next code that was identified under the Impact on supply chain performance was Faster **Delivery and Reduced Lead Time**. The following quotes were classified under this code.

“Through the ERP system, we can track whether orders have been placed with suppliers and, once goods are received, we record the MRN in the system. The ERP provides strong control and visibility across the process. Every two weeks, we meet with the team to review ERP reports to ensure that all purchase orders have been accurately placed with suppliers and to verify whether goods are in-house.” (Respondent 1, Interview 2025).

“Using our real-time tracking systems, we quickly identified the issue, reallocated available materials, and adjusted production priorities. We also coordinated with alternate suppliers and logistics partners to ensure continuity. Despite the challenge, we met delivery timelines, maintained product quality, controlled costs, and received positive customer feedback.” (Respondent 1, Interview 2025)

“During the 2023 port congestion, ERP forecasting helped us reorganize shipments and still meet 98% of delivery timelines.” (Respondent 5, Interview 2025)

“During a fabric delay situation, our ERP and supplier portal helped us track material status and predict the delay’s impact on production.” (Respondent 3, Interview 2025)

“During a supplier delay, we shifted to an alternative supplier and adjusted schedules, allowing us to meet delivery deadlines without affecting quality.” (Respondent 9, Interview 2025)

The major effects of adopting digital tools and resiliency strategy in the supply chain are faster delivery and shorter lead times. Monitoring inventory levels, production schedules and shipment progress in real-time enables managers to anticipate any form of delays and take corrective measures before delays begin to cause havoc. Possibility to re-order, rerouting, or turn on alternate suppliers makes sure the continuation of operations even in unexpected situations like congestion in ports or shortages of suppliers. Digital systems promote the communication between internal and external partners and allow the planning of production and the allocation of resources in a timely manner. These abilities in combination with resilience practices, including backup suppliers, and flexible scheduling, reduce lead times without compromising the quality standards. Effective delivery reinforces customer satisfaction and facilitates reliability in operations even in unpredictable environment. Organizations are able to continuously achieve cost, quality and delivery objectives by tapping down to time and increasing responsiveness. Altogether, resilience mechanisms that have been developed through the use of advanced digital tools guarantee a supply chain that is deft,

resilient, and able to maintain its performance even in the presence of uncertainty or disruptions.

5.1.4 Challenges in Implementation

There are several challenges that could arise in implementing digital tools and resilience strategies in supply chain management and prevent complete effectiveness. They include technical constraints and system integration problems, workforce adjustment, resistance to change, and the cost of digital transformation. The organizational preparedness, such as training of the staff, proper alignment of processes, and executive support, are also important determinants of implementation success. Moreover, when having problems with coordination among suppliers and variations in the degree of digital maturity between partners may cause a gap in flawless deployment. These issues are of primary importance to find the methods of mitigation and guarantee that technology integration and resilience practice are effectively introduced into the supply chain activities.

The first code that was identified under the Challenges in Implementation **was Technical and System Integration Issues**. The following quotes were classified under this code.

“Our operations are supported by ERP systems such as AX, which integrate procurement, production, inventory, and logistics data in real time. However, integrating all modules with older systems has been a significant challenge.” (Respondent 2, Interview 2025)

“We use ERP systems NOW for order management, production tracking, and inventory control. Sometimes, connecting this system with supplier IoT devices for real-time updates is complicated and requires constant troubleshooting.” (Respondent 3, Interview 2025)

“ERP integration across multiple departments can be cumbersome. Ensuring that production, inventory, and logistics data are consistently updated requires careful coordination and frequent system audits.” (Respondent 6, Interview 2025)

“Integration of digital platforms with legacy procurement and warehouse systems is often challenging, causing delays in reporting and occasional mismatches in data between modules.” (Respondent 5, Interview 2025)

One of the frequent problems of the implementation of digital solutions in supply chains is technical and system integration problems. Most organizations have several legacy systems to go with new ERP and IoT systems and thus compatibility issues arise. The incorporation of modules of procurement, inventory, production and logistics involves a lot of IT skills and coordination because when systems are not quite aligned there are chances of data errors and delays in operations. Moreover, real-time connection of the systems of suppliers or IoT devices provides additional complexity since not all partners might possess compatible infrastructure. To ensure that there is synchronization, regular audits and troubleshooting are required which may overload internal resources and reduce the speed of making decisions. There is also an impact of these challenges to the reporting accuracy, which restricts the timely and informed operational decision making. Technical challenges need meticulous planning, committed IT support and gradual integration processes. Well tackling of these integration issues will make sure that digital tools work unified within the departments, allowing to monitor them correctly, see them better, and make the work more efficient. In the end, efficient system integration is the key to the achievement of the entire positive process of digitalization in supply chains.

The next code that was identified under the Challenges in Implementation was **Workforce Adaptation and Training Challenges**. The following quotes were classified under this code.

“Many staff members find it difficult to adapt to digital tools and new ERP functionalities. Regular training sessions are required to ensure everyone is competent in using the system effectively.” (Respondent 1, Interview 2025)

“Implementing new digital practices demands not only technical knowledge but also behavioral change, which is often met with resistance among employees accustomed to traditional workflows.” (Respondent 2, Interview 2025)

“Staff need time and guidance to understand predictive analytics and digital dashboards. Without sufficient training, errors in decision-making can occur, affecting supply chain performance.” (Respondent 3, Interview 2025)

“Even when digital systems are available, employees sometimes revert to manual processes due to habit or lack of confidence in the new tools, slowing down implementation.” (Respondent 5, Interview 2025)

Digital and resilience strategy implementation presents a challenge in the form of workforce adaptation and training. Workers, who are used to the conventional process of work, tend to have difficulties with using new applications, like ERP modules, predictive analytics, or digital dashboards. The fear of technology, the unfamiliarity, and uncertainty of the benefits of technology may be a source of resistance to change. However, despite the provision of training, the learning curves of the staff differ, which results in unequal use of systems and the inability to make appropriate decisions related to operations in some cases. Poor knowledge of functionality may also slow down the processes, where employees might revert to manual procedures or workarounds to constrain the usefulness of digital solutions. To overcome these challenges, it is necessary to organize training activities, provide constant leads, and maintain a program of change management in order to develop confidence and competence in the personnel. Adoption is also encouraged with the help of leaders and clear communication regarding the purpose and benefits of new systems. In the long run, the effective workforce adaptation will make the organization have more capacity to use technology as a tool to enhance visibility of their operations, enhance response time, as well as, the overall efficiency of the supply chain. Proper training and support will make sure that human resources are used

to complement technological investments that will enhance the success of implementation initiatives.

The next code that was identified under the Challenges in Implementation was **Supplier coordination and Alignment Issues**. The following quotes were classified under this code.

“Sometimes suppliers are not fully digitalized, so even though we use ERP for procurement and order visibility, we still have to coordinate manually and track updates through calls.” (Respondent 4, Interview 2025)

“Digitalized processes work smoothly only when suppliers also operate on compatible systems. If not, we experience delays in confirming orders and shipment tracking.” (Respondent 6, Interview 2025)

“When upstream partners are slow at updating order progress digitally, we face gaps in lead-time predictions and must cross-verify information manually.” (Respondent 3, Interview 2025)

“Aligning operations becomes difficult when one party is automated and the other runs on semi-manual processes. Integration is then incomplete.” (Respondent 7, Interview 2025)

There were also issues of supplier coordination in situations where buyers and suppliers had varying levels of digital maturity. Operational visibility was also diminished even where internal systems were well developed, as the partner network was based on manual updates. Failure to synchronize on the digital adoption resulted in delay in confirmations, delay in reporting and occasional differences in the shipment information. Organizations were forced to sometimes use phone communication, or manual follow-ups to confirm information, which lowered the efficiency benefits that digital systems were supposed to provide. Supplier alignment is thus a necessary condition, a digitalized world can only be so efficient when everyone has similar platforms and provides regularly updated data. In case this is not to happen, visibility is disjointed, time to respond is extended and proactive planning is curtailed.

This digital divide can be closed by setting of common technology standards, progressive onboarding and common integration protocols. Enhancing supplier relationships will help in maintaining the smooth flow of data throughout the chain that will facilitate real-time monitoring and reduced decision-making cycles. In the absence of this alignment, even developed internal systems cannot provide optimal performance.

The next code that was identified under the Challenges in Implementation was **Cost and Resource Constraints in Implementation**. The following quotes were classified under this code.

“Digital transformation requires investment in systems, integration work, and training. We sometimes need to prioritize implementation in phases based on available budgets.” (Respondent 2, Interview 2025)

“Introducing IoT-enabled tracking and visibility tools adds cost along with hardware, maintenance, and system upgrades.” (Respondent 5, Interview 2025)

“Full automation is not possible at once due to financial limitations, so the company upgrades departments gradually depending on urgency.” (Respondent 8, Interview 2025)

“Digital resilience practices demand resource allocation and periodic upgrades, which are not always immediately feasible.” (Respondent 4, Interview 2025)

A significant limitation to the digital supply chain implementation is the use of cost-based barriers. Interviews have made it clear that organizations embrace technology at stages since ERP upgrades, IoT integration, and predictive analytics involve huge amounts of financial investment. In addition to the cost of installation, maintenance cost, and periodically increasing the system and training resources raise recurrent spending. That is to say, digital transformation is a process and not a rollout. Although this incremental strategy allows the company to make progresses within the budget constraint, it slows down complete

connectivity and limits the real-time visibility until the full integration of all units and partners. In a case where the resources are inadequate, what might be sacrificed is the priority to the most essential parts of the operations leaving others parts to be partially manual. The partial implementation weakens the likelihood of success of the digitalization efforts and resilience efforts. There are links between strategic planning, investment justification, and ROI-based deployment and these could assist organizations to overcome financial constraints. Initial expenditure can be compensated by long-term benefits like shorter lead times and enhanced transparency and savings in costs through efficiency. Nevertheless, even in the absence of cautious funding and leadership assistance, the process of digital transformation can turn out to be slower than intended.

5.1.5 Best practices and future recommendations

This theme dwells on how businesses improve long term digital supply chain stability by working together, optimizing and continuous improvement of processes. According to the interviews, the participants identified the need to enhance the use of digital tools, close collaboration with suppliers, and end-to-end visibility systems as the factors that would be needed to sustain performance. The key suggestions of future improvement were primarily focused on the gradual technological upgrade, better connectivity of data between partner networks, and the creation of a predictive and active supply chain environment.

The first code that was identified under the Best practices and future recommendations was **Strengthening Collaboration and shared visibility systems**. The following quotes were classified under this code.

“Better visibility across the network will improve planning and reduce unexpected problems if suppliers and buyers can update information digitally and in real time.” (Respondent 3, Interview 2025)

“Collaboration between buyers and suppliers should grow with system sharing, otherwise information sits in silos even when we digitalize internally.” (Respondent 6, Interview 2025)

“Future improvements need to focus on connecting all partners within one dashboard or platform to enhance forward planning accuracy.” (Respondent 4, Interview 2025)

“Working more collaboratively with suppliers using synchronized tracking tools can reduce follow-ups and improve responsiveness.” (Respondent 7, Interview 2025)

According to the interview data, digital growth is not possible without collaboration based on similarity in terms of visibility platforms. Although companies have unique systems, they are useless in case supply network partners are not interconnected. The necessity to have combined dashboards in which order status, inventory status and shipment track can be viewed simultaneously, eliminating manual research, was highlighted by respondents. The common digital ecosystems enable organizations to be able to predict risks sooner, plan capacity better and react proactively to customer and production fluctuations. Good cooperation also minimizes bottlenecks, enhances responsiveness and promotes unanimity in decision making. The trend in future thus is toward the establishment of inter-organizational connectivity, in which the buyers and suppliers do not work on disparate systems but work on congruent platforms. It is also helpful in resilience, as disruptions can be tracked among others and responded to more promptly. An effective digital relationship is a platform of predictive planning, continuous flow of orders, and quicker solution of uncertainties in the clothes industry.

The next code that was identified under the Best practices and future recommendations was **Continuous Digital Improvement and Phased Future upgrade** . The following quotes were classified under this code.

“Improvements in the future may include expanding automation to more supply chain functions step by step as the system matures.” (Respondent 5, Interview 2025)

“We expect to gradually upgrade modules over time to reach full automation, including analytics-based forecasting and smart scheduling.” (Respondent 8, Interview 2025)

“Developing more predictive capabilities should be the next move so the system can forecast problems before they occur.” (Respondent 2, Interview 2025)

“Training, periodic upgrades and smarter tools will help us reach better operational agility in the long run.” (Respondent 6, Interview 2025)

The gradual, progressive thinking and attitude were emphasized as a viable way of future digital growth on multiple occasions. Another benefit of progressive digitalization is that firms expect to introduce new modules, analytics tools, and layers of automation as the system and labor force matures instead of all-at-once full-scale digitalization. Respondents acknowledged that digital strength was developed with time, and the enhancements, including predictive forecasting, automated scheduling, and decision-support dashboards, would improve the performance further. The trainee commitment will make sure the employees get easy accustomed to the newer technologies and minimize resistance to changes and get maximum use of the tools. Gradual upgrades are also the reason that enables companies to handle cost pressure and still gain visibility and agility. With time, the supply chain can be turned into a predictive supply chain with all disruptions detected earlier and dealt with in a strategic manner through layered enhancement. The forward-thinking of the interviews is the notion that digitalization is not a single installation and is an ongoing ability to build resilience, responsiveness, and long-term competitive ability.

5.2 Summary of Key Findings

The general results of the given study suggest the obvious trend of the influence of digitalization and the resilience practices on the performance of the apparel supply chain. Among the respondents, digital tools like ERP, PLM, IoT-enabled tracking systems and analytics platforms were mentioned as core drivers of enhancing the visibility, speed, inventory precision, and decision-making. These systems were not considered as operational facilitators only, but also strategic facilitators, which enable transparency, information flow in real-time and more accurate production planning. This substantiates the fact that digitalization is becoming an inherent part of contemporary supply chains and not a decent upgrade.

Resilience practices were also found to be of equal significance, especially in the context of dealing with uncertainty and disruptions. The interview results showed that diversification of suppliers, flexibility in planning and sourcing of backup material were prevalent measures to reduce delays in production, cost risks and uncertainties in deliveries. Agile operations structure, buffer stocks, and other logistics pathways also helped in continuity during external shocks. These resilience actions reinforced punctual delivery performance, customer satisfaction and assisted in decreasing reliance on solitary sources of supply.

The study also established serious effects of these plans on the supply chain performance. Digital tools and resilience activities collectively enhanced inter-departmental coordination, minimized lead time, and assisted in proactive disruption tracking like shipment delays, cloth shortages and specification modifications. The respondents observed that disruption could be identified promptly and responded to faster through digital dashboard and automated notifications, to ensure that the businesses were still able to achieve the cost and quality and delivery targets. This was working to demonstrate that technology and resilience are better together when supportive of one another.

Notwithstanding all their advantages, there are obstacles. Problems that have been identified to hamper the full use of the digital tools include failure to integrate the systems assets among

the partners, siloed data, and missing skills. Ability to deal with change and constant upgrades was also perceived as a requirement to maintain the progress.

Respondents noted the need to spread digital presence throughout the network, focus on greater automation over time, enhance supplier cooperation, and build a predictive forecasting ability. The conclusions made are that the best mode of digitalization is one in which it is constantly emerging and is enabled by a robust operation system that is flexible to withstand disruption.

5.3 Theme Mapping

The results of the interview indicated that there were five prevailing empirical themes that were Digitalization Tools and Operational Efficiency, Resilience Practices and Adaptive Capacity, Impact on Supply Chain Performance, Challenges in Implementation, and Best Practices and Future Recommendations. The themes are directly consistent to the theoretical framework of the study (RBV, TOE, Contingency Theory) and combinedly describe how the digital capabilities and resilience strategy of Sri Lankan apparel firms can help them sustain performance despite uncertainty.

The relationship between each theme and the three guiding theories and its role in supply chain results are described in the mapping presented below in the context of the present study.

Table 2 Relationship between implemented sustainability approaches and major theoretical Framework

Themes Derived from Findings	Resource-Based View (RBV)	Technology–Organization–Environment (TOE)	Contingency Theory	Resulting Supply Chain Outcomes

Digitalization Tools & Operational Efficiency	Digital systems (ERP, analytics, IoT) treated as strategic resources that create competitive advantage through data visibility & speed.	Adoption influenced by technological readiness, skill availability, management support & integration capacity.	Effectiveness depends on context—firms with more resources gain more value compared to low-tech firms.	Enhanced inventory accuracy, real-time monitoring, faster decision-making, reduced manual delays.
Resilience Practices & Adaptive Capacity	Resilience seen as a capability built through supplier networks, knowledge & operational flexibility.	Investment in contingency planning, emergency sourcing, communication systems shaped by organizational capacity & external risk pressure.	Resilience strategies vary depending on context (market volatility, supplier dependency, resource strength).	Faster disruption recovery, stability in material flow, improved delivery commitments.
Impact on Supply Chain Performance	Internal digital & human resources convert technology into measurable output performance.	Technology implementation + organisational readiness jointly drive performance results.	Performance gains depend on fit between tech adoption, structure & uncertainty conditions.	Reduced lead time, cost savings, improved reliability, better customer satisfaction.

Challenges in Implementation	Limited resources constrain ability to digitalize, train staff & scale systems.	Barriers relate to cost, integration complexity, system compatibility & change resistance.	Context determines challenge severity—small firms struggle more than large established players.	Slower digital adoption, skill gaps, fragmented data flow, partial tech utilisation.
Best Practices & Future Recommendations	Capability-enhancing resources (skills, systems, partnerships) strengthen sustainable competitive advantage.	Tech upgrades, collaborative platforms, training programs grow gradually as organizations mature.	Effective future strategies require alignment with company size, resources & disruption exposure.	Long-term resilience, greater visibility, stronger partnerships, continuous process optimisation.

Mapping shows that there is a good fit between empirical themes and theoretical framework on which the research is based. The first and second themes are being supported through RBV that defines digital tools, analytics capabilities, and resilience mechanisms as the strategic resources. These resources become the sources of long-lasting operation enhancement as they are internally generated and hard to replicate by competitors. This is echoed in high level of data accuracy, lower lead times, and low disruption recovery capability as evidenced in the interviews.

The themes associated with digitalization, implementation issues, and system improvement requirements are the most evident ones in relation to TOE Framework. Interview results indicate that technological preparedness and organisational culture have a strong impact on

the outcome of digital adoption. ERP systems, visibility dashboards and automation can be implemented faster through leadership intervention, training of employees and compliance requirements which are buyer driven. Conversely, it was associated with cost barriers to adoption because of high investment cost, low integration with different systems, and lack of technical skills. This goes to buttress the TOE argument that technology implementation is a matter of internal and external conditions and not a uniform approach.

The Contingency Theory manifests itself in the issues concerning the performance effects and capability enhancement in the future. The results of digitalization and resilience practices were not the same among the firms. Organisational variability that was high order and buyer dependency that was global derived greater value out of digital visibility, predictive planning, and diversified sourcing. Those who were not as complex operated with simpler systems. This validates the essence of the Contingency Theory that the best answer will be determined by the organisational scenario and the degree of uncertainty in the environment.

6 Conclusion and Recommendations

6.1 Discussion on the results and Findings

The study fills a gap in the existing literature on the topic of digitalisation and the enhancement of supply chain resilience in the Sri Lankan apparel manufacturing industry. Although the concept of digital transformation, analytics-based decision-making, and the resiliency mapping is extensively discussed at the international level, literature on the particular topics of Sri Lanka is not fully developed. Global evidence suggests the importance of ERP, IoT, automation and predictive systems to enhance visibility, traceability and decision accuracy but the scope to which the digital interventions operate in the local apparel supply chains has been academically vague. Thus, the present research makes a contribution as it focuses on the current usage of digital systems, the methods of resilience capacities development, the obstacles on the way, and the performance outcomes.

It was researched by using nine semi-structured interviews with operational managers, people involved in executive and supply chain planning, IT analysts and digital transformation staff involved in manufacturing operations. These results suggest that there is a massive investment in ERP, barcoding, real-time dashboards, digital approvals, predictive planning modules and automated tracking systems. The tools directly allow gaining visibility of materials, production status and inventory movement and enhance the speed and reliability of decision-making. The digital assets according to RBV also exist as strategic internal resources, and the evidence in the interview testifies to this by decreasing manual errors and enhancing schedule compliance and responsiveness to production.

Others of the challenges that interviewees cited include the difficulty of integrating a system, high cost of implementation, lack of skills and resistance by users to the new platforms. These inhibitions are consistent with Technology-Organisation-Environment model where successful adoption would be based on organisational preparedness, workforce capacity, investment

capacity and pressure to comply as a result of the buyers. The results support the argument that digital transformation is not merely a technological change but a change in behaviour and capabilities-based change that needs a cultural change and constant training.

The paper also confirms that resilience strategies such as diversifying suppliers, predictive and digital forecasting, inventory visibility and digital contingency planning, served to alleviate the impacts of disruption on companies. This is a manifestation of Contingency Theory since the firms had been advantaged in different ways based on the level of complexity of their operations, the fluctuation in the demand of their buyers, and the maturity of the technology. Digitalisation made performance better, although not evenly distributed - the results were strongest when digital means were applied profoundly and not superficially.

Performance indicators showed positive changes in terms of lead time, reduction in errors, on-time delivery and customer satisfaction particularly where the digital data flowed smoothly through various departments. Nevertheless, in cases where skills, integration and training were low, outcomes were additive as opposed to transformative. The results indicate the shift of Sri Lankan apparel companies, though the maturity of digital supply chains differs greatly with the organisational size and maturity.

6.1.1 Adoption of Digital tools and capabilities

The results indicate that the manufacturers of apparel in Sri Lanka are embracing the fundamental digital technologies like ERP systems, production dashboards, barcoding, approval automation, forecasting modules and real-time tracking. These technologies enhanced visibility through procurement, cutting and sewing and finishing operations to make a quicker and more responsive data reaction. According to RBV, digital platforms were embedded functions and not support functions and provided competitive advantage by accuracy, traceability and workflow synchronisation.

ERP and real-time dashboards minimized manual follow-ups and allowed managers to keep track of production progression requiring less emphasis on physical oversight. Barcode systems had a significant effect on eliminating misplacement of cut panels and finished units, and enhanced order sequence control. Predictive forecasting facilitated the decision-making process in demand planning and the allocation of raw materials in the times of uncertainty.

The findings provide support to the research objective because they indicate that digital tools are proactively used and are core to operational planning, inventory movement and communication control in apparel supply chains.

6.1.2 Supply Chain Performance Impact

Digitalisation enhanced the performance in various performance indicators. Responses during the interview revealed that there was less rework, quicker approval processing, line balancing, more inventory visibility, and accuracy in customer communication. Waiting time to make a decision decreased in areas where automation and access to data enhanced performance in terms of lead time.

The presence of real-time dashboards made it easier to handle escalation in quick time and adjust short-term planning, and the barcode system of movement tracking minimised material losses and increased traceability. Customer responsiveness was also improved as reporting and status updates became faster.

Nevertheless, the levels of improvement were different according to digital maturity and the ability of employees. In complete systems, reductions in lead time and reliability in orders proved to be more effective and in fragmented systems the results were average. This upholds the Contingency Theory by demonstrating that digitalisation fails to ensure performance unless it has a group of trained staff, coordination within and between the departments and ongoing improvements to the processes.

6.1.3 Problems of implementing Digitalisation

Even though there is an improvement, there are significant challenges that companies encounter in digital integration. Cost barrier is still a high initial cost particularly in the case of high-tech automation and predictive technologies. The lack of skills and lack of technical capacity limits the level of utilisation of the system. Problems of integrating past platforms and new digital modules slow down the timelines of adoption.

As a behavioural challenge, resistance to change was also observed - the employees who were used to manual reporting had problems adapting to complete digital workflows. This corroborates TOE intuitions that organisational preparedness, top management endorsement, training rate, and acceptance of employees are dependent on technology adoption.

The skills gaps emphasize the necessity of systematic capability building, whereas the integration problems point to the fact that digitalisation needs to be done not through a single implementation, but in phases.

6.1.4 Needs related to the best practices and industry support

The implementation was highly associated with cross functional collaboration, constant training and standardisation of technology. Companies that have continued to be closely aligned amongst the IT teams, production planners and the supply chain units enjoyed a smoother adoption. Changing the systems through routine monitoring, reviewing performance and updating the systems, ensured organisations remained improved and not realised gains.

Intra-department and regular training increased the level of knowledge sharing and allowed the normalisation of the usage of the technologies. Financial incentives and nationwide development of digital capacity might play a crucial role in enhancing the pace of change in the whole industry at the policy level.

6.2 Theoretical Contributions

The theoretical contribution to this paper is the fact that it illustrates the reflection of Resource Based View RBV, Technology Organisation Environment TOE and Contingency Theory in the actual practice of supply chain in the Sri Lankan apparel industry. This qualitative work is not targeted at proving the cause and effect, as the research conducted with the help of interviews does not give any statistical information about the correlations between variables. Instead, the findings reflect what the industry specialists think about the role played by digital tools, internal capabilities and external conditions in the daily operations. Electronic systems such as ERP, data tracking tools and integrated information flows, through participant insights, appear to be assets that help increase a competitive advantage that is a demonstration of RBV. Some of the factors that influence adoption and utilisation and coincide with TOE are organisational readiness, leadership support, technology maturity and workforce skill. The performance outcome is the determination of fit of digital systems to the firm situation, resource endowment and the supply network situation which is an action of the Contingency Theory.

Other than creating the topicality of the theoretical lenses, the study contributes to the larger supply chain digitalisation, resilience and performance literature. According to the past studies, digital tools increase visibility, reduce the impact of manual disruption and capacity to respond during uncertainty as mentioned by Chauhan et al. 2022, Somapa, Cools and Dullaert 2018 and Ahmed and MacCarthy 2021. The present findings take this literature a step further on how such benefits can be translated into reality in the Sri Lankan apparel operations. According to the research, resilience is achieved through accuracy of data, real time information exchange, speed, and more assured decisions during disruptions. However, it is also indicated by the findings that digitalisation does not always lead to the improved performance. The positive outcomes include process integration and reliable supplier relations, which are met with qualified employees, consistent supplier relations, and positive results achieved when digital systems are embraced. This point of view is a subtlety to the

existing literature, such as Ivanov, Dolgui, Das and Sokolov 2019 and Parikh 2018, that technology capability is not enough.

On the whole, the research can be helpful because it helps to realize theory in the real life. It demonstrates the RBV, TOE and Contingency Theory in action and it also builds on the existing body of literature by revealing the effect of interaction between digitalisation and resilience on supply chain performance in an emergent economy apparel setting.

6.3 Recommendations

6.3.1 Suggestions to the Apparel Manufacturing Firms

Fashion brands need to focus more on long-term investment in developing digital capabilities instead of making disjointed technological investments. Optimisation of ERP, automation modules, predictive analytics and real-time visibility platforms will be reinforced gradually to reduce rework, minimise operational delays and favour quicker and more precise decision-making cycles. The industry will also be transitioned away off manual dependency to technology based operational excellence with the help of long term capability building.

In addition to the development of the system, companies must institutionalise systematic digital skills progress since talent deficit proved to be a limitation in its adoption. The route to ERP navigation, data interpretation, forecasting, and planning based on data should be institutionalised as part of the regular capacity-building. It can be further enhanced by the creation of internal digital champions and specialized talent units to promote faster adoption and troubleshooting, knowledge transfer and process optimization without providing services to external consultants.

Cultural adoption is another factor that leads to successful transformation as opposed to the technological presence. To instill digital-first thinking and instigate change by implementing technology, the leadership should promote the open communication, employee engagement

in implementing changes, and pilot-guided onboarding to foster comfort and lessen opposition. Engagement can be cemented by reward systems that reward digital accuracy, efficiency gains and problem solving behaviour, which will be seen as support, not imposition with new systems. Once the employees realize the role of digital tools in offloading work and improving clarity, the adoption will become self-reinforcing.

Resilience needs to be instilled as an ongoing operational model as opposed to a disaster response tool. Multi-sourcing, supplier scorecards, digital risk tracking, buffer planning, and scenario-driven forecasts will boost agility and the speed of recovery in the event of disruption by formalising them. This change means resilience is not a toolkit aimed at dealing with emergency situations but a standardised and continuous ability that protects the stability of performance in case of uncertainty.

6.2.2 Policymaking and Industry Recommendations and Advice to the National Ecosystem

The sector requires policy support to facilitate the large-scale technological maturity. As long as high technology investment continues to be a financial strain to a lot of manufacturers, strategic incentives like subsidised credit, tax advantages associated with automation and government-enabled digital upskilling plans can hasten transformation across the industry. These types of interventions will ensure mid-tier apparel exporters are able to modernise with the large-scale firms.

Coherent national digital supply chain framework would enhance integration and interoperability among the manufacturers, logistics partners, buyers, and suppliers. The integration roadmap to be shared that will direct the data formats, traces standards and the communication standards can be established and can simplify collaboration and minimize fragmentation. This will facilitate visibility, compliance and transparency particularly on export oriented value chains.

It is also important to enhance competency development on a large scale. A digitally competent workforce in the next generation of supply chain environments can be trained in dedicated training hubs, ERP practice laboratories, demand forecasting simulators, and data analytics basics. The partnership between the industry and academia can make skills development to be in line with the future operational needs and not the traditional production-based skills training.

The further development also presupposes the systematic knowledge exchange within the organisations. The use of benchmarking networks, innovation sharing forums, and case based learning platforms can aid firms in learning through real implementations rather than through experimentation. By making best practices visible, the industry will be able to move forward in one direction and each organisation will not need to undergo costly trial-and-error phases.

6.4 Limitations of the Study

The study had a narrow scope because it was only conducted on a few apparel manufacturing companies in Sri Lanka limiting the generalisation of the results to the industry as a whole.

The research was narrowly based on the concept of digitalisation and resilience as the main determinants of the supply chain performance without considering the other aspects of the operations, including labour practices, human resources management, corporate sustainability initiatives, and environmental or regulatory compliance. Although they are also likely to influence efficiency, risk management and organisational adaptability, they were not studied thoroughly in the context of the current study. In addition, it was a cross-sectional study, and therefore, no changes in digital adoption, resilience practices, and supply chain outcomes over time were considered, which did not allow the longitudinal evaluation of the practices changing over time or reacting to external disruptions.

Although the inductive qualitative approach is fitting in investigating the experience and cognising the mechanisms, it does not allow testing hypotheses or causal relationships of

digitalisation, resilience, and performance outcomes. The systematical coding and theme development may have interpretation bias, and other perspectives may give a slightly different answer. Regardless of these shortcomings, the paper offers valuable information about the prevailing conditions of digitalisation and resilience in the Sri Lankan apparel supply chains and pinpoints certain challenges, gaps, and possible opportunities to address them. The limitations observed herein highlight why future studies are necessary wherein the sample size is increased, longitudinal data used and various dimensions of supply chain and operational performance should be taken into consideration in order to derive more generalisable, validated, and comprehensive conclusions.

6.5 Recommendations for future research

The research on the future needs to increase the scope and scale of the research in order to have a better insight on the digitalisation and resilience in the supply chains of the apparel industry. One could also include a bigger and more diverse group of manufacturers, especially those of small- and medium-size and export-oriented companies, to trace the patterns of adoption and problems in various firm sizes and circumstances. This would enable the researcher to investigate the scale of a company, availability of resources, and global exposure, and their impact on digitalisation preparedness and resilience patterns, as well. The integration of both qualitative and quantitative measures of performance, including measures of digital system utilisation, operational KPIs, lead-time reliability, production costs, and response times of incidents, would make the findings more robust and ensure the empirical validation of observed trends.

Comparison with other countries to which Sri Lanka is an apparel-exporting country may help identify country-dependent contextual factors, regulatory frameworks, and cultural factors that inform the application and adoption of digital and resilience approaches. In addition, researchers might explore how suppliers, pressure of compliance by buyers, and workforce digital literacy affects the performance of the supply chain in future research. A study on the

effect of supplier collaboration, data-sharing, and adoption of technologies at various levels to the end-to-end supply chain would be informative on the systemic resilience.

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Appendix

Appendix A- Interview Protocol

Research Title: Supply Chain Digitalization, Resilience, and Performance in the Apparel Sector of Sri Lanka

Key Information

Name of Interviewee:	
Designation:	
Contact number :	
Company email :	
Date of Interview:	
Time of Interview:	

Place of Interview: .....

Introduction and Permission

Self-introduction and Introduction to the Study:

Good [morning/afternoon]. My name is Lihini Kudamanna, a student from the University of Vaasa. I am conducting a research study titled " Supply Chain Digitalization, Resilience, and Performance in the Apparel Sector of Sri Lanka" for my Masters Degree Programme.

Your participation will help me gain valuable insights into this topic. The interview will take approximately 15–20 minutes.

All information collected will be kept strictly confidential, used only for academic purposes and this Master's thesis, and will be deleted after the thesis is evaluated.

A: Background

1. Can you briefly describe your role in the supply chain operations of your organization?
2. How long have you been involved in managing supply chain activities here?

B: Supply Chain Digitalization

3. What digital tools or systems (e.g., ERP, IoT, predictive analytics) does your company use in supply chain management?
4. How do you perceive the impact of digital tools on the overall performance of the supply chain?
5. Can you describe a situation where digitalization helped you monitor, anticipate, or respond to a supply chain issue?

C:Supply Chain Resillience

6. How does your organization prepare for potential disruptions in the supply chain?
7. Which practices have been effective in maintaining operations during disruptions and being resilient to disruption? (e.g., flexibility, redundancy, agile planning)

8. How do you perceive the impact of those practices on the overall performance of the supply chain?

9. Can you share an example where the supply chain successfully met targets (cost, time, quality, customer satisfaction) despite challenges?

D:Reflection

10. How do digitalization and resilience complement each other in your daily operations?

11. In your opinion, what improvements could enhance the effectiveness of your supply chain in unpredictable or volatile environments?

End of Interview

Thank you very much for your time and valuable insights. Your contribution is greatly appreciated and will support the success of this study.