



Building Resilient and Sustainable Supply Chains through Digital Technologies: A Multiple-Case Study of Textile Firms

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ABSTRACT

This paper explores how digital technologies can be used to develop resilient and sustainable supply chains in the textile industry. The study examines how the textile companies can use such technologies as AI, IoT, Blockchain, and Big Data analytics to support the supply chain operation, increase the resilience to the disruptions, and sustainability through the research approach based on the multiple-case study and thematic analysis. The results show that digital technologies are essential resources to predict, prepare, and recover the disruptions as well as enable optimization of resources and the practices of the circular economy. Although these technologies had some drawbacks in the form of the cost of implementation, resistance to change and the requirement of skilled labor force, those companies that have managed to integrate successfully noted a better operational efficiency and competitive advantage. The research paper is relevant to the existing body of literature on digital transformation within the supply chain and practical advice to textile companies that are aiming to promote their resilience and sustainability with the help of digital resources.



Introduction

Over the past years, there has been a growing pressure on the textile industry to deal with the two issues of resilience and sustainability in its supply chains. With the given sector being one of the most sensitive to global availability and unavailability, like the natural disasters, the economic fluctuations, and even the geopolitical uncertainties, the need to have robust and sustainable supply chains never has been more acute. The challenges that textile companies ought to deal with are especially specific to those operating within emerging economies, such as the disruption of the supply chain, the environment, the use of resources, and the increased demand of customers towards more sustainable and ethical products (M. Ahmad et al., 2025). Against this backdrop, it is possible to note that the use of digital technologies in supply chains has become a promising

approach to achieve resilience and sustainability. The technologies that will transform the way companies will conduct their supply chains are Artificial Intelligence (AI), Internet of Things (IoT), Blockchain, and Big Data, which will help companies to manage, monitor, and optimize their supply chain solutions to adjust to the changing market conditions more rapidly and eliminate the impact of the disruption that can potentially happen (Ibrahim et al., 2025).

Despite the fact that the digital technologies are increasingly being adopted as providers of supply chain transformation, the literature nonetheless lacks the role of digital technology in production of resilient and sustainable supply chains within the textile industry. Despite the role of other studies on the role of digital technologies in the general supply chain management, little has been done on the role of digital technologies in enhancing resilience and sustainability in textile companies. This paper will address this gap by analyzing the manner in which textile enterprises are adopting digital technologies to develop shock-resilient, yet sustainable supply chains in terms of environmental and societal performance. By revealing such a gap, the research will contribute to a better understanding of how digital transformation can be used to achieve operational effectiveness and sustainable operations in one of the largest components of the global economy.

The strength of the work lies in the fact that it could suggest some feasible implications to the textile firms and policy-makers who are interested in managing the issues of supply chain resilience and sustainability in the scenario of digitalization. With the world supply chain being increasingly more connected and complicated, there is no more significant need to learn how to use the digital tools to develop resilience and promote sustainability as a competitive advantage asset that can be relied upon over time (Iqbal et al., 2024). Moreover, this research may be applied in further strategies of applying the ideas of the circular economy in the textile supply chain as an area, which gains increasing popularity as businesses strive to reduce waste, better the use of resources and decrease the environmental footprint that the companies leave.

This is novel research in several aspects. First, it takes up a multiple-case-study research design, which enables researching the problem of the application of digital technologies to the problem of resilience and sustainability by different textile companies that have their own unique context. The fact that the study consists of numerous cases provides a comprehensive comparative analysis of the variation of application of digital technologies to practitioners and scholars, as presented by numerous companies. In addition, the theoretical framework used in the research is based on the Resource-Based View (RBV), Dynamic Capability Theory, and Circular Economy Theory that allows to provide the multi-theoretical approach to the problem of analyzing the role of digital technologies in the management of the supply chain. The theories provide a strong basis on the way corporations can utilize the resources, capabilities and circular practices to simplify the supply chain activities of the companies in highly unstable business environments.

Lastly, the study contributes to the existing body of knowledge on the subject of digital transformation in supply chains by providing empirical data on how textile companies can use digital technologies to achieve resilience and sustainability. This way it will strive to help companies navigate the obstacles of the contemporary supply chain besides smoothing practices that are cost effective and green.

Literature Review

Supply Chain Resilience and Sustainability

Sustainability and supply chain resilience are the two important aspects that have gained high introspection in the academic circles and the practical setting in the last few decades. The resilience concept in supply chains involves the capability of a firm to prevent, delay, react to, and

recuperate the disruptions (S. Ahmed et al., 2025). It entails the ability to recover both following shocks and business continuity by means of responsiveness and adjustability. The concept of resilience is especially crucial in the textile sector because it is one of the most vulnerable sectors in case it is disrupted due to various factors, including changes in the prices of raw materials, labor supply, geopolitical tensions, or natural disasters. The COVID-19 pandemic, in particular, made the vulnerability of global supply chains more obvious, and textile companies were facing numerous delays and disruptions in their work, which resulted in production delays and inventory shortage (Dewan & Alam, 2022). Hence, supply chain resiliency within the textile sector assumes a strategic priority, which allows the companies to survive such shocks and keep supplying the customers.

Supply chain sustainability, on the other hand, entails the incorporation of the environment, social and economic issues into the supply chain management practice (Ullah et al., 2024). The concept of sustainability has become mandatory in the textile sector under the influence of the rising demand of environmentally-friendly products by consumers, the issues of the environmental footprint of the textile production, and the growing regulatory issue. Textile companies must deal with the necessity to find a balance between the low-cost goods and the reduction of the environmental harm through the waste, water consumption, and carbon emissions (Hussain, 2025). This increasingly stresses on the textile firms to be sustainable, such as by sourcing renewable materials, minimising waste, adopting fair labour practices in their supply chain (Bukhari & Hayat, 2024). Integration of resilience and sustainability are not just about being able to continue to exist despite disruption but are a subset of long term sustainable practices that buffer the resources to the succeeding generations.

The mutual influence of resilience and sustainability is acquiring a new perspective due to the realization of companies that resilient supply chain must be sustainable to experience the long-term disruptive events, which include climate change (F. Ahmad & Khokhar, 2024). Companies that operate in a friendly way to the environment such as using renewable sources of energy or materials that are environmentally friendly are in the long-run benefiting because they reduce costs and increase their image. Conversely, non-sustainable ones may be afforded greater degree of regulatory scrutiny, loss of reputation and lack of efficiency in their operations in the long-term. It has been suggested by researchers that resilience and sustainability are complementary terms and the adaptive nimbleness of resilient supply chains in most instances is required to instil sustainability in its business operations (S. S. Ali et al., 2024).

Still, both resilience and sustainability are a complex question that should be achieved by textile businesses. It involves a systemic approach such as the diversification of the supply chain, lean management and digital technology implementation (Faraz et al., 2025). The research has also suggested that the companies that successfully integrate the digital technologies to their supply chains will be better placed to address the resilience and sustainability. The digitalization will enable the companies to track and evaluate the effectiveness of the supply chain, carry out the risk assessment and optimize the effectiveness of the resources, which will increase the sustainability and resilience (Maalik et al., 2022). Nevertheless, they are not easily accessible to most of the textile companies including companies operating in the emerging economies since most companies do not have the funds and capabilities to use more advanced technologies (F. Ali et al., 2024).

Role of Digital Technologies in Supply Chains

Digital technologies have transformed it to be one of the most major sources of change in supply chain that have resulted in efficiency, resilience, and sustainability at the industrial level. The management approach of the supply chain within the textile industry has been transformed due to the implementation of the digital products like the Internet of Things (IoT), Artificial Intelligence

(AI), the use of Blockchain and Big Data (Saleem & Bashir, 2024). They help to track, make decisions based on data, and predictive analytics in real-time, which may be applied to enhance visibility, agility, and responsiveness throughout the supply chain operations (Raza et al., 2021).

IoT has emerged as one of the most significant aids of promoting efficiency and sustainability of the supply chain. The RFID tags, the sensors used in the IoT devices help the companies keep track of the goods through the entire supply channel, beginning with the purchase of the raw materials all the way to delivery of the finished product (Hossain et al., 2024). This enhanced visibility helps the firms to identify the areas of inefficiency, keeping track of the environmental effects, and utilizing the resources to their fullest capacity (Zhang et al., 2024). The example is the integration of the IoT sensors into the textile companies and assisting them in measuring the water quantity used during the manufacturing process to reduce waste and decrease the effects on the environment (Akhavan & Philsoophian, 2025). Additionally, the IoT-tracking will give the companies the chance to forecast the potential disruptions, such as the transportation delays, and resolve them in the proactive manner to enhance the resilience of the supply chain (Rehman Khan et al., 2022).

Artificial Intelligence (AI) and Machine Learning (ML) to facilitate the work of a supply chain (demand forecasting, inventory management, and predictive maintenance) are increasingly used (Duman Altan et al., 2024). The algorithms of AI can analyze a large quantity of data, identify trends that a human decision-maker may miss to enable firms predict better and better decisions. An example is the use of AI-based demand forecaster that can help textile companies forecast the shifts in the customer demand, which will allow the company to adjust the production plan and mitigate the risk of overstocking or shortages (Abbasi et al., 2025). Besides, the AI-driven systems are able to resiliently make the supply chain more robust by identifying its vulnerabilities and proposing the means of redressing them. Using AI as an example, it will be capable of proposing new suppliers or distribution channels during a disruption, which will make the firm take longer to recuperate after an unexpected incident (Aslam & Khurshid, 2024).

The primary components of sustainability are the supply chain transparency and traceability that can be improved with the blockchain technology. Blockchain provides firms with an unmodifiable computer database that allows them to track all the transactions and the movement of the products throughout the supply chain (Mahar et al., 2025). This kind of transparency does not only ease the ethical sourcing and fair labor practices, but also enables consumers to check the sustainability promise of textile companies. In addition, Blockchain could make the supply chains easier, such as the need to involve intermediaries and the decreasing cost of operations (Aslam et al., 2025). The concept of sustainability is another area where blockchain can be applied to ensure that the principles of the circular economy are practiced by enabling the execution of the material reuse, recycling, and maximum amount of waste in the entire supply chain (Piprani et al., 2024).

The big data and sophisticated analytics is essential in deriving the insights which are premised on massive amount of supply chain data. The textile companies possess immense data, both in terms of manufacturing statistics and the reaction of the customers and the extraction of this information can provide a valuable insight into the performance, risks, and opportunities (Dad et al., 2023). The Big Data analytics can help the companies to figure out the trends in demand, monitor the performance of the suppliers, and predict any possible disruption. Using the case of data analytics, companies can evaluate the environmental performance of their supply chain, be it energy and waste production, and optimize their operations to reduce their carbon footprint (T. Ahmed et al., 2024). Besides that, Big Data analytics are used in decision making as they have the ability to provide real-time information which can enhance the resilience and sustainability since firms are in a position to respond swiftly to arising issues (Malakar et al., 2025).

Digital technologies may be very beneficial but their introduction in the textile industry is not smooth sailing. Among the challenges that stop the implementation of these technologies at the mass level, it is possible to identify high costs of the implementation process, lack of staff trained to use it, and resistance to change (Daniel et al., 2026). Moreover, the digital technology integration primarily requires significant investment in the infrastructure, which is not always done in small and medium textile companies. Nevertheless, the advantages it may bring such as the increased efficiency of supply chains, reduced wastage, and resiliency make the digital technologies an unavoidable component of a supply chain strategy in the future (Liang et al., 2026).

Theoretical Foundation

The given study is founded on three significant theoretical frameworks the Resource-Based View (RBV), the Dynamic Capability Theory and the Circular Economy Theory. These theories are a powerful framework of explaining how digital technologies can be used to create resilient and sustainable supply chains in the textile industry. Resource-Based View (RBV) presupposes that the companies acquire competitive advantage depending on the specific resources and strength of the companies (Kurtessis et al., 2017). In this regard, digital technologies can be considered an effective tool as a part of the supply chains that enable firms to expand their capacity to perform well and become more resilient. According to RBV, the competitive advantage can be achieved when the firm is able to acquire, derive and use resources with little availability, high value and imitable (Dixit et al., 2026). Within the textile companies, digital technologies such as AI, Blockchain, and IoT may become the unique asset the companies could leverage in order to beat their rivals. As an alternative example, the competitive advantage of companies may be offered through supply chain transparency via Blockchain or demand forecasting via AI (Siame & Chisenga, 2026). The latter perspective focuses on the importance of applying technological tools in the creation of value and the improvement of the performance of a supply chain.

Dynamic Capability Theory is based on the RBV by emphasizing the importance of the capability of a given firm to restructure and realign its resources in line with the changes that occur in the environments (Dwivedi et al., 2026). The dynamic capabilities in the textile industry may be observed in the framework of the rapid response of the firms to disruption not only in the form of disrupted supply chain, but also in the form of a change in the regulatory requirements, and the continuous sustainability improvement practices of the company. To take an example, businesses that improve their supply chain strategies by applying the principles of a circular economy, reducing waste, and guaranteeing sustainability can accomplish such in a relatively short time by adopting dynamic capabilities through the introduction of digital technologies (Putranto et al., 2026). Another area that dynamic capabilities can help firms to pursue through the mechanism of quickly adjusting their operations, in order to lessen the effects of risks, and exploiting the opportunities that arise (Dittfeld et al., 2022). The theory can be applied to the research in particular because the framework provides an understanding of how businesses can use digital technologies to enhance their responsiveness and adaptability to the disruptions.

The Circular Economy Theory is directed to the creation of closed-circles that contribute to minimizing waste and maximizing resources efficiency and sustainability (Irfan et al., 2022). The importance of reuse, recycling and refurbishing of materials over linear and linear approach of take, make and dispose have been addressed by the concepts of circular economy in relation to supply chain management. Digital technologies will become essential in the textile companies to enable the circularity in the economy activity, such as the possibility to track the materials flow, waste management, and ethical obtaining of raw materials (Nichifor et al., 2025). An example of this is the use of blockchain to achieve the tracking and certification of the recycled material where

they are then put back into production thus leading to a more sustainable supply chain. In addition, IoT and Big Data may assist in streamlining the utilization of assets to ensure that the companies will lessen their effects on the environment yet still be efficient in their activities (Jæger & Myrold, 2023).

These three theoretical approaches to the problem combined will make this study provide a comprehensive theory of how digital technologies can be used to achieve resilient and sustainable supply chains in the textile industry (Cicerelli & Ravetti, 2024). These theories could offer valuable insights into the resources, capabilities, and practices that businesses could use to improve the work of the supply chain and achieve long-term sustainability goals. The introduction of digital technologies can be discussed as a strategic asset, and companies can use it to form their dynamic capabilities and establish the practice of the circular economy which ultimately results in the higher resilience and sustainability.

Methodology

A multiple-case study design is also used in the proposed study to investigate the way the digital technologies can be adopted to enhance the resiliency and sustainability of the textile supply chains. The multiple-case study research design is particularly suitable for this study, as it will allow the investigation to investigate in greater detail and comparatively how different textile companies with their unique circumstances use the digital technologies to manage the supply chain issues. The case study approach allows gaining a better insight into the complex and real world practices of each firm but also enables one to identify patterns in various firms. The cases are selected based on specific criteria, including the size of the firm, their geographical location and the use of digital solutions like AI, IoT, Blockchain and Big Data in their supply chain. The research encompasses both developed and emerging textile companies so that the sample of the research is not limited to one type of perspectives on how digital technologies may help supply chains to be resilient and sustainable. To select the firms that have actively engaged in the application of digital technologies in the supply chain and have shown their interest in sustainable and resilient practices, a purposive sampling method was used.

Primary data are collected through semi-structured interviews with the key stakeholders in the chosen textile companies such as the supply chain managers, computer experts, and sustainability officers. Such individuals were selected due to their direct participation in the digital technologies implementation and management in the supply chain. The interviews were done face to face or through video conferencing mediums which was flexible and easy to reach participants. To guarantee the validity and fidelity of the data, the questions in the interview were crafted to examine different dimensions of digital technologies adoption, supply chain resilience, sustainability programs, and the issues that companies experience when adopting these technologies into their business. The audio-recorded interviews were transcribed to analyze them. Secondary data (company reports, industry publications, and other pertinent case studies) were also gathered to supplement the interview data so as to offer more context to the findings.

The NVivo is used as data analysis software that is a qualitative data analysis program and helps to organize, code and identify patterns within interview transcripts. Thematic analysis was done using NVivo, and was conducted based on Braun & Clarke, (2006) model, which consisted of a number of steps: Familiarization with data, initial codes, searching themes, revising themes, and defining and naming themes. The thematic analysis procedure permitted identifying the major themes connected to the role of digital technologies in the development of supply chain resiliency and sustainability. Also, the cross-case analysis was made to compare and contrast the results of various firms and assist in identifying similarities and specific practices in the cases. The method offered an in-depth view of the effects that digital technologies have on the performance of the

supply chain and can be used as an invaluable addition to academic and management practices. The use of semi-structured interviews, data analysis using NVivo software, and multiple case study design, represent solid and systematic approach to the research questions and their analysis.

Table 1. Profile of Participating Firms and Interviewed Professionals

Firm	Organizational Size	Market Orientation	Core Textile Activity	Interviewed Positions	Managerial Experience	Key Digital Technologies Discussed
Firm 1	Large enterprise	Export-oriented	Apparel manufacturing	Supply Chain Manager; IT Systems Manager; Sustainability Manager; Operations Director	12–18	AI, IoT, Big Data Analytics
Firm 2	Medium-sized enterprise	Domestic & Export	Yarn & Fabric production	Supply Chain Manager; IT Manager; Operations Head	8–15	IoT, ERP-based analytics
Firm 3	Large enterprise	International market	Garment manufacturing	Sustainability Manager; IT Systems Manager; Operations Director	10–20	Blockchain, AI-enabled forecasting
Firm 4	Small-to-medium enterprise	Domestic market	Home textile production	Supply Chain Manager; Production Manager	7–14	IoT monitoring systems

To ensure confidentiality, the participating textile firms and interviewees are presented anonymously. Data were collected through site visits and semi-structured discussions with key managerial personnel involved in digital supply chain initiatives. These included supply chain managers, IT systems managers, sustainability managers, and operations directors. Table 1 presents a consolidated overview of the participating firms and the professional profiles of the interviewed managers.

Data Analysis

The analysis of the data in this paper is done under thematic analysis approach according to the method used by Braun & Clarke, (2006) where patterns (themes) are identified, analyzed and reported within the qualitative data. The interview transcripts were coded and analyzed using NVivo software in order to identify themes and sub-themes associated with the role of digital technologies in improving supply chain resilience and sustainability in textile firms. The analysis was done in various steps in which an initial reading of the data was done, coding was done, pattern searching was done, themes were reviewed and finally defining and naming of the themes were done. The themes, sub-themes, findings and discussions of the thematic discussions are contained in the following sections.

Table 2: Thematic Analysis

Theme	Sub-theme(s)	Findings
Theme 1: Technology Adoption and Integration	1. Digital tools integration 2. Adoption barriers	Firms face challenges in integrating digital tools; however, those who successfully do so benefit from improved resilience and sustainability.
Theme 2: Enhancing Supply Chain Resilience	1. Anticipation and preparedness 2. Recovery mechanisms	Digital technologies enable firms to predict disruptions and recover faster, improving overall supply chain resilience.
Theme 3: Achieving Sustainability	1. Waste reduction 2. Circular practices	Digital technologies help firms reduce environmental impact and adopt circular economy practices.
Theme 4: Organizational and Cultural Factors	1. Resistance to change 2. Organizational culture	Organizational factors play a critical role in the adoption of digital technologies for resilience and sustainability.

Theme 1: Technology Adoption and Integration

The initial theme that occurred as a result of the data was connected to the introduction and incorporation of digital technologies into the textile supply chain. The companies used in the cases adopted different digital technologies like IoT, Blockchain, and AI to develop the capabilities of their operations. Nonetheless, the rate at which it was adopted differed by the size of the firm, resources, as well as the maturity of the industry. The bigger companies that had more resources could invest in more sophisticated technologies, like Blockchain as a transparency and traceability tool, whereas smaller companies were more interested in such tools as the IoT to monitor everything in real-time and collect data. Although these benefits are possible, various companies were struggling to adopt the digital technologies in their supply chains activities on a large scale. Problems such as large initial cost of investment, shortage of skilled man power and organizational resistance to change were also major challenges. Other companies noted that they have challenges in persuading the top management to invest in digital projects, and some have problems with how to train their employees to use new systems. All these challenges were particularly evident in the companies with poor technological systems where old systems were deep rooted and transitioning to digital solutions was more complicated.

Nevertheless, those companies that managed to successfully implement digital technologies were extremely helpful in terms of operational efficiency, visibility of supply chains and interdepartmental communication. Indicatively, a textile company that used IoT sensors to track material consumption and measure environmental factors noted that waste was cut by 15 percent, and the efficiency was enhanced by 10 percent. These companies shifted towards a more data-driven decision-making process due to the integration of digital tools that, in turn, led to the resiliency and sustainability of their supply chain on the whole.

Theme 2: Enhancing Supply Chain Resilience

The second theme which has been observed in the analysis of data is associated with the role of digital technologies in heightening the supply chain resilience. Digital tools were identified to be instrumental in assisting companies to predict and plan on possible disruption, including the tardiness in supply, change in demand and other sudden crises. Specifically, the analytics of AI and Big Data enabled companies to develop more precise models of demand forecasting and

improve inventory management, which will reduce the risk of stockouts or overstocking. One company said that through predictive maintenance of equipment using AI, they got to save 20% of production delays and as well as machine downtimes.

In addition, the IoT allowed monitoring supply chains in real-time, which gave businesses the opportunity to trace the appearance of any problem before it turned into a significant disruption. As an example, sensors embedded in the transportation fleet in the IoT system enabled a textile company to track the whereabouts of vehicles, delivery time, and external conditions, which could help them predict and prevent possible delays in the deliveries. The information gathered by the IoT devices also helped to accelerate the process of recovery in the eventuality in case of disruption. When one of the firms supply chains was hit by a natural disaster, they incorporated their digital systems to reroute shipments quickly, inform the suppliers impacted and reshape their production schedules to reduce the effect on delivery times and customer satisfaction.

The firms also indicated that they enhanced their adaptive capabilities, which is an important element of resiliency, after the digital technologies made them able to redesign their supply chains promptly in reaction to unanticipated events. Indicatively, some companies had implemented alternative sourcing policies where they found new suppliers and channels of distribution using online platforms and thereby enhancing their ability to counteract shortages in the supply chain.

Theme 3: Achieving Sustainability

The third theme revealed was the role that digital technologies play in turning the textile supply chains into being sustainable. The issue of sustainability is also an emerging issue in the textile sector where consumers, regulators and environmental organizations are pressurizing companies to minimize their environmental impact. The digital technologies had a considerable place in ensuring that firms were able to embrace greener practices including waste reduction, efficiency in resource use, and ideas of the circular economy.

Among the most important conclusions made during this theme, there was the fact that it is possible to manage the use of resources during the production of textiles using digital technologies and to monitor this process. The sensors on IoT monitored water use and electricity use with the help of which the firms could locate the areas where inefficiency occurred and take the necessary actions. As an example, a company saved 30 percent of its water consumption levels by applying IoT devices to monitor the current water consumption levels and modulate its production process to correspond to these levels. The AI and data analytics also assisted companies in minimizing wastes as the patterns in material utilization and manufacturing procedures could be detected so that firms could save on inventory management and reduce overproduction.

Moreover, digital technologies positively influenced the use of circular economy in the textile supply chain. An example is blockchain which monitored the life of the materials used in production; recycled or repurposed material was utilized. Companies which embraced these practices were not only capable of minimizing their impact on the environment, but also enjoyed a competitive advantage since they promoted their sustainability practices to consumers. As an example, a textile company could utilize Blockchain to give the consumers verifiable information about the origin and sustainability of the materials used in the construction of their products that allowed the company to stand out among others in the competitive market.

Theme 4: Organizational and Cultural Factors

The fourth and last theme that was found based on the data analysis is associated with the role of organizational and cultural factors that can influence the adoption of digital technologies to its supply chain resilience and sustainability. Some companies have cited resistance to change as one

of the major obstacles to the implementation of the digital technologies. This opposition was usually based on the organizational culture where old doing business methods were inbuilt, and workers were not ready to accept new technologies. The reluctance of the senior management to embrace the potential positive changes of digital transformation was a hindrance in the process of implementing the new systems in some cases.

Nonetheless, successful companies that were successful in incorporating digital technologies usually had a robust organizational culture that facilitated innovation and change. These companies were less conservative in their adoption of new technologies and they were also venturesome in training and supporting the employees. It was also important to overcome resistance to change because the presence of change champions at the organizational level was also able to help alter the mindset of the organization toward the introduction of digital technologies. A company, which had managed to implement Blockchain into its supply chain, told that the active role of the top management in making the change and the establishment of cross-functional teams to make sure that all stakeholders are following the change process will be the key to success.

These companies were characterized by the organizational culture of a high level of adherence to the idea of continuous improvement and readiness to invest in the change to the digital environment in the long run in spite of the short-term difficulties. This culture had allowed the firms to not only successfully apply digital technologies but to also apply these technologies in order to become more resilient and sustainable in their supply chains.

The thematic analysis of the information on the multiple-case study revealed that digital technologies play a significant role in enhancing resiliency and sustainability aspects of the textile supply chains. The introduction and adoption of digital technologies such as IoT, AI, Blockchain, and Big Data can provide companies with chances to optimize work and become more efficient and reduce the environmental impact. However, these technologies are not introduced in a short journey as the adoption is also associated with such issues as high initial investment cost, resistance to change and skilled labor. Despite such challenges, companies that successfully adopted digital technologies might report tremendous improvements in the resilience of their supply chains, operational efficiency and performance, and sustainability. Also, the discussion has shown that the significance of organizational culture and leadership in driving digital transformation and overcoming resistance to change is paramount.

Discussion

The findings made in this study suggest that online technologies are essential to enhance the resilience and sustainability of textile supply chains. The Internet of Things (IoT), Artificial Intelligence (AI), Blockchain and Big Data analytics can be integrated into textile companies to be in a good position to handle disruptions, resource usage, and sustainability programs. The ability of the firms to meet the growing wave of sustainable practices, which is achieved through adoption of digital technologies not only helps in strengthening the functional stability of the firms, but also helps in positioning the firms in a better position to survive in the rapidly changing global market environment.

Another important contribution of the study is the establishment of the role of digital technologies in facilitating firms to plan and recover disruptions in the supply chain activities. Resilience depended on the use of AI and Big Data analytics to forecast demand, manage inventory, and predictive maintenance as key enablers. The technologies enable companies to be flexible to changes in the market, supply chain failure, or bottlenecks in operations. The capacity to predict better and act in advance is quite imperative in the textile manufacturing sector where timelines in the production process are very liberal to delays in supply and demand changes. Our results align

with the previous studies, which suggest that digital technologies, and AI in particular, can help a firm to predict and control risks, thereby creating a more resilient supply chain (Cicerelli & Ravetti, 2024). Additionally, real-time monitoring and data collection through IoT also reinforce resilience since it allows firms to monitor materials, shipments, and the environmental conditions, whereby the event of potential problems is detected in time and avoided in the most appealing manner.

The benefit of this study also upholds a similar assertion, which argues that sustainability and resilience have been associated. These companies that participated in this study did not simply employ the digital technologies to enhance their adaptability to the disruptions but sought to employ these resources to enable sustainable operations. An example is the application of IoT in water and energy use that helped companies to minimize waste, use of energy and minimize their environmental exposure. The result aligns with the accumulating literature that highlights the importance of digital tools in terms of supporting environmental sustainability in supply chains (Xiufan & Meng, 2025). Moreover, the adoption of the Blockchain technology to track materials and ensure ethical sourcing complies with the concept of the circular economy that is concerned with the reduction of waste and enhancing the reuse of resources (Ardolino et al., 2025). Not only do these technologies assist the firms to achieve sustainability but also assist them in enhanced operational efficiencies, hence giving them a competitive edge in a market that is highly appreciating sustainability.

The paper also brings out the importance of organizational and cultural factors in adoption of digital technologies. Lack of change willingness especially in traditional organizations was also established as a major force that hindered implementation of digital solutions. Although the digital tools have significant advantages, the firms whose organizational structures or cultures were resistant to being changed could not implement the technologies successfully. It helps substantiate the stipulations of the earlier researches that highlight the role of organizational culture and leadership in technological change (Liang et al., 2025). Companies that are proactive in the digital adoption process, that is, have leadership support and an innovation culture were more successful in breaking such barriers and enjoying the benefits of the digital transformation. The key to determining buy-in among employees and resistance was the existence of the so-called change champions in the organizations, people who support the idea of digital initiatives. This observation is in line with the existing evidence that effective digital transformation does not only necessitate the Technological abilities but also the conducive organizational culture (Liang et al., 2026).

The merger of three essential theories: the Resource-Based View (RBV), the Dynamic Capability Theory, and the Circular Economy Theory is also another essential theoretical contribution of this research. The RBV holds that competitive advantage is attained by the successful exploitation of unique resources, and the current research extends the concept by proving that digital technologies can be seen as valuable resources to increase supply chain resilience and sustainability. The businesses that utilized the help of digital solutions, such as AI, IoT, and Blockchain, might be able to utilize them in order to simplify their operations and increase their susceptibility to interference. This is supplemented with the Dynamic Capability Theory which are the ways through which firms transform their resource base to respond to changing environment (Fernando et al., 2026). As the present paper has established, digital technologies have the ability to enhance dynamic capabilities of firms, in particular, in relation to their responsiveness to disruption and continuous improvement of sustainability practices. Finally, the prism of analysis that was applied to the adoption of sustainable practices was the Circular Economy Theory. The digital technologies, such as Blockchain and IoT, allowed the companies to act according to the principles of the circular economy since they provided more efficient methods of tracking the resources,

reducing the waste levels, and promoting the use of the recycled resources, thus making the supply chain more sustainable.

However, since the digital technologies also have certain strong points, the research also reveals the problems linked with the introduction of these technologies, especially, in the case of small corporations. The challenges that were noted to be the most effective barriers to digital transformation were high implementation costs, incompetent workforce, and high demands to invest in infrastructure significantly. It can be explained by the findings published by Dittfeld et al., (2022) who suggest that the small and medium-sized enterprises (SMEs) must introduce highly sophisticated digital technologies. Larger companies can afford to implement and make the technologies operational, however, SMEs have a serious problem concerning the money and technical side of the digitalization. It means that the smaller textile firms require special help and resources which can help them to get over these challenges and exploit the digital technologies.

However, despite these challenges, the strategic importance of digital technologies of the long-term competitiveness of textile companies is also observed during the research. Companies that fail to adopt the application of digital tools may be disadvantaged because of their failure to adjust to the demands of the consumers to strike a balance between sustainable products. The digital technologies are not only advantageous in terms of their operations, but allow the firms to respond to the escalation in the needs of transparency, sustainability and ethical behavior. To illustrate this point, the implementation of a Blockchain, which is capable of ensuring the materials traceability and ensuring the sustainability of the production processes, can provide companies with a beneficial tool to make them stand out in the range of their rivals. Moreover, involving digital technologies into their supply chains, the companies get a chance to become more responsive to disruption, reduce costs, and increase efficiency, which all belong to their general competitive positioning in the industry.

Conclusion

The present paper provides a lot of data on the great role of digital technologies with the help of which the textile supply chains will be more resilient and sustainable. The findings indicate the role of digital technologies in improving the performance of the supply chain as it can assist the companies in anticipating disruptions, utilizing their resources in a more efficient way, and promoting the process of sustainability. Even though such traditional barriers as the high costs of implementation, resistance to change, and lack of skilled personnel are present, the strategic values of digital technologies, particularly in their ability to bring more efficiency to operations, make their supply chains more visible, and the execution of the idea of a circular economy, make them essential towards the attainment of the long-term competitive advantage. Finally, a firm that is effective in adopting digital technologies into its supply chains will be in a better position to overcome the challenges of a dynamic market environment and facilitate sustainability and resiliency in its business.

Future Directions

The effects of digital technologies on the supply chain resilience and sustainability in various industries should be the focus of future research in order to determine whether the results of the textile sector can be applied to other sectors with similar issues. The comparison of the firms that have successfully adopted the digital technologies with those that have had challenges would provide a better understanding of the factors that contribute to the adoption process. Moreover, it is possible that there is further research of how new digital technologies, such as blockchain-based smart contracts or more advanced machine learning algorithms, may facilitate an even more sustainable and resilient supply chain. The other possible future research direction would be to

focus on application of digital technologies in small and medium-sized enterprises (SMEs), where these companies are more likely to suffer problems with the implementation, and how they could be tackled by both practitioners and policymakers.

Practical and Managerial Implications

Practically, the textile companies will be encouraged to view the digital technologies as the extension of the supply chain strategy. The necessity to invest in the demand forecasting technologies with the help of AI, real-time monitoring with the help of IoT, and raises in transparency and traceability with the help of Blockchain will allow companies not only to make the operations more efficient but also to develop more sustainable and resilient supply chains. Firms should aim at developing internal capabilities by developing training and upskilling opportunities among the employees in order to effectively integrate these technologies. This will ensure that the workforce is adequately prepared to handle the complexity of the digital transformation. In addition, firms must build an innovation and change culture since it will assist the firm in establishing a more desirable environment in which digital technologies can be embraced. Management and presence of key decision-makers is paramount in this change as they are able to contribute to significantly overcome the organizational resistance and offer the resources necessary to bring the technology into the organization.

Textile companies need to view the digital technologies not as a solution to the existing problem but rather as a more holistic way of making itself more resilient and sustainable at the managerial level. Managers ought to know how to align digital efforts to the general business objectives and ensure that the adoption of these technologies can be exploited to realize the short-term and long-term business sustainability processes. In addition, the managers should strive to exploit the possibilities of digital technologies to integrate the practices of the circular economy into their supply chain, such as the increase in waste management, the tracking of recycles, and the optimization of resource utilization. Collaboration with technology vendors, outsourced consultants, and the other members of the industry also will most likely help the companies to overcome the intricacies of the digital integration and to assure them that they are doing best practices. Finally, textile firms are also to consider the development of their digital systems and implement consecutive stages of advancement to obtain the most benefits of such investments. In such a manner, they can create a stronger supply chain, which is also more sustainable and will be able to prosper in the long-run, in the market that becomes more competitive and more environmentally-conscious.

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