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Textile Supply Chain Optimization through Artificial Intelligence and Prescriptive Analytics Capability

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Abstract
In the context of a rapidly changing landscape of the international market, high competition, and short product life cycle, highly unpredictable demand, Pakistan's Textile sector is increasingly facing problems in its supply process. To gain clarity in the supply chain, textile companies are turning to display innovative digital technology, enabling digital materials integration and predictions analysis. However, coming from these investments in technologies, the performance of the supply chains is still uneven. These reveal a Non-Simultaneous Significant relationship between creating analytical sites and effective decision making, emphasizing the need for advanced decision-oriented skills, in this study it is the functional prescriptive analytics capability (PAC) which comes between the integration of AI in the digital supply chain, predictive analytics capability and textile supply chains performance Pakistan from dynamic capability and resource-based view. Prescriptive analytics are a higher order analytical capability that combines optimization logarithms, simulation models and decision support system that would both predictive and intelligence based to recommend the best approach to the operational constraint. The study adopts quantitative cross sectional source approach to collect the information on medium size and big textile manufacturing companies from professional who work on production in relation to supply chain procurement and planning of Pakistan. The link and the mediation among the variables of prescriptive analytics capability are tested with partial least square equation modeling (PLS-SEM). The proposed model states that only when technical and analysis skills are transformed into data based decisions focused on optimization of the supply chain; the performance of the supply chain will be improved. The results should demonstrate how they drive digital supply chain integration, and predictive analytics, boost prescriptive analytics capability which in turn greatly enhance supply chain performance. This research contributes much to the

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literature of supply chain analytics particularly in the framework of emerging economies in doing so, the prescriptive analytics capabilities are empirically validated as mediators.

Keywords: AI–Driven Supply, Predictive Analytics Capability, Prescriptive Analytics Capability, Digital Supply Chain Integration, Supply Chain Performance and Textile Industry of Pakistan are the Major Areas of Focus.

Introduction

The textile supply chain in Pakistan faces Increasing difficulties due to volatile demand, and Global competition, and operational efficiencies. AI-assisted supply makes it possible for organizations to take thousands of data for handling and extract precise actionable understanding promptly, besides enhancing the rate and precision of procurement, productions, and coordination choices (Culot et al., 2024). Digital Supply Chain Integration (DSCI) is defined as the seamless thinking between the internal process and the external partners to allow real time information sharing and operational coordination's. Combining these with this integration helps improve responsive information which soils. (K. P. Liu et al., 2022). The allow' predictive analytics capabilities enable firms to predict future disruption to demand and requirements for resources based on historical and real time data. But access predictive insight isn't enough: firm must be able to turn those insights into optimal decisions. Prescriptive Analytics Capability Function is a bridge between AI driven Insight, predictive analytics, and digital integration to make actionable decisions, improving overall textile supply chain performance. Using optimization algorithm decision support systems, PAC systems indicate the most optimal operations for enhancing responsiveness, lowering cost, and improving the whole supply chain efficiency. This AI-driven supply, digital supply chain integration and predictive analytics capability is added as an independent variable to this equation, while PAC is treated as a mediating variable. The objective of this study is to show the contribution of digital transformation to enhance the textiles supply chain performance. The modern textile industry is determined by fast changing technology, fluctuating international markets and growing competitiveness to challenge the traditional approaches of the supply chain management (Culot et al., 2024). Seasonality, frequent product changes and consumer instability in terms of preferences create uncertainty for a textiled sourcing, production and distribution system that differs from conventional manufacturing industries (D. Ivanov, 2022a). Due to these factors, the textile industry is especially susceptible to inefficiencies brought on by a week of coordination mechanism delayed decision-making process, and a restricted capacity for analysis (Dubey et al., 2020). One of the structural constraints that make it difficult for the supply chain system to operate is the distribution of suppliers, the lack of information system, and the reliance on managerial judgment based on intuition (Fernando & Ikhsan, 2023). Although the textile industry has strategic importance for earning foreign exchange and job creation, it is still suffering from challenges of inventory instability and production constraints that are limiting the competitiveness

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of Pakistan's textile industry in the global market (Ali et al., 2025). These challenges illustrate the growing need for the development of decision support mechanisms that will help in effective and timely decisions in supply chain (Kache & Seuring, 2017). One of the key strategic responses to complex supply chain is to be organized by moderation, which enables businesses to incorporate the most advanced technologies to enhance information sharing and coordination and operational responsiveness (Büyüközkan & Göçer, 2018). AI-powered instant supply chain systems allow companies to process vast amounts of data, uncover patterns, and automate some of the simpler aspects of planning in a more timely and reliable way than traditional systems (Culot et al., 2024). AI applications in Supply Chain have been proven to drive inventory accuracy, supplier evaluation, and demand sensing, and reduce operating risk and uncertainty (D. Ivanov, 2022). Digital supply chain integration, which is highly familiar as a method to link internal operations and external partners with common digital technology, is currently used together with the implementation of AI (Liu et al., 2022). Through process integration, the information clarity increases and operational activities are synchronized along the supply chain network by enabling the exchange of information in real-time between manufacturers, suppliers and consumers (Büyüközkan & Göçer, 2018). Based on empirical studies, it is found that a poorly coordinated supply chain is less able to respond to market changes and less effective in coordinating its actions compared to an integrated supply chain (Queiroz et al., 2021). Forecasting skills are another key element of organizational change that helps businesses predict the need for resources, plan for the future, and identify potential issues (Wang et al., 2018). In a market where fashion is a driving force, predictive analytics plays a crucial role in anticipating supply issues, seasonal fluctuations, and demand spikes, making it valuable for proactive planning in the textile industry (Adedoyin Tolulope Oyewole et al., 2024). The manufacturing sector has shown that the use of predictive analytics leads to greater forecast accuracy and planning consistency, contributing to greater supply and demand alignment (Alter & Samba, 2019; Fossa Samba & Alter, 2019). In spite of these breakthroughs, recent research indicates that better supply chain results do not necessarily result from predictive insight (i.e., not everything on supply chain value is gained from predictive insight) (Fossa Samba & Alter, 2019). However, some companies still suffer sub-optimal results, even when they have accurate forecasts, because of other factors, such as cognitive biases, slow responses and inadequate decision support systems (Dubey et al., 2020). The gap between the action managers take and the knowledge they have provides a significant limitation of relying merely on predictive analytics (Dalen & Ram, 2018). Prescriptive analytics capability is used to tackle this constraint by explicitly concentrating on optimum decision-making over predictions (Kemble et al., 2020). Prescriptive analytics includes the output of predictive analytics as well as advanced decision-support systems, optimization algorithms, and simulation models to suggest the best possible operational approach in the context of different operational constraints (M. S. Naidu & Chaudhari, 2024). Prescriptive analytics can simultaneously evaluate various scenarios and trade-offs to guide managers in making decisions that deliver the best cost, service, flexibility, and resilience outcomes (Nisha

Pawar 2024). From the perspective of analytics maturity, prescriptive analytics are the culmination of descriptive and forecasting analytics. (Dalen & Ram, 2018) However, several organizations are performing in the middle stage of prediction and hampered in achieving results from their investments in digital (M. S. Naidu & Chaudhari, 2024). This emptiness is even starker in developing nations, where firms often do not have the expertise or resources to make decisions based on optimization (Dubey et al., 2020). Although AI and predictive technologies have shown a positive impact on the performance of Pakistan textile industry, however, the capability of prescriptive analytics is still underdeveloped in this industry (Ali et al. 2025). Although digital platforms and forecasting tools are gaining widespread adoption in the business world, decisions are still largely made traditionally, and responding to disruptions in the supply chain increases the difficulty (Shahid et al., 2025). This means that the potential digital transformation offers is not fully exploited, and as a result inefficiencies and low competitiveness (Kache & Seuring, 2017) persist. The dynamic capabilities theory provides a solid theoretical input to explain this phenomenon and puts a premium on businesses building higher-order capabilities, its ability to convert technological resources into long-term performance benefits (Teece, 2007). According to this strategy, AI systems, online integration, and predictive analytics are all forms of increased environmental awareness sensing systems (D. Ivanov, 2022a). On the other hand, prescriptive analytics capability is a grasping capability that allows companies to act based on the discoveries by redeploying resources optimally to make optimal decisions (Dalen & Ram, 2018). Focusing on the resource-based view of technology, the notion of competitive advantage—only created if technology can be used through complementary organizational assets (Barney, 1991)—also holds true here. Prescriptive analytics capabilities operationalize the digital and analytical resources, by incorporating them into organized decision-making processes, thus also promoting improved supply chain performance (Fossa Samba & Alter, 2019). This view helps to understand the differences in performance of firms with the same technological investment (Kemble et al., 2023). On this theoretical basis, the present study places the capability of prescriptive analytics as an important mediating variable between AI-based supply, digital supply chain integration, and predictive analytics and textile supply chain performance. The study's scope also aligns with the textile industry in Pakistan, as the body of literature on supply chain analytics primarily has been focused on developed economies (Fernando & Ikhsan, 2023). The study contributes to the theory development through empirical evidence for the role of decision-oriented analytics in how technological capabilities contribute to tangible improvements in performance (Fossa Samba & Alter, 2019). In general, the research contributes to the knowledge base on how to take a step from forecasting to optimization-driven decision-making processes to optimize supply chains in emerging economies in the face of a highly volatile global environment (D. Ivanov, 2022a). In the current challenging and fast-paced business world, he or she continually seeks new and creative technologies to boost operational efficiency and give a competitive edge. Supply chain management (SCM) is an important function in maintaining the flow of materials, information, and products from supplier to end customer. With growing globalization, market uncertainty, evolving customer expectations, and operational complexities have come a host of difficulties to supply chain managers. This has led to the increased uptake of AI technologies by organizations to optimize their supply chain performance and making accurate decisions (Mohsen, 2023). Artificial Intelligence is the capability of computer systems to conduct functions which are normally performed by human intelligence such as learning, reasoning, problem solving, prediction and decision making. (Huang & Rust, 2018)Recent advancements in machine learning, deep learning, big data analytics, cloud computing, and the Internet of Things (IoT) have accelerated the adoption of AI across various business functions, particularly supply chain management (Pournader et al., 2021) AI technologies enable organizations to process vast amounts of data, identify patterns, generate insights, and automate complex operational activities that were previously dependent on human intervention (Toorajipour et al., 2021)..AI's integration in Supply Chain Management has revolutionized the way supply chain functions are performed, making it a smart and data-driven system. AI-powered instruments help organizations with demand forecasting, stock optimization, logistics planning, automation in the warehouse, supplier management, transportation planning, and risk management (Mohsen, 2023). These features enable companies to adapt more quickly to market changes, cut down on expenses, lower waste, and please their clients better. AI can help enhance the responsiveness, flexibility, and efficiency of supply chains, as well as agile and lean supply chain practices, according to (Mohsen, 2023). AI's impact on supply chain management goes beyond automation and forecasting provides one of the major contributions of AI.AI's impact on supply chain management is not limited to automation and forecasting is one of the significant contributions. Common forecasting techniques are not well suited for analyzing a lot of data and swiftly shifting market scenarios. Historical sales data, customer behavior, seasonal trends, and external environmental factors provide valuable information for AI systems to analyze and make more precise demand predictions (Wang et al., 2018). Having more accurate forecasts allows companies to adjust their inventory more precisely, to avoid overshooting or undershooting orders, and to avoid the cost of excess inventory, thus improving the performance of their supply chain (Ben-Daya et al., 2019). AI improves logistics and transportation management by optimizing delivery routes, utilising vehicles better and cut down transportation expenses. With the help of intelligent algorithms, logistics activities can be monitored in real time and the necessary corrective measures can be recommended in case of disruption (Abedinnia et al., 2017).These features can help you to deliver faster, provide better service, and boost the efficiency of your operations. In addition, AI-driven warehouse automation systems can enhance the efficiency of order fulfillment processes, minimize human error, and enable optimal inventory management (Mohsen, 2023). AI's role in supply chain resiliency has grown more pronounced. The COVID-19 pandemic and other events throughout the world revealed that conventional supply chain systems are not necessarily prepared to manage uncertainty and risk, and that intelligent technologies are needed to do so. By using AI, organizations can detect threats, forecast future problems, and create plans to prevent them from happening again (Zamani et al., 2023). Zouari et al., 2021, show that the digitalized supply chain based on the AI technologies exhibits more resilience, adaptability, and sustainability from uncertainties. Apart from the operational benefits, AI can facilitate the digitalization of your supply chain by integrating modern technologies like blockchain, IoT, cloud computing, and big data. Intelligent supply chains offer improved visibility, transparency, and collaboration within supply chain networks at various levels while enabling real-time decision making (Xie et al., 2020a). These technologies help partners in the supply chain communicate with each other, and enhance communication between suppliers, manufacturers, distributors, and retailers, this means that an organization can be more efficient and meet a higher level of customer satisfaction. Although AI has numerous benefits for supply chain management, there are some challenges to be faced. Many technology adoption challenges such as technology investments, data quality, integration with systems, skills of the employees, and ethical issues of data privacy and security have been associated with organizations (Mohsen, 2023). Despite this, the advantages that come with AI adoption are still on the rise, prompting organizations to invest in intelligent supply chain solutions. As AI becomes more integral to conducting business in today's world, the impact of AI on the performance of the supply chain is an area of both academic and real-world interest. Hence, the objective of this study is to investigate the impact of AI tools on Supply Chain performance and to identify the contributions of AI technologies in operational efficiency, forecasting ability, inventory control, supply chain logistics, resilience, and overall competitiveness of an organization. Pakistan's textile supply chain is experiencing issues related to incomplete information due to lack of data based decision-making and coordination problems, and the competitiveness of the textile industry has taken a hit. While AI and Predictive Analytics and Digital integration are being embraced by Al though firm, they typically don't get it to meaningfully improve performance without turning insight into optimum decisions. Hence, the study aimed to examine the Mediating role of Prescriptive Analytics Capability in Effective Supply Chain decisions in the view of Technological input. Hence, the study aims to examine the role of the PAC between the AI-driven, digital supply chain integration and predictive analytics with textile supply chain performance of Pakistan. Predicative analytics has been proven to require forecasting, inventory planning and operational efficiencies, and yet such benefits are not fully harnessed and not optimized for decision making processes, leading to continued inefficiencies due to forecasting error and sub-optimal resource elongation (Ali et al., 2025); (Oyewole et al., 2024). Despite the adoption of technology, operational disruption, mismatch between supply and demand in the textile sector and fluctuations in inventories are common in Pakistan, where this sector is a major source of export. This implies a lack of sophisticated decision-making skills in companies hinders the value that can be achieved from AI and predictive tools, or they could complement and support sophisticated approaches to decision-making.This means that if companies do not have advanced decision making skills, the value of AI and predictive tools is not fully realised or that they can supplement and support advanced decision making capabilities. A lot of predictive

System generated insight but lacking the ability to transform that insight into actionable strategies that drive the real-time supply chain decision making. Research from the analytics landscape around the globe shows that gains from digital supply chains are best found when an organization builds a continuum of analytical maturity that moves from descriptive and predictive analytics toward prescriptive analytics which recommend choices of action instead of predictions (M. S. Naidu & Chaudhari, 2024). The need of the hour, however, is found in the literature that most of the conceptual and empirical studies are highly focused on applications of predictive and descriptive analytics while existing literature has limited research and coverage on capabilities of prescriptive analytics which involve developing a predictive model along with an optimization framework to provide a recommendation for the decision alternative is either absent or not studied specially in the emerging markets and specially the textile sector of Pakistan. Predictive Analytics helps in the enhancement of forecasts accuracy, but without PAC, it does not guarantee that supply chain decision invariably translates to better performance out comes (Nisha Pawar, 2024). Additionally, studies in Pakistan reveal that AI and predictive analytics have contributed positively to supply chain performance overall – for instance, by improving responsiveness and visibility – but that they haven't investigated the relationship between these technologies and improved decision quality and performance outcomes when mediated by other higher-order analytical capabilities. For example, research on the usage of AI in Karachi and larger contexts in the supply chain speaks to efficiency gains but fails to examine how decision supports-competence translates into operational performance gains Shahid, A., et al. (2024). A recent study in the industry has validated that the textile supply in Pakistan is still facing problems related to operational inefficiency caused by lack of analytical decision making. The Pakistan textile bureau of statics 2024 reveals that approximately 58% of textile companies use manual or semi digital planning system, leading to regular forecasting inaccuracies and delays in production. The same report by Mckinsey (2023) finds that the firm with no experience in prescriptive analytics has 25-40% volatility in the firm and takes 30% longer to respond to supply disruption. Research on the Pakistan manufacturing sector also point to the lack of using digital prescriptive, that is, an organisational that has a lack of advance decision support mechanisms to turn insights into optimal action (Adedoyin Tolulope Oyewole et al., 2024; Ali et al., 2025). The scope of the study was limited only to select medium and large textile companies of Pakistan especially those who participate in Supply chain planning, procurement, and production operation of the companies. The research is limited to the adoption of AI Tools for supply chain, DSi (Digital supply chain integration), PMP (Predicative Analytics and Prescriptive Analytics) on the supply chain performance and does not include small companies, non-manufacturing companies or companies located outside Pakistan. The boundary assures the context for the country's industrial environment, in countries where the digital maturity level is low (Büyüközkan & Göçer, 2018; Dubey et al., 2020). The textile industries' lack of progress in building capacity for prescriptive analytics is likely to exacerbate existing shortcomings. Without advance decision support with continue facing high forecasting error, stock out, overstocking and production bottlenecks. In the end, decreasing the reliability and comprehensiveness of exports study reveals that organization that does not have prescriptive analytics have 35% higher operational costs and vastly decreased responsiveness in turbulent markets (M. S. Naidu & Chaudhari, 2024). Decision optimization capability is missing in the textile Sector which is already prone to uncertainties from the global market which could result in persistent supply disruption, customer satisfaction drop and long-term loss of market share (Kache & Seuring, 2017). Due to geographical uncertainty demand fluctuation and constant disruption in operation, Global supply chains are at a time of extreme volatility (D. Ivanov, 2024). Manufacturing industries are constantly required to increase their responsiveness and decrease their operations costs (Culot et al., 2024). The short product life cycles and uncertainty of demand are especially problems in the textile and apparel industry (Yang et al., 2024). These challenges are greater in the lower level of the economies of the emerging economies, where structural and technological restrictions remain (M. S. Naidu & Chaudhari, 2024). The importance of Pakistan textile industry for exports and jobs is explored by the critical role being played by the players in the textile industry (J. Ali et al., n.d.). The industry remained very much affected by Chronic supply chains inefficiencies (Shahid et al.,2024) despite their importance. Typical problems include incorrect forecasts, overproduction, inventory issues, delivery delay etc. The inefficiency directives reduce the competitiveness of the buyer (Islam et al., 2026). The developments of artificial intelligence in recent years have intensified increasingly towards better support of supply chain decision making (Fossa Samba et al., 2024). The AI drive and supply system makes processing massive quantities of data significantly faster and provides retail time professional visibility (Jackson et al., 2024). Predictive analytics has emerged as a vital part of supply chain management in today's world (Adedoyin Tolulope Oyewole et al., 2024). These analytics tools enable companies to anticipate the demand and potential disruption, and risk in advance (Yang et al., 2024). The focus of predictive models is on predicting outcomes based on historical and real time data (Cegielski et al., 2012). Effective operational decisions (D. Ivanov, 2025) cannot be provided by merely predicting. In fact, recent research found that many businesses faced challenges in turning predictive insights into actionable business decisions (Kosasih et al., 2024). A lack of analytical insights can hinder management's ability to rally an institution even when they are present (Rai et al., 2025). This gap resulted in delayed responses in efficient resource allocation and in consistent performance outcome (Dubey et al., 2024). Consequently, digital investment often did not achieve the desired outcomes in terms of productivity (Bag & Kumar Mangla, 2025). This constraint emphasizes the need for supply chain management (SCM) to be equipped with prescriptive analytics capability (Lohmöller et al., 2024). Prescriptive analytics is not just about predicting the best possible outcome; it's about suggesting a specific course of action (D. Ivanov, 2024). It is a combination of optimization algorithms, simulations and decision support system to inform management decisions (Osei et al., 2025). These are role-playing abilities that sports season make under multiple constraints—including course service level and risk (Yang et al., 2024). In many

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industries, prescriptive analytic capability is not strong enough in spite of the industrial importance of the technology (Patrucco et al., 2025a). Most of the organizations remain constantly treated at descriptive or predictive levels of analytics maturity (Culot et al., 2024). This majority difference is especially noticeable in the labour-intensive industries like textiles (Rashid et al., n.d.). Limited analytical expertise and big decision support system further proved to be barriers in Pakistan for the adoption of analytics (Rashid et al., 2025.). There was a strong focus on the track of AI and analytics on performers in existing supply chain literature (Dubey et al., 2024). Very few studies looked into the mechanisms going on inside the analytics to create value. Prescriptive Analytics capability as a mediator has not been studied empirically. This gap undermined the ability to create value through theoretical understanding of analytics driven value creation, Dynamics capabilities (Petropoulos et al., 2026). According to the tourists, it feels enough to be mere sensory, to perform in the sustained manner (Teece, 2025). AI powered supply system and predictive analytics – mail, improved sensing capabilities (D. Ivanov & Dolgui, 2025). If the capability of seizing these understanding parts is absent from the forum, there won't be an effective reconfiguration of the resources (I. Ali et al., 2024). From a resource-based press perspective technology must be complemented by organizational capabilities to create value (Colin, 2024). Powerful AI tools and online platforms are still untapped resources (Fossa Samba et al., 2024). These are exploited in prescriptive analytics, which transform the resources into structure decision optimization (Israel et al., 2025). This capability converts analytical insight into consistent performance improvements. This kind of performance can prove detrimental in the future to the competitiveness in global textile markets. Given the need for AI to enable and provide digital flight integration in the textile supply chain and the lack of a robust prescriptive analytics capability, the main problem studied in this research is the inconsistency of applying AI in the textile supply chain and the lack of robust prescriptive analytics capability. This missing link is essential to help develop the theory for supply chain analytics. It is also of paramount importance for the uptake of management decision-making in emerging economies (Patrucco et al., 2025b). This challenge can be tackled and give the textile sector in Pakistan greater strength and competitiveness. While the existing research highlights the integration of AI, predictive analytics and the digital supply chain as drivers of improved operational performance, most of the literature is limited to developed economies and overlooks emerging market economies such as Pakistan (Dubey et al., 2020; Fernando & Ikhsan, 2023) . Furthermore, predictive and prescriptive technologies have been more widely used. The effect of these technologies on tangible performance of the trade in supply chain in terms of decision-making ability is limited to empirical evidence (Fossa Samba & Alter, 2019; Kemble et al., 2020). Specialize PAC covert technological know-how to become optimized decision, stay unexploded in textile sector of Pakistan. This is a gap to be addressed, because it is crucial to comprehend the potential of effectively using digital transformation to improve supply chain efficiency, resilience and competitiveness. Prescriptive analytics capabilities (PAC) have not been much studied in south Asian manufacturing (Quezado et al., 2022) this

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gap presents a need to research the role of PAC in bridging technological capabilities and actual supply chain performance improvements. Lacking robust PAC and Advanced decision Capabilities, AI and predictive analytics tools can only have minimal improvements on supply chain performance, resulting in ongoing forecasting errors, inventory imbalances, supply disruptions and competitiveness issues (Cai et al., 2021; Kache & Seuring, 2017). This makes it crucial to explore prescriptive analytics as a bridge between the technology and change in performance. Particularly in the dynamic's competitive environment of Pakistan textile (Kemble et al., 2023).The global supply chains are moving into an era of extreme fluctuation and uncertainty in the demand, and frequent disruptions in the operations. Manufacturing industries are continually challenged to be fast and responsive, and at the same time keep their operation costs down. The textile and apparel industry is especially sensitive to a short product life cycle and uncertainty in the demand. In these problems, the structural and technological constraints remain and are more severe in the emerging economies. The importance of the textile industry in terms of export revenue and job creation cannot be overlooked in Pakistan. The industry was still plagued by chronic supply chains inefficiencies, notwithstanding its economic significance. These are typical problems such as incorrect demand forecasting, having more stock than needed, etc. These inefficiency directives weaken international competitiveness the buyer trust. In recent years, in particular, there have been more and more investments in Artificial Intelligence for better supply chain decision making. AI-driven supply system enable the execution of big data sets quickly and offer retail time professional visibility. Digital supply chain integration also enables better coordination between suppliers' manufacturer and distributors, for example by providing timely information and synchronized planning throughout the supply chain, while predictive analytics is a major part of any efficient supply chain management, as these tools can anticipate the need for additional product, predict disruption and help to identify potential risks early. The major emphasis of predictive models deals with projecting future results from available data from history and real time. The fact is that prediction does not necessarily lead to good Operational decisions. A number of recent studies showed that many companies found it difficult to turn predictive insight into actionable decisions, and managers often galvanize an institution and feel those results even when analytical insights are present. This fall behind led to poor response in efficient resource allocation and consistent performance outcome. Digital investment, therefore, often failed to meet the expected performance gains. The restriction is a reminder of the need for prescriptive analytics capability in supply chain management; it combines optimization algorithms with simulations and decision support system to inform managerial decisions. Under several constraints, including course service level and risk, such capabilities sports season are able to create. Despite its strategic relevance prescriptive analytic capability remains underdeveloped in many industries. most of the organizations remain constant treated at descriptive or predictive levels of analytics maturity. This large gap in majority is especially noticeable in the labour intensive industry like textiles. Limited analytical expertise and big decision support system further restricted the spread of analytics in Pak. The current literature on the

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supply chain was mostly restricted to monitoring the visibility of AI and analytics with the performers. Only a handful of studies looked at the y-what-ifs of analytics, or the ways in which they create value within the organization. Overall, the mediating role of prescriptive analytics capability is still an under-researched dimension. Dynamics capabilities. A driver supply system and predictive analytics mail are supplements to enhanced sensing capabilities that suggest that we are just able to sense. Without this ability, seizing capability, that is, the ability to make decisions based on analytics, forum didn't reconfigure resources effectively. Technology, of course, must be supported with the organizational capabilities from the resource-based press stand point in terms of value creation. AI tools and digital platforms are excellent resources that are not being fully leveraged. Prescriptive analytics put these resources into practice by optimizing structures decisions. This ability is what differentiates the analytical insight into actionable performance improvements.

Objectives

To examine the impact of Artificial Intelligence on textile supply chain optimization and operational performance.

To analyze the mediating role of prescriptive analytics capabilities in enhancing decision-making and supply chain efficiency in the textile industry.

Hypothesis

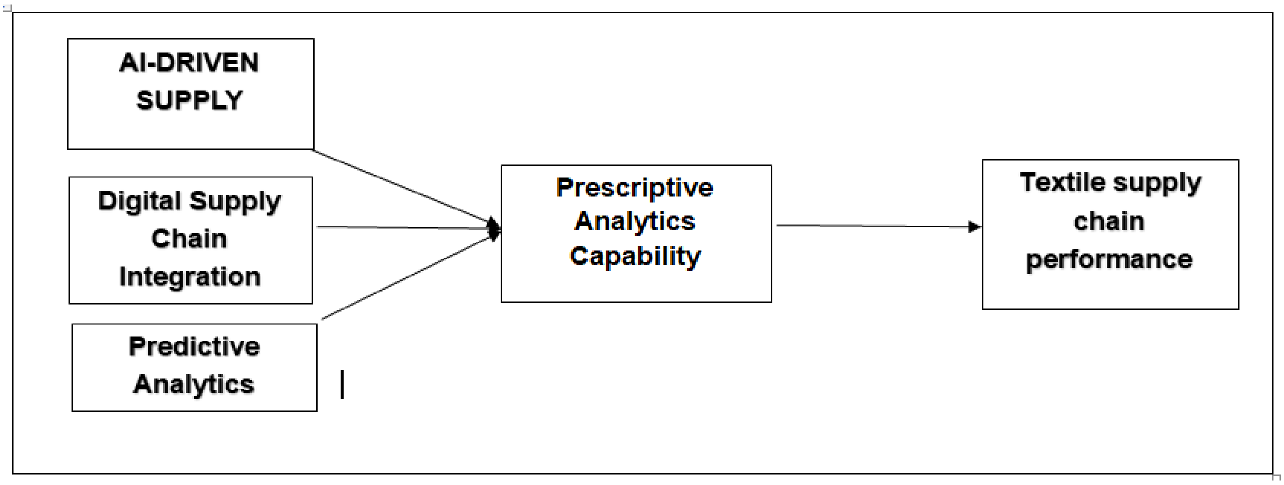
H1: AI-driven supply has a positive effect on Prescriptive Analytics Capability (PAC).

H2: Digital supply Chain integration positive impact on Prescriptive Analytics Capability (PAC).

H3: predictive analytics positive impact of Prescriptive Analytics Capability (PAC).

H4: Prescriptive Analytics Capability positive impact on supply chain performance

H5: Prescriptive Analytics Capability mediates the relationship between Technological capabilities and textile supply chain performance.



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Literature review

The global textile industry is faced with highly complex and volatile supply chain situations where there is uncertainty in demand, short product life cycles, high level of international competition, and frequent supply disruptions. These constraints are further exacerbated in developing countries like Pakistan where the level of digital adoption is low, the supply chain is fragmented, and the decision making process is driven by data. Therefore, the textile supply chain efficiency has emerged as a priority strategic focus point in the kingdom of firms that look for operational effectiveness, adaptability and exporting competitiveness. Organizations nowadays are using digital technologies, especially Artificial Intelligence, digital supply chain integration and digital analytics, which has changed the way organizations are doing SC activities. AI driven supply chain can handle vast amounts of structured data in real-time, finely tuning supply chain forecasting, procurement, inventory management and the supply chain partners to optimize the process and enhance the accuracy of their predictions (Culot et al., 2024). Likewise, the integration facilities at the supply chain are integrated seamlessly between the internal functions and the external partner, improving the visibility, responsiveness and collaboration between the two (Büyüközkan & Göcer, 2018; Liu et al., 2022). Predictive Analytics capabilities are used to anticipate future demand patterns, disruption and resource requirement but evidence of predictive analytics failures have emerged as inventory imbalances, delays to the disruption and forecasting errors (Adedoyin Tolulope Oyewole et al., 2024; Ali, J. et al., n.d.). This restriction has led scholars to pay attention to the prescriptive analytics capability in the field of recommendation that reach optimal action using optimization, simulation and decision support system. Although it has great significance, there is limited research on prescriptive analytics in supply chain, especially in emerging economies and labor intensive sectors like textiles. Current research largely focuses on disruption and predictive analytics and neglects the process of turning analytical insight into actionable decisions that show improvements in performance (Fossa Samba & Alter, 2019; Nisha Pawar, 2024). The present study explains the role of prescriptive analytics capabilities as an important intervening variable between AI-empowered supply chain, digital supply chain integration, and textile performance in Pakistan, bridging the Gap. Artificial Intelligence is revolutionizing the entire supply chain by automation, real-time processing and intelligent decision making. AI-drive technology uses machine learning sensors and optimization algorithms to boost forecasting, procurement, inventory accuracy, and supplier's coordination (Culot et al., 2024). AI can improve visibility, limit uncertainty and enable organizations to quickly respond to disruptions, a study found. AI can further enhance the strength of supply planning and boost the efficiency of operations in the manufacturing and textile industries by analyzing raw data to provide valuable insights. Hence, AI regards the main technological capabilities as the key factor in decision making within analytics related to supply chain. Digital supply chain integration involves the digital linkage among suppliers, producers and customers through various technologies like the Internet of Things and the ERP, cloud system and RFID platforms (Büyüközkan & Göçer, 2018). DSCI improves the

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collaborative working process within the organization and between the organization and its customers. Prior Research Show that Digital Integration helps agility, responsiveness and transparency in processes, indispensable for modern industries such as textile. Predictive analytics features provide forecasting of demand, lead time breakdowns, customer behavior and supply risks based on historical data, statistical models, and machine learning. Research underscores the importance of predictive analytics to help companies anticipate risks and make proactive decisions about initiatives (Wang et al., 2018) Given the volatility of demand, the requirement for changing design and the brief life cycle of products in the textile industry, the predictive analytics becomes more relevant. In the manufacturing sector, such as textile of Pakistan, studies have demonstrated that predictive analytics have a beneficial impact on efficiency performance and accuracy (Ali et al, 2025). Prescriptive Analytics Capabilities are more than prediction and suggest optimal actions. Advising the optimum solution under a specific set of circumstances. It leverages AI optimization simulation and mathematical modeling to inform managers about their decisions. While predictive analytics predicts what will occur in the future, prescriptive analytics is what managers should be doing (Nisha Pawar, 2024). Recent studies reveal prescriptive analytics is a significant mediator, as it translates into operational decisions that boost the responsiveness, cost-efficiency and customer services of the supply chain.

Research Indicate that technologically advanced analytics and digital system real time adjustment in procurement production and planning, distribution leading to superior supply chain performance.(Nisha Pawar, 2024). The Prescriptive Analytics Capabilities are described as an organization's ability to make optimal decisions using data, models, and logic of the analytics. These capabilities are not merely about the prediction but proactive and action oriented as per organizational goals (Mikalef & Gupta, 2021). Prescriptive analytics is seen as the most advanced type of analytics sophistication in the majority models of business analytics as mentioned in recent literature (Wissuchek & Zschech, 2025). Prescriptive analytics capabilities enable companies to compare various options for decision-making. Prescriptive analytics capabilities enable companies to compare options for decision-making (Abdulla & Baryannis, 2024).

AI is defined as the capacity of computer systems to simulate human intelligence and complete tasks.AI describes the ability of computers to perform tasks by imitating human intelligence, including learning, reasoning, prediction and problem-solving (Huang & Rust, 2018). As supply chain becomes more complex in the global market, the presence of big data has enabled the spread of AI technologies in different business functions, especially SCM (Mohsen, 2023). Organizations can leverage AI technologies for analyzing massive amounts of data and extracting valuable insights that can guide strategic and operational decisions (Mohsen, 2023). These technologies can aid businesses in forecasting customer demand, streamlining supply chain operations, managing stock levels, and pinpointing inefficiencies in the supply chain. This can help reduce operational expenses, enhance service quality, shorten lead times, and agility in adapting to market shifts (Mohsen, 2023). Progress in machine learning, deep learning, and cloud computing and big data analytics has played a significant role in the advancement of AI in the supply chain industry. (Li et al., 2021) shared the thought that data and power of computation are the core factors that have contributed to the birth of modern AI. These developments have enabled the analysis of huge amounts of structured and unstructured data, resulting in more accurate estimates and better supply chain planning. Similarly, (Hartmann & Moeller, 2014) stated that companies are now investing in AI to gain end to end visibility and improve their business processes. The biggest use case of AI in supply chain: Demand Forecasting. Forecasting enables the organization to prepare the output, input and distribution plans as per the market. Wang et al. (2022) reported that the forecasting system with AI achieved much better forecasting accuracy than the traditional statistical forecasting system with a smaller mean forecasting error. Better prediction can help to manage inventories, and take the edge off of stock-outs and overstocking. Another key aspect is inventory optimization, which AI can enhance. Properly managing stock can be challenging in fast-changing market situations. Predictive analytics: AI algorithms take into account the fluctuations in demand and will automatically adjust inventory levels (Li et al., 2021). Mohsen (2023) states that the companies can utilize AI to reduce the costs of holding inventory while retaining stock availability. This function brings better efficiency to working capital utilization, and allows customers to obtain the product they need at the time they need it.

AI has also been a game-changer for supply chain organizations.AI has proved its worth in the logistics and transportation management space, too. AI models can be leveraged to optimize routes, schedules, and resource allocation within the transportation sector. Further cited by (Hartmann & Moeller, 2014), AI systems in logistics could foresee a disruption and suggest alternative transportation methods instantly and in real-time, therefore contributing to an overall better performance in logistics. Transportation efficiency directly contributes to the competitiveness of the supply chain and to improved quality of customer service. In the realm of warehouses, AI technologies like automation and intelligent decision-making systems have also revolutionized the way warehouses are managed. Automated warehouses use artificial intelligence (AI) robots and machine learning algorithms to improve order picking, storage and allocation, and inventory management (Ben-Daya et al., 2019). These technologies can boost efficiency of the operations by decreasing manual labour and reducing human error. According to Mohsen (2023), the use of AI in warehouse management systems (WMS) increases productivity, speeds up order fulfillment, and decreases operational expenses. Thus, it can enhance enterprise efficiencies in their warehouses, and customer satisfaction with the businesses. It has also been a focus of research in recent years with the appearance of the global crisis COVID-19 which generated a series of disruptions that impacted these supply chains, creating a new space in the research field of supply chain resilience. AI can play a vital role in improving the supply chain's resilience by foreseeing, identifying, and managing disruptions more effectively (Zamani et al., 2023).Predictive analytics and real-time data can be used by AI systems to anticipate and predict potential disruptions in the supply chain, such as changes in demand or issues with suppliers or transportation, before they negatively impact company operations. Zouari et al., (2021) noted that the technologies of AI-driven supply chain are more resilient and adaptive when digitized, in case of business volatile environments. Risk management is closely related to Supply chain resilience. With the help of artificial intelligence-based systems, both internal and external data can be examined, risks identified, and recommendations provided for risk mitigation. According to Mohsen (2023), AI plays a part in strengthening an organization's ability to buffer the supply chain against disaster and geopolitical risk, market volatility, and operational disruptions. Business continuity and long term sustainability is closely linked to effective risk management. AI, together with other digital technologies, has made tremendous strides in the smart supply chain field.AI combined with the other digital technologies has ushered in a new phase of intelligent supply chain. To enhance the visibility, transparency and coordination of supply chain networks, intelligent supply chains rely on technologies like Big Data, the Internet of Things (IoT), cloud computing, blockchain and artificial intelligence (AI) (Mohsen, 2023). According to Xie et al. (2020b), the intelligent supply chain is the answer to the information asymmetry, and can help to make decisions in real-time. Better visibility enables businesses to track processes at all times and adapt quickly to fluctuating market demands. By delivering live data from connected devices, sensors, and equipment along the entire supply chain, the Internet of Things (IoT) complements AI, and Ben-Daya et al. (2019) noted that it helps boost supply chain monitoring and increase the accuracy of forecasting. This data can be combined with AI capabilities that can provide a business with insights to influence procurement, production, inventory and logistics processes. AI along with IoT is playing a significant role in Operational Efficiency and Supply Chain Agility. One of the other elements of the block chain is its ability to increase supply chain transparency and traceability, further bolstering AI-based supply chains. Another advantage of block chain technology is the capability to enhance the supply chain transparency and traceability, which further strengthens the AI supply chain. According to (Mohsen, 2023), Block chain ensures that reports on transactions in supply chains are irrevocable and secure across the network. This functionality can help keep regulatory compliance, fight fraud and foster trust between supply chain stakeholders. The decentralization and AI capabilities enhance the reliability of decision-making and governance in supply chains. AI can be useful in developing agile and lean supply chains, too. Efficient supply chains have the goal of reducing waste and maximizing efficiency, whereas agile supply chains are concerned with reacting to changes in customer demands and the processes required dealing with them. From operational visibility, process efficiencies, and quick response to market changes, (Rahimi & Alemtabriz, 2022)AI is able to assist with both approaches. As suggested in (Xie et al., 2020a), the “legality” is the combination of lean and agile attributes to the intelligent supply chain systems. AI helps organizations be league by optimizing for cut costs and flexibility. AI has also played a very significant role in Customer Relationship Management (CRM). AI-powered chatbots, virtual assistants, and recommendation engines are among the revolutionary technologies that improve customer interaction by providing personalized and real-time responses (Mohsen, 2023). These technologies increase customer satisfaction, build customer loyalty and increase the performance of the organizations. Moreover, AI can help organizations understand customer behavior and preferences, which can help them, create personalized products and services that better meet the needs of market demand. AI tools can also greatly enhance cooperation between supply chain partners. A supply chain has multiple stakeholders including suppliers, manufacturers, distributors, logistics providers and retailers. Better collaborating leads to better synchronization of the activities of a chain, which contributes to higher chain efficiency (Toorajipour et al., 2021). Numerous studies have emphasized the adoption of AI for supporting sustainable supply chain management. AI can be utilized to optimize resource usage, reduce waste, and improve environmental outcomes, as noted by (Chiappetta Jabbour et al., 2020). AI systems aid in making sustainable decisions by pinpointing energy-saving, waste reduction, and efficient resource allocation opportunities. These skills are consistent with the organization's increased focus on Environmental Sustainability and CSR. Though there are several benefits to using AI, there are some challenges in getting it implemented in the organizations. Mohsen (2023) found that some of the challenges include high implementation expenses, no standardization in implementation, data integration and data quality issues. Also, the ethical concerns regarding data privacy, cyber security, and algorithmic bias remain relevant in the decision-making process for adopting AI. Organizations need to invest in technological infrastructure, up skill their employees, and put in place effective governance in order to fully leverage the potential of AI and reduce the risk. The potential for AI to revolutionize SCM extends beyond the current applications, with future research showing that it can bring further benefits in the form of increased automation, predictive analytics, and intelligent decision-making. Pournader et al., (2021) state that AI's future will involve greater application with block chain, the Internet of Things (IoT), and enhanced analytics. In the future, AI will be a key driver for developing smarter, more resilient, sustainable, and custom focused supply chains as organizations keep on their digital transformation journeys. As a summary, the findings from the literature are strong, from which, it may be concluded that AI positively affects the performance of supply chain management. The opportunities for organizations to enhance the efficiency and competitiveness of their operations with AI are great, as AI models optimize forecasting, improve inventory management, streamline logistics, risk management, customer service and collaboration, and help drive sustainability initiatives. In today's context, AI is seen as becoming an important asset to help companies reach excellence over the long term in their supply chains (Mohsen, 2023). The theories of dynamic capabilities can be used to gain a better understanding of the way in which digital technologies, and analytical, can be adopted by organization to achieve outstanding supply chain performance. Dynamic capabilities (Teece, 2007), were the firm's ability to sense opportunity and threats in the changing environment, to seize opportunities through considered decision making and reconfigure resources accordingly. When facing highly dynamic supply chain relationships, supply breaks and market volatility, it is important to know how to

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manage the challenges of the diverse relationships between supply and demand in the textiles sector.

A sensing mechanism could be thought of as AI driven supply system, digital integration and analytics capabilities that let firms know when the supply environment changes. Unfortunately, these sensing mechanisms do not necessarily lead to performance improvements without advanced decision making skills. One of the higher order dynamics capabilities is prescriptive analytics, which allows companies to grasp opportunities by using analytical information to make optimal decisions in aspects of sourcing planning, inventory management and distribution (Dalen & Ram, 2018; M. S. Naidu & Chaudhari, 2024). From the perspective of prescriptive analytics capabilities serve as a reconfiguring mechanism that connects di errant digital insights with the operational actions, thus increasing the agility resilience and performance of the supply chain, as supported by empirical research (A. V. Ivanov & Popkov, 2022; Kache & Seuring, 2017). This study directly situates itself in the intersection between Dynamic Capabilities Theory (DCT) and Knowledge Based View (KBV) of the firm, start addressing architectural data infrastructure-to-Operational Preferable Superiority Transmutations (APS) systematically on highly volatile industrial contexts like Pakistan Textile Industry (PTI) specifically. The classic resource-based view argues that the source of competitive advantage is the valuable, scarcer, inimitable, and non-substitution (VRIN) assets, but today's supply chain exists in a context of high market volatility, unpredictable levels of demand, and macroeconomic shocks. Therefore, ownership of the Static technology assets is not enough. The resource-based perspectives that emphasize valuable, rare, inimitable and non-substitutable resources and capabilities that underlie the performance of firms (Barney, 1991). Digital technologies and capabilities in the fields of analytics in the context of supply chain management (SCM) represent strategic resources and may contribute to operational efficiency and competitive advantage, but RBV scholar Emphasize that these resources need to be leveraged with capabilities within the organization to achieve enduring performance benefits. AI system predicts analytics tools and integrated digital platforms are valuable tech resources. However, they will only be effective in the decision-making process if the firm can exploit them. This capability of utilizing prescriptive analytics is an orientation of using predictive models along with optimization and simulation to suggest actionable strategies (Nisha Pawar, 2024). So, PAC complements the RBV with a focus on how the digital and analytical artifacts become transformed into better supply chain results. Complementary to DCT is the Knowledge-Based View (KBV) which suggests that the knowledge is the most important strategic asset because it is structurally complex, socially embedded and very hard for competitors to replicate (Grant, 1996). This study operationally defines KBV by following the journey of the evolution of supply chain metrics between Data, Information, Knowledge, and Wisdom.

This analytics maturity framework divided the capacity of organizations to analytics into descriptive diagnostics and predictive and prescriptive level. Descriptive and predictive analytics are concerned with analyzing and understanding past events and predicting what is likely to happen in the future, while prescriptive analytics are more concerned with the optimization of decisions that are to be taken, considering certain constraints (Dalen & Ram, 2018). A study found that many organizations are stuck at the "predictive" stage and are not yet moving towards "prescriptive analytic maturity" (M. S. Naidu & Chaudhari, 2024). This gap is especially acute for firms in emerging economies, where the availability of advanced systems of decision-making support, as well as analytical skills, is frequently limited. This study contributes to the analytics maturity framework and empirically investigates the role of prescriptive analytics capability as a mediating variable, bridging the gap between these benefits of AL driven supply chains and digital integrations and the actual realization of benefits within textile companies operating within the Pakistani context.

AI-driven Supply Chain

AI is proving to be a game-changer in supply chain management, allowing businesses to automate, analyze vast data, and make informed decisions in supply chain operations. AI driven system supply chain leverage machine learning algorithms, natural language processing computer vision, and advanced optimization techniques to enhance forecasting accuracy, procurement efficiency, inventory management, and supplier coordination (Culot et al., 2024). In conventional supply chain, decision making is often based on historical data and managerial intuition. In contrast, AI-based systems can learn from real-time data from the various nodes in the supply chain to make proactive and adaptive decisions. AI applications have demonstrated their impact in improving demand sensing and forecasting, mitigating uncertainty, and providing greater visibility through the use of data from internal systems and external stakeholders, as reported by Culot et al (2024) and A. V. Ivanov & Popkov (2022). In the textile industry these are important features where demands are fluctuating, fashion is changing and souring worldwide is complicated, and needs prompt responses. According to empirical evidence, AI-based supply chains have significantly better OP performance with various types of outcomes, such as shorter lead times, better forecast accuracy, lower inventory expenses and better response to disruption (Kache & Seuring, 2017). Specifically, in the manufacturing context, AI can be used to support the planning system by dynamically adjusting the production schedule and procurement decisions based on changes in demand and supply conditions. This flexibility will help export-oriented textile companies to be agile and resilient in their supply chain, especially when they are dealing with volatile markets. There are several challenges in putting AI output into the operation decision-making process which limits the use of AI capabilities (Alter & Samba, 2019). This is particularly true if the economy is in its infancy, with companies not having the analytical knowledge or decision support systems and organizational capabilities to act on AI-driven insights. In Pakistan textile industry, the adoption of AI is still uneven with considerable focus on simple automation and forecasting, and limited on high-value decision optimization. According to Shahid et al (2025), AI supported practices have improved the visibility and efficiency of the supply chain, but their impact on performance is limited by weak decision-making-capacity.

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Predictive analytics capability

Predictive analytics capability refers to an organization ability to utilize historical and real time data, statistical techniques and machine learning algorithms to forecast future events, trending, and uncertainties within the supply chain. Predictive analytics is used widely in supply chain management for various applications like demand forecasting, inventory planning, and capacities utilization, identifying risk and anticipating disruption issues (Wang et al., 2018). With the increasing volume of big data and sophisticated analytical tools, companies have made great strides in making predictions. Using sales data, market signals, supplier data to performance data, and operation processes. Traditional forecasting methods are not predicative analytics when it comes to the organization predicting changes in the demand and supply situation. Previous studies have shown that predictive analytics enhances forecast accuracy, decreases uncertainty, aids in initiative-taking planning and coordination in manufacturing supply chains (Alter & Samba, 2019). Predictive analytics capability is especially important in the fabric industry as it is characterized by very high demands volatility, short product life cycles, seasonality effects, and frequent changes of designs. By forecasting accurately, textile companies can optimize their production dates, raw materials procurement and inventory to meet market requirements. According to empirical studies, adopting predictive analytics in textile and apparel supply chains can result in various benefits. These include increased optional efficiency, minimizing stock-outs, decreasing access inventory, and ensuring better responsiveness to market fluctuations (Ali et al., 2025). Despite all these benefits, there are a number of limitations to predictive analytics, as some scholars point out when it comes to using it in isolation. The main goal of predictive analytics is to predict the event more than to suggest appropriate action for managers based on the outcomes they are predicting. This can lead to firms having correct forecasts and still making sub optimal decisions at the end of the day because of cognitive bias at the individual or organisation level or because of the lack of structured decision supports mechanism (Adedoyin Tolulope Oyewole, et al., 2024). This restriction is most clearly visible in low-tech nations like Pakistan where businesses can implement predictive analytics technologies without having the corresponding analytical and decision-making skills. Studies in manufacturing and textile industries in Pakistan indicate that the benefits of predictive power are often not maximized or fully incorporated into business operations, resulting in current inefficiencies like inaccurate forecasts, stock imbalance, and production delays (Ali et al., 2025.; Shahid et al., 2025.). The results of these findings show that the predictive analytics capabilities are not sufficient to sustain the performance of the supply chain. Predictive analytics is therefore a step towards a more mature analytics level, which has to be extended by other analytical tools like optimization and simulations to create and suggest optimal decision in a certain scenario or constraint (Dalen & Ram, 2018). Thus, predictive analytics is essential, but not enough, to achieve great supply chain performance. The findings of this theoretical and empirical evidence support the current study's argument that predictive analytics capabilities improve prescriptive analytics capabilities. Predictive analytics provides the analytical underpinning for prescriptive decision support systems, through its ability to deliver accurate forecast and risk assessments. Therefore, the impact of predictive analytics capabilities on performance of the supply chain is expected to be indirect in nature as it relates to the impact on prescriptive analytics capabilities. The most advanced type of analytics maturity is prescriptive analytics capability (PAC), which is concerned with recommended optimal action, instead of only describing historic patterns, or predicting future events (Dalen & Ram, 2018; Kemble et al., 2020; M. S. Naidu & Chaudhari, 2024). The output of the predictive analytics is combined with optimization algorithms, simulations models and advanced decision support system to get actionable recommendations under various operational constraints using the help of PAC (Alter & Samba, 2019; Kemble et al., 2020). Prescriptive analytics is different from predictive analytics as it directly answers questions of decision makers to enable desired performance outcomes (Dalen & Ram, 2018; Nisha Pawar, 2024). Prescriptive Analytics capability in supply chain management (SCM) applies the knowledge and insight gained from predictive analytics to guide practitioners to make optimal decisions across the breadth of chain components, such as procurement, production planning, inventory deployment, and logistics routing and response to disruptions (Alter & Samba, 2019; Dalen & Ram, 2018). Prescriptive analytics uses mathematical programming and computational intelligence approaches to assess the service level, performance, flexibility, cost efficiency and mitigation trade-offs, that are associated with the decision (Dalen & Ram, 2018; M. S. Naidu & Chaudhari, 2024). To engage in prior research: highlight that PAC is a process for auctioning the analysis, and that it involves establishing a structured, repeatable process for making decisions (Alter & Samba, 2019; Nisha Pawar, 2024). However, recent studies underscore that predictive analytics offered by AI-powered supply Systems can be beneficial and offer valuable insights only when combined with prescriptive decision-making (Culot et al., 2024; Fossa Samba & Alter, 2019). Based on the empirical evidence, it has been found that companies with well-established PAC had higher supply chain responsiveness, lower operational cost, a reduced decision latency, and improved reliability compared to those that had only one predictive analytics (Kemble et al., 2020; M. S. Naidu & Chaudhari, 2024). The study highlights this finding to support the arguments the prescriptive analytics is required capability to enable analytical intelligence respond to operational excellence (Alter & Samba, 2019; Dalen & Ram, 2018). In the textile industry PAC is particularly critical due to high demand uncertainty, short product lifecycle and complex global sourcing networks (Dubey et al., 2020; Kache & Seuring, 2017). Optimization models are used to deal with multiple constraints of a textile company at a time, such as production capacity, availability of raw material, labour constraint, and delivery lead time, etc. (Alter & Samba, 2019; Gunasekaran et al., 2004). Further, simulation tools can be used by managers to consider various scenarios and different accesses disruptions before taking a decision (Alter & Samba, 2019; Nisha Pawar, 2024). Although prescriptive analytics capability is essential, it is yet to be developed in many organizations especially in emerging economies (Dubey et al., 2020; M. S. Naidu & Chaudhari, 2024). Research shows that companies generally face challenges in adopting PAC due to their lack of advanced decision supports infrastructure and their analytical skills and organizational readiness (Alter & Samba, 2019; Kache & Seuring, 2017). Adopting AI and predictive analytics often proved beneficial in the textile sector, but the benefits were constrained by the fact that information was not being used for data-backed decision-making, leaving management to rely more on intuition than data (Ali et al., 2025., Shahid et al., 2025). From the theoretical prescriptive perspective, PAC is a capability of higher order that helps companies to reconfigure resources and synchronize their supply chain decisions with their strategic goals in turbulent environments (D. Ivanov, 2022b; Teece, 2007). Therefore, in this study, prescriptive analytics capability is identified as an important intervening variable that correlates technological capabilities with enhanced textile supply chain performance (Fossa Samba & Alter, 2019; Nisha Pawar 2024). Textile supply chain performance is the extent to which the activities of the supply chain achieved the organization's objective in terms of cost, quality, delivery, reliability, flexibility and responsiveness (Gunasekaran et al., 2004), In the textile sector, the performance of a supply chain can be considered as a multidimensional construct as it comprises of the interdependence of procurement, production, logistics and market responsiveness (Dubey et al., 2020; Kache & Seuring, 2017). The product lifecycle, Volatile demand and seasonal fluctuations, along with high global completion pressure, impose a high level of performance pressure on the Textile Supply Chain (TSC) (Dubey et al., 2020; D. Ivanov, 2022b). False forecasting, coordination, inventory imbalances, and slow disruption responses can also seriously diminish export reliability and competitiveness, due to operational inefficiencies (Gunasekaran et al., 2004; Kache & Seuring, 2017). Therefore, in developing countries like Pakistan (Ali et al., 2025; Shahid et al., 2025), the focus on improving supply chain (SC) performance has gained significant attention as a strategic priority for textile companies. Digital technologies and analytics are strongly known as essential facilitators of excellent SC performance (Liu et al., 2022; Culot et al., 2024). AI-powered supply system boosts automation and visibility, and digital supply chain integration ensures better information sharing and coordination across partner (Büyüközkan & Göçer, 2018; K. P. Liu et al., 2022). Predictive analytics future supports initiative-taking planning by predicting changes in demand and risk of supply. Yet, real-world research has shown that if technology is adopted, it does not ensure that performance will improve. A lot of companies do not reap the returns they promised because they do not have good decision-making skills and limited analytical maturity. In the absence of prescriptive decisions support mechanism, digitals insights are not always fully utilised and inefficiencies remain. Apart from having up-to-date data and accurate forecasts in the textile supply chain, the ability to make optimal decisions on constraints is also essential (D. Ivanov, 2022b; M. S. Naidu & Chaudhari, 2024). Prescriptive analytics solutions are critical components that help managers make decisions that deliver the highest possible performance gains in the cost, service and flexibilities categories (Fossa Samba & Alter, 2019; Nisha Pawar, 2024). Empirical studies of DSCs and analytics have been mainly conducted in developed economies with less in emerging markets (Dubey et al., 2020; Kemble et al., 2020). The context of limited digital infrastructure, low digital skills and organization resistance, have been reported to have impact on the outcomes of technology adoption, based on the study conducted in developing countries (Fernando & Ikhsan, 2023; Quezado et al., 2022). In developing countries, like Pakistan, firms have recently started using AI, digital transformation and predictive analysis to improve transparency and efficiency in their supply chains (Ali et al., 2025; Shahid et al., 2025). Empirical evidence however shows mixed results on the actual performance with the responsiveness improvement being coupled with persistent problems of inefficiencies in the decisions made (Dubey et al., 2020; Fernando & Ikhsan, 2023). The lack of advanced analytical decision support capabilities are a key reason for these inefficiencies. In the context of the Pakistan textile industry, predictive analytics has been found to enhance the accuracy of customer predictions; however, the impact on the performance of the supply chain is found extremely limited (Ali et al., 2025; Shahid et al., 2025). Planning systems that are still used are manual or semi-digital, and many textile companies do not use analytical insight in their operations (Dubey et al., 2020; Shahid et al., 2025). The evidence indicates that predictive insights are not completely translated into optimized operational actions (Dalen & Ram, 2018; Nisha Pawar, 2024). The second example shows that companies without the ability to manage prescriptive analytics face higher costs of operations and slower disruption responses (in terms of time) (D. Ivanov, 2022b; M.S. Naidu & Chaudhari, 2024). Although this empirical study specifically focused on the PAC in the textile sector of Pakistan is limited, this is because the study of PAC in Pakistan textile industry is negligible.Even though this empirical study specifically focused on the PAC in the textile industry of Pakistan is limited, this is because the study of PAC in the textile industry in Pakistan is negligible. This Gap is identified with research data to explain the technological capabilities influencing performance via the decision-making mechanisms (Fossa Samba & Alter, 2019; Kemble et al., 2020). Prescriptive analytics capability is a mediating factor in improving job performance. Technical capabilities, as embodied in prescriptive analytics capability, have an intervening role in the relationship between technical capability and supply chain performance (Dalen & Ram, 2018; Fossa Samba & Alter, 2019). While AI powered supply chain systems, digital integration, and predictive analytics provide improved data accessibility and boost forecasting accuracy, they do not guarantee improved performance per se (Culot et al., 2024; Dubey et al., 2020) . They depend on the firm's capability of applying analytical insights to make optimized decisions, as stated by M. S. Naidu & Chaudhari (2024) and Nisha Pawar (2024). Prescriptive analytics capabilities are mechanisms of turning technological input into coordinated actions in the supply chain (Alter & Samba, 2019; Fossa Samba & Alter, 2019; D. Ivanov, 2022b). Incorporating predictive outputs with optimization and simulation models allows companies to optimize resource allocation and be initiative-taking against disruptions (D. Ivanov, 2022b; Kemble et al., 2023). This means that decisions will be data-driven and strategically aligned (Dalen & Ram, 2018; Nisha Pawar, 2024). Priors study confirms that analytics capabilities enhance performance only when embedded with organizational decision-making processes (Fossa Samba & Alter, 2019; Kemble et al., 2023). Textile industries in Pakistan are

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subject to several challenges and limitations because of the absence of PAC, such as lack of success in sustaining performance improvements through the use of AI and predictive analytics (Ali et al., 2025; Shahid et al., 2025). Being such a mediator makes PAC a strong explanation of the process of value creation in a digital transformation of the supply chain in emerging economies (D. Ivanov, 2022b; M. S. Naidu & Chaudhari, 2024). Based on this, the study hypothesis was formulated, which is "relationship between technological capabilities and textile supply chain performance goes through prescriptive analytics capabilities" (Fossa Samba & Alter, 2019; Nisha Pawar, 2024). In today's rapidly evolving supply chain landscape, the theoretical framework of Artificial Intelligence (AI) tools in Supply Chain Management (SCM) is positioned on the crossroads of Resource Based View (RBV) of the firm and Dynamic Capabilities Theory, providing a well-developed theoretical framework that captures the role of digital investments as a means to achieve long-term operational success (Pattnaik et al., 2024). Manufacturing and distribution networks are experiencing a dramatic transformation in the modern global economy, caused by accelerated technology development, highly dynamic international markets and short production cycles. From the classical perspective of the Resource Based View (RBV), the physical infrastructure, the standard warehouse systems, and the basic digital data storage are regarded as such static tangible assets that can also be reproduced by industry competitors thus not providing market differentiation or strategic value in the long run (D. Ivanov & Dolgui, 2025). Dynamic Capabilities Theory argues that the biggest benchmark for a firm's survival is its ability to interrelate and systematically integrate the resources that underlie it, so as to reconfigure and deploy them as necessary in real-time to the rapidly changing environment (Teece, 2025). In the context of modern coordination, this is a theoretical progression, which shows that the tracking of raw data, historical data reports and basic analytics are just entry-level inputs (Chartier et al., 2020). The gamechanger in strategy becomes when an organization, armed with these baseline data setups, can evolve those data into superior intelligence, automation, and an integrated, real-time decision-making environment that actively guides optimal operating paths (Teece, 2025). Thus, from the academic perspective, AI tools are not just back-office functions, but integral functions, constantly reshaping the structure of a supply chain that shield the company from volatilities in the external markets and market uncertainties, including surprises in supply chain arrangements and punishing competitive pressures (Dubey et al., 2020). Modern organizations leverage machine learning models, neural networks and heuristic engines to achieve the goal of making a successful connection between the abstract corporate strategy and real-world action and outcomes, underscoring the fact that the variance in how the supply chain is truly performing lies in the sophistication and maturity of the firm's ability to analyze data and apply AI (Dubey et al., 2020). An empirical analysis of the operations management literature reveals a clear technological evolution that smoothly transitions from business intelligence to predictive forecasting models to today's situation of prescriptive and autonomous execution (Chartier et al., 2020). In the past, the supply chain relied on descriptive analytics, which simply looked at the past and

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pointed to operational issues such as inventory stockout, fulfillment delays, etc. Although the integration of predictive analytics greatly expanded the scope of predictive research using time-series forecasting, machine learning regression models and probabilistic simulations to predict future demand levels or potential logistical bottlenecks, the use of this extension of the discipline still gave rise to a major operational dilemma: the need for human managers to devise tactical responses to the forecasts (Abdulla & Baryannis, 2024). The new frontier of global logistics literature has been entirely dedicated to the subject of Prescriptive Analytics Capabilities (PAC), the combination of complex optimization algorithms, automated heuristic engines, and artificial intelligence in real-time that is used to forecast systemic disruption, and to actually calculate and prescribe the exact, optimal, course of action throughout the distribution network (Smyth et al., 2024). In a complex manufacturing world where lead times are extremely short, raw material prices are volatile and consumer demands are constantly evolving, the ability of an organization to undertake automated AI workflows is essential to its operational viability. Academic literature clearly states that an organization that implements these sophisticated tools can move past the traditional decision-making process – which is prone to human error and takes too much time – and introduce a new paradigm of continuous optimization, automatically thwarting risk in the global logistics network (D. Ivanov, 2022c). AI's use in demand forecasting, here, is one of the most thoroughly validated and transformed arenas of modern quantitative research, changing the way businesses match production plans against ever-shifting market realities and demands (Farreira et al., 2022). Historical sales data and the linear smoothing of forecasts have historically formed the backbone of traditional demand forecasting models, which often lacked the ability to capture unexpected market shocks, macroeconomic indicators, or consumer patterns and have shown to be insufficient predictors of demand, especially under conditions of volatile consumer demand, where outlier events are more likely to drive outlier results (Ferreira et al., 2022b). The limitations are overcome using AI based predictive tools such as deep learning neural networks and the gradient boosting machine learning algorithms that allow them to process huge, multi-dimensional data sets at once. These sophisticated tools combine internal company information along with data from the outside world, such as real-time market sentiment, social media trends, meteorological data, macro-economic indicators and more. Researchers in the field of high-performance logistics networks note that if the basic tracking tools are integrated into more advanced optimization systems, the company has a unique advantage: the ability to dynamically adjust production volumes, optimize warehouse logistics and manage changing prices of raw materials in real time (D. Ivanov, 2025). This high-level literary approach moves beyond that of technology as a behind-the-scenes tool, and instead elevates it to a front-line driver of enterprise adaptability, one capable of directly and effectively turning raw operational data into real-time, highly beneficial business moves. Empirical studies show that this technological integration significantly lowers the bullwhip effect of fluctuations in demand further up the supply chain that have significantly harmed millions in international distribution channels in the past(Bodendorf et al., 2022). AI has revolutionized procurement and

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strategic sourcing by creating a new framework that maximizes efficiency and reduces contractual risks. Organizations suffered from many supply vulnerability issues when they were negotiating with suppliers in volatile global markets, traditional purchasing (administrative inertia, manual supplier assessment, reactive purchasing) procedures were heavily inefficient(Park et al., 2021a). The AI-powered procurement software is capable of automating supplier relationship management (SRM) processes throughout their entire lifecycle, starting with sourcing, through sourcing initiatives and contract auditing, and ending with real-time risk monitoring (Park et al., 2021b). These tools work by constantly searching financial databases, geopolitical events and news sites across the globe and identify problems with suppliers' financial stability, geopolitical risk and compliance standards, providing automatic alerts to procurement directors before these issues affect production lines (Dubey et al., 2020). In addition, the historical pricing structure and freight rates are analyzed millions of times by machine learning based optimisation algorithms so the enterprise is not hit by random increases in price. Few studies directly correlate advanced data analytics with comprehensive supply chain performance outcomes, has substantiated that a data-driven organization undergoes a complete transformation, and that the incorporation of automated data models has a direct, statistically significant impact on organization agility, inventory optimisation and cost reductions (Dubey et al., 2020). Warehousing's adoption of AI tools is a pivotal topic in current logistics discourse, fundamentally changing the nature of the storage centers from traditional storage warehouses to intelligent and automated fulfillment centers. Spatial inefficiency, picking inaccuracies and sub-optimal inventory placement were some of the most common issues found in traditional warehousing that affected overall order fulfillment cycles, (Carvalho et al. 2019). AI-powered warehouse management systems (WMS) overcome these challenges by implementing genetic algorithms and reinforcement learning models to streamline all aspects of warehouse operations. These tools compute the optimal spatial slotting configuration according to some real-time velocity metrics to assure that high velocity products are automatically slotted in an accessible position in the warehouse, minimizing picking transit times (Carvalho et al., 2019). Additionally, using AI in computer vision and AMRs (autonomous mobile robots) has streamlined material handling, making it cheaper to reduce human error and increase order fulfillment precision. The second aspect of inventory optimization is the use of AI tools that adopt frameworks based on continuous review to determine reorder points, safety stocks, and economic order quantities, which are based on live demand patterns, and not just historical averages (D. Ivanov, 2022c). The organizations that are digitally mature will use the automated feedback cycles to dynamically modify procurement, re-route distribution pathways, and/or reconfigure raw material mixes in real-time as needed (Dubey et al., 2020). The traffic fluctuations, fluctuating fuel prices, and highly demanding nature of last-mile delivery are major challenges in the distribution and transportation segments of the supply chain, areas that offer a great potential for application of AI tools. The old approaches were based on pre-programmed schedules and geographic mapping and could not react to the real road conditions or unexpected disruptions. A smart logistics platform

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can handle multiple streams of telematics data, traffic information, weather forecasts, and delivery time windows in real-time, all of which are optimized through machine learning algorithms and a dynamic routing optimization engine (Mashud et al., 2024). These AI solutions automatically adjust delivery routes based on real-time traffic data and weather predictions, automatically rerouting fleets around traffic jams or severe weather to reduce the need for fuel changes and carbon emissions, and cut delivery time. Last Mile Logistics is the most inefficient and expensive part of the global supply chain (Mashud et al., 2024). Historical drop-off times, vehicle capacities and customer availability patterns are analysed using AI tools to optimize urban delivery networks. The transformation in the performance of a supply chain becomes statistically significant with the systematic application as it has been observed that they go through a radical change when the data is not merely used to forecast the future but is actually used to send forth the prescribed choices of action optimally when there is extreme macroeconomic uncertainty in the operations (Dubey et al., 2020). In addition to helping with logistics processes now, AI tools help businesses to maintain the equipment and facilities that support manufacturing and transport internationally to keep global supply chains running (Fossa Samba & Alter, 2019). Preventative or reactive maintenance schedules heavily depended on traditional asset management, and both were extremely inefficient in their operation, either because of unnecessary spending on maintenance or unexpected failures of machines, turning entire production lines upside down. Internet of Things (IoT) sensor arrays, utilizing artificial intelligence-based predictive maintenance systems, have been installed throughout manufacturing lines, goods fleets and automated sorting lines to constantly track vibration, temperature, acoustic frequencies, and operational loads. These high-frequency data streams are fed to a machine learning anomaly detection model that processes the data in real-time and effectively detects micro-deviations from baseline values of the operational parameters, which signify early-state degradation of components (Fossa Samba & Alter, 2019). The AI system, which can forecast the exact timeframe when a machine part is about to fail, automatically triggers maintenance tickets, arranges repairs during idle periods in the natural production and places an order for replacement parts in the automated procurement system. This integration leaves no room for unscheduled downtime, significantly extends the life of multi-million dollar corporate assets and ensures the manufacturing capacities are extremely stable, predictable and fully in tune with external market commitments (Fossa Samba & Alter, 2019). This highly unstable architecture of the global supply chain is well documented in the modern logistics literature to be generated by very volatile markets, short production life cycles, and extreme competition pressures (D. Ivanov, 2022c). In this hyper-dynamic environment, traditional risk management approaches do not work since they view risk mitigation as a reactive and manual process that is not a part of the daily operational routine (D. Ivanov & Dolgui, 2025). AI changes the game for enterprise resiliency because it is like a radar for global logistical networks. The advanced risk management platforms use machine learning algorithms, predictive simulation models, and big data processing to constantly monitor the global environment for risk factors such as strikes by workers at

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international ports, drastic changes in the laws and regulations in existence, natural disasters and intensifying international tensions (D. Ivanov & Dolgui, 2025). These AI systems can simulate multiple scenarios of the disruption's potential ripple effect throughout the entire tier-one, tier-two and tier-three supplier chain—running millions of simulations automatically. For instance, when a critical vulnerability is identified, the AI tool activates pre-programmed contingency strategies, such as rerouting shipping containers to other ports, redistributing order volumes among diverse suppliers, or moving parts of the inventory buffers to ensure regional warehouses (Queiroz et al., 2021). This sophisticated capability transforms the enterprise from a reactive crisis management stage to a structural resiliency stage, and highlights that an enterprise that treats data as a strategic and dynamic asset is much better prepared to preserve the profit margin and continue its operations seamlessly under extreme uncertainty (Dubey et al., 2020). Artificial Intelligence in Operations Management literature has great credibility in the form of the ultimate achievements measurable and measurable improvements in the key operational indicators of the enterprise (Fossa Samba & Alter, 2019).

Methodology

This chapter presents the methodologically driven empirical examination of the linkages between AI-enabled, digitally integrated supply chain, predictive analytics, and prescriptive analytics with the performance of textile supply chain in Pakistan. Previous studies have highlighted the need for systematical empirical research based on reliable quantitative analysis methods in order to fully grasp the value of advanced digital technologies in supply chain (Kache & Seuring, 2017). For this study I recommend following a well-structured method based on best practices in the fields of analytics, operations management, and decision science (Wiengarten et al., 2022). This study relies on positive research methodology which assumes that phenomena of the organizations were observed, measured and explained by applying the principle of statistical relationship. Specifically, the positivism approach would be suitable to research studies that focus on testing the performance outcome of technology adoption; using empirical data (rather than subjective interpretation), researchers could test the causal relationships involved (Park et al., 2020). Based on this philosophical stance, the present study could ensure the objectivity, re-constructive and generalizability of findings in the context of Pakistan textile Industry. Is of the deductive type of research; in this case, the hypothesis is formulated based on the theory which has been developed, and empirical evidence is used to test the hypothesis. Where theories have used the relationship between the variables demonstrated in the previous experiments well, deductive reasoning is appropriate (Dwivedi et al., 2019). Hypothesis in this study are based on the dynamics capabilities theory resource-based view and analytics maturity literature, which all lead to believe that technological resources can affect performance due to higher order decision making capabilities (Helfat and Peteraf, 2015).Deductive research is a common approach in supply chain and analytics research studies to test the theorical model in diverse industrial and national settings (Queiroz et al., 2021).The sampling to be used

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in the research is a quantitative cross sectional survey design, which allows many respondents to collect numerical data at a single point in time. A cross section design could be used to measure the present situation of adoption of AI, Maturity of analytics and AI-assisted decision making in the textile industry of the Pakistan economy which is rapidly undergoing digital transformation (ul Hameed et al., 2023). The target population for this research works is the people working in the activities of supply chain, production, planning logistics and procurement activities within medium and large textile manufacturing companies of Pakistan especially where analytics will be part of their work. The unit of analysis is the individual employee since employee perceptions provide important findings related to the use of organizational analytics and the efficiency of the decisions (Podsakoff et al., 2012). Knowledgeable responds are ensured which leads to better validation and reliability of the information gathered that is important in research which is based on analysis imperative (Flynn et al., 2010). By employing purposive sampling method, the respondents who have first-hand experience with supply chain systems and analytics tools are identified. Purposive sampling is also suitable where the research requires special subject expertise, such as analytics and operation management studies, where the distribution of experts in analytics in the organization is not even (Gupta et al., 2021). The researcher intended sampling 220 respondents because it was enough to conduct structural equation modeling based on variance methods. The findings of empirical studies showed that partial least squares structural modeling (PLS-SEM) was dependable and could be used with small to medium sample size and high statistical power (Sarstedt et al., 2022) and multiple constructs mediation analysis was successfully conducted (Asadi et al., 2020). Primary data is collected using a questionnaire which is developed as a structured question in online mode, specifically the online version of google form and from a few manually. When it comes to response, especially in a geographically dispersed industrial setting, internet data collection brings, among other things, better accessibility, and lower administrative costs, while improving efficiency (Evans and Mathur, 2018). Electrical surveys are becoming more popular in digital supply chain research because of its functioning (Lohmer and Lasch, 2021). The intention of the study is communicated to the respondents, and the respondents are assured that their confidentiality will be respected before they are allowed to participate

Measurement scales

Multi-item measurement scales incorporated in the questionnaire are borrowed scales which are used in existing studies to achieve content validity and construct reliability. The five point Likert scale will be used to measure all items and is the only widely accepted approach to capturing perceptual data in the context of organizational research (Joshi and Rahman, 2015) Likert scales enable the respondents to describe different levels of agreement, and the approach is appropriate to access analytics opportunities and performance perceptions (de Winter and Dodou, 2010).

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Measurement Items

Construct	Code	Measurement Items
AI-Driven Supply Chain (ADS) (Culot et al., 2024; Mohsen, 2023)	ADS1	Our firm uses AI tools to improve supply chain visibility.
	ADS2	AI helps our company make faster procurement decisions.
	ADS3	AI systems improve forecasting and planning accuracy.
	ADS4	AI supports real-time decision-making in operations.
	ADS5	AI enhances coordination with suppliers.
Digital Supply Chain Integration (DSCI) (Büyüközkan & Göçer, 2018; Liu et al., 2022)	DSCI1	Our company shares real-time information across supply chain partners.
	DSCI2	Digital tools (ERP, cloud, IoT) integrate procurement and production.
	DSCI3	Digital systems improve communication across departments.
	DSCI4	We have digital connectivity with suppliers and customers.
	DSCI5	Digital integration enhances collaboration and responsiveness.
Predictive Analytics Capability (PA) (Akter & Wamba, 2019; Wang et al., 2018)	PA1	Predictive analytics improves our forecasting accuracy.
	PA2	Predictive tools help us anticipate supply chain disruptions.
	PA3	Predictive analytics supports inventory planning.
	PA4	Our firm uses data-driven forecasting models.
	PA5	Predictive analytics enhances proactive decision-making.
Prescriptive Analytics Capability (PAC) (Delen & Ram, 2018)	PAC1	Our firm uses analytics tools that recommend optimal decisions.
	PAC2	Prescriptive analytics helps select the best decision alternatives.
	PAC3	Optimization and simulation models support planning and scheduling.
	PAC4	Prescriptive analytics converts predictive insights into actions.
	PAC5	Managers rely on prescriptive tools to improve decision quality.
Supply Chain Performance (SCP)	TSCP1	Our supply chain responds quickly to demand changes.

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(Gunasekaran et al., 2004)	TSCP2	Lead times have improved due to digital and AI technologies.
	TSCP3	Our operational costs have decreased in recent years.
	TSCP4	Inventory accuracy and stability have improved.
	TSCP5	Customer satisfaction has increased due to improved supply chain performance.

This study's research paradigm and method are rooted in a positivist paradigm and strictly deductive, quantitative approach with the objective of providing a scientifically valid foundation so that the relationship between technological infrastructure, data capabilities and operational results in the textile industry can be investigated. Positivism is a highly conscious methodological choice because positivism involves an ontological assumption of social and organizational being that is independent of the researcher: corporate capabilities and the performance metrics of the supply chain can be observed in an objective and standardized manner by means of empirical scientific instruments and be operationalized, separated and quantified without subjective bias. The researcher's distance from the objects of the study guarantees that the data collected is not influenced by the researcher's own values or qualitative interpretations, and that the distance between the researcher and the object of the study allows the study to proceed from theory to the empirical verification. Drawing on existing literature in the field of supply chain management and information system, the conceptual model was proposed first in time, and then this model was tested by numerical data, to discover the universal image and the causal relationship which is statistically proved. The overall research type of this study is a survey/explanatory, cross-sectional research design that explores in greater detail the functional operational mechanisms of an industry, by isolating the individual latent constructs and determining the direction of the interaction between them. The cross-sectional approach involves collecting information for baseline data configurations, Prescriptive Analytics Capabilities (PAC), and Textile Supply Chain Performance (SCP) simultaneously from a wide cross section of industry participants over a specified period. This approach was used to ensure the data were gathered in a rapid and highly structured manner, providing a sufficient database to support or refute the underlying research hypotheses. This empirical study uses the supply chain managers, logistics directors, operations executives, data analysts, and enterprise technology systems specialists who are currently working in the textile industry, which is changing quickly in today's world, as their target population. The textile sector is one of the most important and pertinent test-beds for the advanced analytics models, with its technological dynamic developments, international consumer demands on it, very dynamic pricing structure of raw materials, and high intensity level of competitive dynamics in the global market. The data collected in the present study was of non-probability purpose and convenience sampling as only those people were selected at the intersection of logistics management and technical implementation, whose elucidation of the operational scenarios of the sector was essential in order to capture the reality of the sector and the complexities of the implementation in fact, along with the necessary technical expertise to evaluate advanced data analytics tools. Purposeful sampling was particularly important here so that key informants could be relied upon – each of the respondents had a minimum of a foundation of working knowledge, managerial knowledge or technical knowledge of enterprise resource planning systems and predictive tools. Evaluating entry level or nontechnical personnel will create some significant measurement errors, while evaluating a specific level of operational leadership will ensure that the responses are based on actual instead of just how some people might guess or assume the organization is performing.

This study uses a self-administered survey instrument with scales of independent and dependent variables being measured by a single respondent at one time, making it vulnerable to Common Method Variance (CMV) that indicates that the variation among the variables is due to the method used to measure the variables rather than to the theoretical constructs themselves. To preserve the psychometric purity of the present work, a number of initiative-taking and rigorous methodological and statistical precautions were incorporated into the design itself, which can otherwise lead to artificially inflated path coefficients and implying an artificial sense of the strength of the model. The independent and dependent variables were completely decentralized in the digital survey instrument, which involves the separation of baseline capabilities, prescriptive capabilities, and final supply chain performance measure questions into separate blocks or "sections" of the instrument and shuffled them so that respondents won't recognize the underlying hypotheses and match their responses across the sections merely to their supervisors, thereby having false scores. In addition, the opening statement of the survey explicitly included that all the questions would be anonymous, aggregated and confidential, so that the social desirability bias would be minimalized, eliminate corporate identifiers and personal ones and reduce the professional pride of the managers to embellish the technological readiness or results of their firm. Thirdly, before the instrument was released for use in the final deployment stage, the instrument received rigorous pre-testing from a panel of academic researchers and experienced textile logistics practitioners in order to analyze the face and content validity of the instrument, and to eliminate items with ambiguous meaning and phrases that are too complex or double-barreled, and ensure that the content of the instrument was entirely clear, neutral, and psychometrically suitable.

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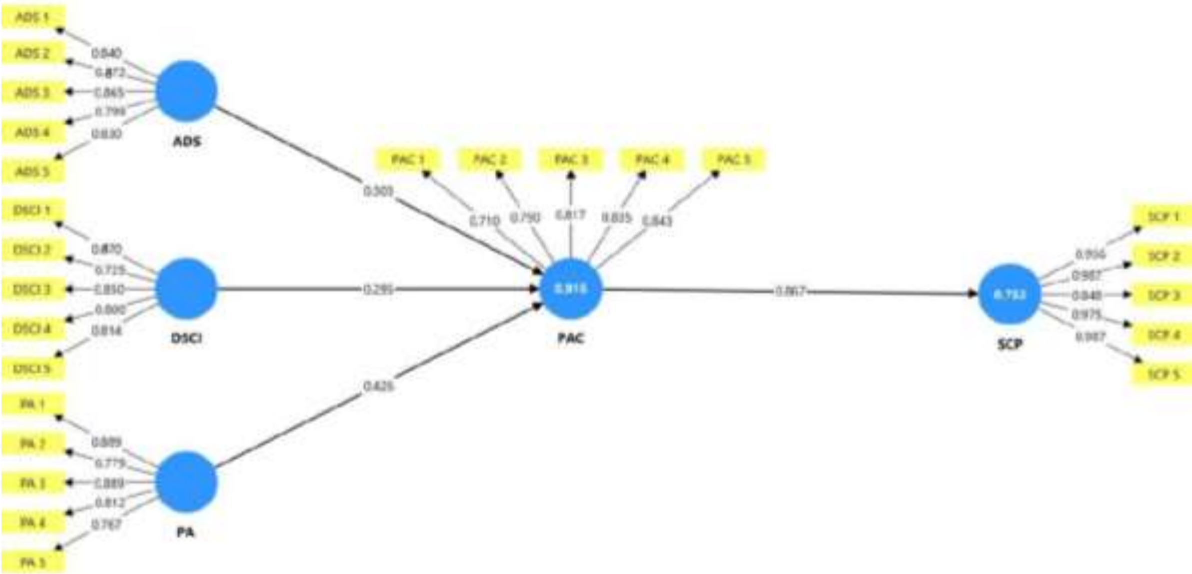

Operationalization of Variables

The operationalization of AI driven supply implies the evaluation of the context involving the use of artificial intelligence technologies to allow organizations to conduct automated planning, intelligence forecasting, and real time supply chain decision support, as well as aligns with recent AI in operations research (Vasen et al., 2021). Digital supply chain integration can be assessed by measuring the extent of digital connectivity and information exchange among internal operation and external collaboration, which are the modern perspectives on digital ecosystems in supply chain (Richey et al., 2022). Predicative analytics functions is operationalized through the organizational capacity to predict demand, predict disruptions, and actively distribute resources using data-driven models and thus the focus of analytics capability literature (Shmueli and Koppius, 2011). The mediating variable is prescriptive analytics capabilities that are quantified through the evaluation of the utilization of optimization algorithms, simulation tools and support systems within the organization that suggest the best supply chain action under constraint. Such operationalization is consistent with the research on decision science that underscores the role of decision optimization driven by analytics on performance (Phillips-Wren et al., 2019) Textile performance measured as a multidimensional construct which includes efficiency, responsiveness reliability, and flexibility as a measure of modern performance in operation management (Ülgen & Forslund, 2015). Each measuring items explain a significant amount of the variance in its underlying construct as indicated by the indicator loading for all constructs exceeding the suggested creation of 0.70. This sports indicator reliability demonstrates that the chosen indicators accurately measured the Corresponding latent variables.

Variables	ADS	DSCI	PA	PAC	SCP
ADS 1	0.840				
ADS 2	0.872				

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ADS 3	0.865				
ADS 4	0.799				
ADS 5	0.830				
DSCI 1		0.870			
DSCI 2		0.725			
DSCI 3		0.850			
DSCI 4		0.800			
DSCI 5		0.814			
PA 1			0.889		
PA 2			0.779		
PA 3			0.889		
PA 4			0.812		
PA 5			0.767		
PAC 1				0.710	
PAC 2				0.790	
PAC 3				0.817	
PAC 4				0.835	
PAC 5				0.843	
SCP 1					0.956
SCP 2					0.987
SCP 3					0.848
SCP 4					0.975
SCP 5					0.987

Construct reliability and validity				
Overview				
	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
ADS	0.826	0.866	0.879	0.601
DSCI	0.832	0.829	0.882	0.600
PA	0.886	0.892	0.916	0.688
PAC	0.859	0.865	0.899	0.641
SCP	0.973	0.973	0.980	0.907

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Cronbach's Alpha: 0.826 – 0.973
Composite Reliability: 0.879 – 0.980
AVE: 0.600 – 0.907
Strong internal consistency dependability is demonstrated by Cronbach alpha and composite reliability rating for every construct that are higher than the lowest permissible creation of 0.70. Additionally, all constructs have every variance extracted every values above 0.50 with just sufficient convergent validity these findings verify that the constructs account for over half of the variance in their indicators An advocate model foot is shown by the standardized root meaning square residual value being below the suggested cut off of 0.08. Given that's PLS-SCM places a higher priority on predictive accuracy than global goodness of fit matrix the norm fit index is acceptable even though it's marginally below the optimal value of 0.90.

Path coefficient

	Original sample (O)	Sample means (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
ADS -> PAC	0.303	0.302	0.097	3.123	0.002
DSCI -> PAC	0.295	0.296	0.092	3.206	0.001
PA -> PAC	0.426	0.427	0.092	4.630	0.000
PAC -> SCP	0.867	0.868	0.096	9.031	0.000

The results of the structural model show that prescriptive analytics competence is significantly enhanced by AI-driven supply, digital supply chain integration, and predictive analytics capabilities. Prescriptive analytics capability is most strongly influenced by predictive analytics competence. Additionally, the performance of the textile supply chain is strongly improved by prescriptive analytics capability, underscoring its crucial role in converting technology capabilities into performance outcomes.

Mean, STDEV, T values, p values

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
PAC	0.266	0.268	0.057	4.667	0.000
SCP	0.276	0.278	0.056	4.929	0.000

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R-square adjusted

Prescriptive Analytics Capability (PAC): Together, AI-Driven Supply Chain Integration, Digital Supply Chain Integration, and Predictive Analytics Capability explain **91.5%** (R^2= 0.915) of the variance in a firm's prescriptive capabilities. In plain terms, nearly all the momentum behind a textile firm's ability to generate prescriptive insights comes directly from these three core digital drivers.

Textile Supply Chain Performance (SCP): The model also reveals that Prescriptive Analytics Capability on its own accounts for **76.2%** (R^2= 0.76.2) of the variance in overall supply chain performance. This proves that a textile company's operational success is heavily dependent on its capacity to turn data into automated, optimized decisions rather than relying on guesswork.

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
PAC	0.251	0.253	0.058	4.328	0.000
SCP	0.276	0.278	0.056	4.929	0.000

Composite reliability (rho_c)

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
ADS	0.556	0.558	0.158	3.520	0.000
DSCI	0.447	0.480	0.158	3.037	0.002
PA	0.556	0.558	0.159	3.504	0.000
PAC	0.478	0.480	0.180	2.654	0.008
P	0.556	0.558	0.154	3.615	0.000

Reliability and Validity Construct	Cronbach Alpha	Composite Reliability	AVE
AI-Driven Supply	>0.70	>0.70	>0.50
DSCI	>0.70	>0.70	>0.50
PA	>0.70	>0.70	>0.50
PAC	>0.70	>0.70	>0.50
SCP	>0.70	>0.70	>0.50

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Future Directions

Future studies can go even further and in a few meaningful directions, particularly in the context of the growing digitization of supply chains, compounded by the growing uncertainty (D. Ivanov, 2024). The first clear request is to extend the analytical horizon from Current data-driven practices to the use of new technologies like Internet of Things, block chain platforms, cloud-based analytics infrastructures and digital twins in prescriptive analytics farm work (Mu'min et al., 2025). When uncertainty is high, these technologies can provide richer, real-time and more reliable data, adding to the robustness of a good prescriptive recommendation (Bag, et al., 2023). Digital twins, which can be used to simulate different decision scenarios before implementation, may be an opportunity to test various strategies of resiliency to cost trade-offs and disruption responses in a controlled environment instead of through costly trial and error, as done by Durach et al. (2024). The framework can also be applied to other industries and/or across a national context for further studies, to gauge if the role of prescriptive analytics capability holds the same or shifts with different operational contexts (Kemble et al., 2023). Risk profiles, decision-oriented analytics create value (D. Naidu & Ray, 2024): Industries with highly distinctive regulatory pressure demand profiles, and risk profiles, can differ in the ways the decision-oriented analytics create value. Likewise, comparisons between the developed and emerging economies could gain a better understanding of how the characteristics of digital infrastructure and analytics maturity affected the effectiveness of the adoption of digital prescriptive analytics (Bag et al., 2023). A second avenue is the use of a longitudinal research approach to not just fast track the learning curve but also identify how the analytics capability gradually evolves over time as an organizational asset (Choudhary et al., 2024). The capacity of the prescriptive analytics can appear through learning, experimentation and repeated usage, while the longitudinal studies can be used to better explain the progression of the firm from descriptive to understanding toward optimized decisions (D. Ivanov, 2024). These methods can also help to better understand who is responsible for the majority influence in long-term results like supply chain resilience, adaptability, and sustained performance (M. S. Naidu & Chaudhari, 2024). Finally, future studies should attend more closely to the role of Organizational and behavioral factors in the relationship between please descriptive analytics and performance outcomes, as these factors may moderate the success factors for the implementation of please descriptive analytics, such as management board analytics trust, data governance quality, role of digital skills and learning culture, particularly in emerging economies where resistance to analytics Dr and decisions can be high (Smyth et al., 2024). Case studies and expert interviews are forms of qualitative approaches that provide in-depth explanations of these hidden mechanisms and supplement large scale quantitative results (Durach et al., 2024). Last but not least, future study could incorporate sustainability Orient oriented outcomes in the prescriptive analytic research such as environmental efficiency, carbon reduction, ethical scoring and social sustainability performance (M. S. Naidu & Chaudhari, 2024). Application of the cross-section of decision by region and sustainability would enhance the value of 3 not only for its

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contribution to the decision but also for the ability to guide the managers who make decisions in a rapidly evolving supply chain ecosystem that is increasingly responsible (Kemble et al., 2023). In the future, digital technologies (such as Internet of Things, Block chain, Cloud Systems, and Digital Literacy) could be used as a part of research. The model can be used in other Manufacturing Industries and a longitudinal design can be employed to monitor the change in the adoption of AI and analytics over time. Future study could explore moderating factors, such as leadership support, organizational cultures, and innovation orientation. The model can be evaluated in other countries for international e-maturity benchmarking of digital maturity of textile supply chains. Qualitative research methods such as interviews and case studies can be employed to investigate issues related to the implementation of AI & analytics. Sustainability variables (green performance, energy efficiency, waste reduction) can be included by researchers. Customer-related analytics - demand sensing, consumer data – can be added to create better decisions. Analysis can be deepened using advanced statistical tools such as: Machine Learning SEM, Bayesian SEM and MGA. Other mediators (such as supply chain agility and resilience, decision quality) can be considered to reinforce the theoretical understanding.

Theoretical Implications

The study has a number of significant theoretical contributions. Firstly, it complements the existing literature on digital supply chain (DSC) analytics by adding prescriptive analytics capabilities as key but under-explored aspects. Previous research mostly focuses on descriptive analytics and prescriptive analytics (Ali et al., 2025.; Wang et al., 2018). They seldom looked at the journey of perceptive analytics so that it can be translated into technological insight that leads to optimized decisions. The study advanced theory by showing that only through enhancing supply chain performance through PAC supporting augments (Nisha Pawar, 2024) that digital integration and predictive analytics in the supply chain driven by AI are beneficial to the organization. Second, this study makes a contribution to the dynamics capabilities theory as it creates the PAC and key mediating capability. Prior research indicates that technological systems alone cannot grantee performance(D. Ivanov, 2022c; K. P. Liu et al., 2022), and this Study empirically support the claim of firms must develop decision orientated analytical maturity to extract value from AI and digital tools (Choudhary et al., 2024; D. Naidu & Ray, 2024). The PAC mechanism that transforms digital insight into supply chain decisions places the research in the forefront of the debate regarding the benefits digital transformation brings to the concept of advantage. The deployment of a PAC that converts digital insight into supply chain decisions enhances the theoretical basis of the concept of advantage and its link with digital transformation. The research provides a contextual depth as it does not only contain evidence from a digital immature environment of Pakistan textile sector but also from an emerging economy. Previous research limited to developed countries, and lacked focus on areas where PAC can make a contribution to improve decision-making and operating efficiency in the textile industry in Pakistan. At the end the integration of the model AI driven supply chain digital integration and predictive capabilities PAC and supply chain performance offer a holistic framework for further theoretical work on digital supply chain advanced analytic(Culot et al., 2024; Dalen & Ram, 2018).

Practical Implications

The findings of this research offer significant takeaways for Pakistani textile companies, and initially, the result is confirming that improvement of the predictive analytics and digital supply chain tools will be impossible without the presence of good prescriptive analytics tools (PAC). Previous studies also revealed that organizations may not be able to use the predictive system to their full benefit as insights into decision making are not converted to optimal decisions (Adedoyin Tolulope Oyewole et al., 2024; Ali et al., 2025.; Nisha Pawar, 2024; Wang et al., 2018). Therefore, Manager needs to invest in decision-support system including optimization model and simulation engines (Dalen & Ram, 2018) and (M. S. Naidu & Chaudhari, 2024) in order to translate the data insight into effective supply chain action. Finally, the study has some policy implications. Industry regulators and associations like APTIMA can provide financial incentives for the training of analytics, digital transformation initiatives and strengthen technology infrastructure at the industry level to encourage the adoption of AI as outlined in the literature. This study makes a gentle case for the belief that more data means better decisions in practice – unless there are also layers of prescription that inform decisions, that is (D. Naidu & Ray 2024). This gap translating insight into choice (D. Ivanov, 2024) was bridged by the use of decisions support tools, which include optimization engines, and simulation. Slowly this confidence can be built by; training program analytics team and closer coordination of IT and operations (Fossa Samba & Alter, 2019). It's not a matter of changing managers but enlisting their involvement. operational routines also must be adjusted. When analytics are valued as a tool for daily decisions such as scoring, scheduling, inventory planning and routing, prescriptive analytics come into their own (D. Ivanov, 2024). When they become part of the day-to-day decision-making process, institutions shift from relying on analytics as a driver to a safety net (M. S. Naidu & Chaudhari, 2024). These translation industry bodies and government agencies can be swiftly advanced with policy support and the barriers to adoption can be lowered by incentives, common platforms and training programs (Bag et al., 2023). It's more important in economies where businesses tend to shuffle in and out of existence, such as in the emerging world, where businesses are going more toward cautious digital transformation (Wiengarten, 2023).

Conclusion

This study relates a simple story, all by itself, prediction alone is not enough (D. Naidu & Ray, 2024). The transformation of the value emerges insight to decision and decision to action (D. Ivanov, 2024). This is the intersection point hidden in the dark supporting the performance of the whole digital supply chain with prescriptive analytics capabilities (Fossa Samba et al., 2024). The study highlights the importance of structure decision intelligence in the context of Pakistan's textile industry, demonstrating that it plays a crucial role in boosting resilience and competitiveness in resource-limited environments (Bag et al., 2023). Not shouting movies and better-than-wildly predicting decisions (D. Ivanov, 2024). This dissertation aims to gain a deep understanding, map and analyze the critical role that advanced data analytics infrastructure plays within the modern textile sector, which is currently undergoing radical transformation through rapid technological change, dynamic world needs, consumer trends and unprecedented competition from around the world. Today, supply chains are becoming more and more exposed to external shocks and increasingly complex, making traditional, bottom-up management approaches completely underwhelming. This critical operational challenge, this research developed and validated an extensive structural equation framework that will be able to empirically test the fundamental baseline data capabilities in order to understand the underlying mechanism that transforms these capabilities into complex Prescriptive Analytics Capabilities (PAC) and finally into significant measurable improvements in Textile Supply Chain Performance (SCP).

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