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RESEARCH ARTICLE

The Impact of Technology-Driven Data Analytics on Information Sharing and Supply Chain Responsiveness- A Conceptual Framework

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ABSTRACT - This study examined the impact of technology-driven data analytics (TDDA) on information sharing (IS) and supply chain responsiveness (SCR), proposing a conceptual framework to understand the interrelationships between these variables. Moreover, this study identified key technological innovations, such as big data analytics (BDA), machine learning (ML), the Internet of Things (IoT), artificial intelligence (AI), and blockchain, that can facilitate the collection, processing, and sharing of information across supply chain partners. These technologies enable faster and more accurate decision-making, significantly enhancing SCR's ability to respond to fluctuating demand, disruptions, and other dynamic changes. The conceptual framework developed in this paper outlined the pathways through which data analytics influenced the effectiveness of information systems (IS) and the ability of supply chains to respond quickly to market conditions. The paper provided insights into the benefits of implementing these technologies within supply chains through a systematic review of current literature. This study contributed significantly to understanding the correlations between TDDA and SCR. Furthermore, the developed conceptual framework explained the positive mediating relationship of IS to enhance the impact of TDDA on SCR. The findings suggested that TDDA, when integrated with robust information-sharing mechanisms, can substantially improve supply chain agility, resilience, and overall operational performance. This paper contributed to understanding how technology can transform traditional supply chain practices, offering theoretical and practical implications for organizations aiming to enhance their SCR in the digital age.

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1. INTRODUCTION

The rapid advancement of technology has significantly transformed data analytics, leading to the emergence of technology-driven data analytics (TDDA). This approach utilizes sophisticated tools and platforms to collect, process, and analyze large volumes of data, enabling organizations to extract actionable insights and make informed decisions. Integrating big data, cloud computing, machine learning (ML), and artificial intelligence (AI) has revolutionized analytics to achieve real-time processing and analysis of complex data sets at a large scale (Sharker, 2020). In supply chain management (SCM), for instance, big data analytics (BDA) has been a crucial factor in improving and driving innovation in the supply chain, especially in response to global challenges such as the COVID-19 pandemic (Ali, 2024). Moreover, data analytics impact supply chain decision-making, including demand forecasting, inventory optimization, and planning, highlighting the importance of data analytics efficiency and reducing overall operational costs (Elopre, 2023).

TDDAs have been extended further by incorporating more than one technology to achieve more beneficial outcomes. For instance, integrating Internet of Things (IoT) and BDA disruptive technologies can improve and promote sustainable practices in manufacturing industries (Zhang et al., 2024). Furthermore, utilizing cutting-edge technologies such as AI, Robotics, and blockchain has leveraged the supply chain to operate in real time, promoting decisions, transparency, and traceability. For example, IoT can provide real-time information, location, and status of goods in the supply chain pipeline, predict supply chain disruptions, control inventory, and ensure that supply chain stakeholders can react proactively to demand spikes or supply conditions (Gubbi et al., 2020). Also, AI and ML technologies are integrated to predict forecast patterns, identify deviations, and automate decision-making processes, making the supply chain more agile and responsive (Wamba et al., 2022).

Integrating TDDA and information systems (IS) is pivotal in enhancing supply chain responsiveness (SCR). While existing research has explored various facets of this integration, several research gaps remain. Although studies have proposed frameworks for understanding the impact of BDA on supply chain operations, a unified theoretical model encompassing both data analytics and IS is lacking. Such a framework would elucidate the interplay between these elements and their collective effect on SCR (Hasan et al., 2022). Moreover, effective data governance is crucial for successful data analytics and IS. However, research focusing on data governance within supply chain operations is limited. Investigating how data governance practices influence the effectiveness of data analytics and IS can inform best practices for SCM. The potential of advanced technologies such as AI and BDA in enhancing supply chain resilience is recognized. However, studies examining how these technologies, when combined with IS, impact SCR are limited. Research in this

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area can provide valuable insights into leveraging AI and big data for improved supply chain performance (Zamani et al., 2023).

2. LITERATURE REVIEW

2.1 Technology Data-Driven Analytics

TDDA has become a crucial tool in multiple fields, leveraging advancements in computational power, data storage, and AI to extract meaningful insights from large and complex datasets. With the advent of technologies such as Big Data, cloud computing, ML, and AI, businesses and organizations can make data-informed decisions, streamline operations, and create innovative solutions. The continuous evolution of these technologies has significantly impacted sectors, including but not limited to SCM. A recent empirical study by Singh (2025) found that data analytics capabilities significantly enhanced supply chain collaboration and flexibility, leading to supply chain resilience. Moreover, Waller & Fawcett (2013) found that data analytics improve supply chain efficiency and responsiveness, enhance demand forecasting by 10%, and improve inventory forecast by 15-30%. Data analytics capabilities significantly positively affected supply chain performance, especially in agility and efficiency, and firms showed higher analytical capabilities by 20-25% in order fulfillment, delivery, and cost reduction (Akter et al., 2016). A case study by IBM's Watson Supply Chain (2021) found that data analytics improved supply chain demand forecasting by 83% and stock excess by 16% resulting in fulfilment and profitability. The finding of Quan & Hien (2023) also supported the existing literature by concluding that firms that practised data analytics demonstrated 20-50% improvement in demand forecasting compared to industry benchmarks. The following sections will explore how TDDA transforms SCM by examining key methodologies, applications, challenges, and future trends. Regarding technological foundations in SCM, several technologies are revolutionizing data analytics in supply chains, such as big data, ML, AI, IoT, and Blockchain Technology.

2.1.1 Big Data Analytics

The term BDA can be defined as applying advanced analytic techniques, including data mining, statistical analysis, and predictive analytics, on vast datasets as a new business intelligence practice (Tiwari et al., 2018). BDA provides valuable insights by processing large and unstructured datasets, offering supply chain managers real-time decision-making capabilities. Cloud computing is critical in facilitating data storage, processing, and collaboration. In a recent study, Singh et al. (2024) highlighted how cloud-based big data platforms enable the real-time sharing of SCM data across multiple stakeholders, thus improving responsiveness and efficiency. Moreover, BDA is a demanding analytical tool for enhancing demand forecasting by analyzing historical sales data, market trends, and external factors to predict future demand, allowing companies to adjust production and inventory (Chae et al., 2024).

A literature review study conducted by Barzizza et al. (2023) found that firms with BDA achieved a high return on investment by 15-20%. BDA's impact on SCM can reduce operational costs by 20-50% and increase production efficiency by 30% (Handanga et al., 2021). Equally important, BDA's potential promotes supply chain risk management, and environment-friendly products ultimately boost innovation and better performance, leading to a positive relationship between sustainability and supply chain performance (Santiago et al., 2024). Besides, Dubey et al. (2018) found that BDA capability positively and significantly impacted supply chain agility and competitive advantage. Analyzing customer orientation is crucial to meet market demand. Consequently, one of the key roles of BDA in fields such as supply chain and logistics management, and inventory management is to optimize business operations by analyzing customer behaviour (Maheshwari et al., 2020). Hence, BDA can support solving critical performance challenges, coping with firms' mission and vision, and aligning with the company's business strategy (Queiroz & Telles, 2018).

2.1.2 Machine Learning

ML has become pivotal in modern SCM, offering advanced tools to enhance efficiency, predict demand, and mitigate risks. Recent scholarly research has underscored its transformative impact across various facets of supply chain operations. ML positively affects supply chain areas, including demand and inventory management, mitigating supply chain risks, and security. First, in terms of demand forecasting and inventory management, accurate demand forecasting is essential for effective inventory control. Traditional methods often struggle with the complexities of modern supply chains. A study by Jahin et al. (2024) introduced the Multi-Channel Data Fusion Network (MCDFN), a hybrid model integrating Convolutional Neural Networks (CNN), Long Short-Term Memory networks (LSTM), and Gated Recurrent Units (GRU). This model demonstrated superior predictive performance, significantly enhancing demand forecasting accuracy. Second, ML can efficiently identify and mitigate risks to make the supply chain resilient.

Jahin et al. (2023) conducted a systematic literature review on AI in supply chain risk assessment, highlighting the transformative role of AI/ML models such as Random Forest and XGBoost in improving precision and adaptability in risk management strategies. Third, ML applications have improved transportation optimization and inventory levels. According to a study by Pasupuleti et al. (2024), optimized routing resulted in an average cost savings of 6% per shipment. Moreover, the demand forecast model reduced the mean absolute percentage error to 2.3%, outperforming traditional models with 3.7% and 4.1% errors. Besides, applying ML stock reorder strategies reduced stock levels by 5-10% compared to fixed control policies (Barzizza et al., 2023). Fourth, ensuring the security of supply chains against disruptions is vital. Wang et al. (2024) proposed an automated ML framework to enhance supply chain security. This

framework focused on fraud detection, maintenance prediction, material backorder forecasting, streamlining data analysis, and model construction to improve security measures. Hence, the latest scholarly research highlighted that ML is instrumental in refining demand forecasting, enhancing risk assessment, bolstering security, and integrating AI into SCM. These advancements enable organizations to operate more efficiently, adapt to market changes, and maintain resilience in disruptions.

2.1.3 Artificial Intelligence

First, AI applications have enabled predictive analytics in SCM, allowing companies to forecast demand, predict supply disruptions, and optimize inventory management. Walter et al. (2025) found that AI applications improve supply chain demand planning in functional areas such as manufacturing, procurement, and supply chain risk management. According to Britt (2024), early adopters of AI-enabled SCM enhanced forecasting errors by up to 50%, logistics costs improved by 15%, inventory levels by 35%, and service levels by 65%. Moreover, AI applications were adopted and proved effective in SCM areas, including but not limited to demand forecasting and planning, inventory management, logistics optimization, and risk management (Thakur et al., 2023). According to D'Souza & Jambhale (2025), implementing AI in SCM and logistics is expected to improve operational efficiency by 5-10%, and robotics in warehousing could enhance productivity by 30% as stated by Supply Chain Statistics.

Second, AI applications are revolutionizing supply chain operations by improving decision-making and efficiency. A recent study by Cohen & Tang (2024) emphasized that AI can add value to supply chain planning, production, inventory management, and product distribution. Companies that practice AI-powered tools can process vast amounts of real-time data, enhancing demand forecasting accuracy, optimizing resource allocation, and improving inventory management. Accurate demand forecasting is crucial for effective inventory control. AI technologies, such as ML algorithms, enable companies to analyze historical data and predict future demand patterns more precisely (Awasthi, 2024). This capability leads to optimized inventory levels, reduced stockouts, and minimized excess inventory, enhancing customer satisfaction and operational efficiency. According to Bangarkar, (2024), AI applications in SCM reduced prediction errors in forecast accuracy by 20-50%, decreased sales loss by 65%, reduced overstocking by 20-50%, lowered logistic costs by 15%, improved inventory by 35%, high service level by 65%, increased warehouse productivity by 22%, and improved response time by 25%. Nestle leveraged AI applications to predict customer demand and decreased overstock by 10% in various countries (Intellias, 2023).AI contributes to building resilient supply chains by enabling proactive risk assessment and management and improving and strengthening supply chain resilience. By analyzing data from various sources, AI can identify potential disruptions and suggest mitigation strategies (Samuels, 2025). This proactive approach allows companies to respond to unforeseen events, maintaining continuity and minimizing operational disruptions.

Moreover, AI enhances supply chain security through fraud detection, maintenance prediction, and material backorder forecasting applications. Besides, AI contributes to automated ML frameworks that streamline data analysis and model construction, improving the efficiency and effectiveness of security measures (Wang et al., 2024). Integrating AI into security protocols helps identify vulnerabilities and enable timely interventions. Lastly, AI practices help facilitate sustainable practices. AI supports sustainable supply chain practices by optimizing resource utilization and reducing waste. Furthermore, AI can suggest more sustainable alternatives by analyzing energy consumption, material usage, and transportation logistics data, contributing to environmental conservation and cost savings (Samuels, 2025). A bibliometric study by Saleh and Shabir (2023) found that AI integration can promote SCR in terms of customer, service, quality, and production management. Therefore, the literature confirms that AI enhances operational efficiency, improves demand forecasting, builds resilience, strengthens security, and promotes sustainability in SCM. These advancements enable organizations to operate more effectively, adapt to market changes, and maintain resilience in disruptions.

2.1.4 Internet of Things

IoT is a pivotal element in modern SCM, offering enhanced visibility, efficiency, and responsiveness. By integrating IoT technologies, organizations can monitor assets in real time, optimize routes, and ensure product quality throughout the supply chain. The key applications of IoT in SCM are inventory management, asset tracking, cloud chain monitoring, predictive maintenance, and route optimization. In terms of inventory management, IoT enables real-time inventory levels, reducing stockouts and overstocking situations. This led to more accurate demand forecasting, efficient stock replenishment, and IoT devices detected anomalies in equipment performance, allowing for timely maintenance and reducing downtime (Sallam et al., 2023). Also, with IoT-enabled devices, companies can monitor the location and condition of assets, such as vehicles and equipment, ensuring optimal accuracy and reducing losses (Udeh, 2024). According to Linder (2025), IoT applications reduced errors and shortages by 40%, cut costs by 30%, and enhanced customer satisfaction by 70%. Furthermore, IoT-enabled automation improved productivity and output by 10-50% (Spears, 2023). Equally important, IoT-enabled sensor applications in predictive maintenance reduced equipment downtime by up to 30% (Crudu, 2025). Moreover, IoT helped SCM achieve up to 30% productivity by sharing real-time data and analytics to ensure decision-making and operations efficiency (Strategymrc, 2023). Moreover, IoT has a positive and significant application in cold chain monitoring. IoT sensors tracked temperature and humidity for perishable goods, ensuring products remain within the required conditions, thereby improving quality and compliance (Ahmed et al., 2021). Lastly, by analyzing real-time data, IoT can enhance planning and delivery routes, saving time and reducing fuel consumption. (Karim et al., 2024). Hence, IoT transforms SCM by providing real-time insights, improving efficiency, and enhancing decision-making processes.

2.1.5 Blockchain

Blockchain technology has emerged as a transformative force in SCM by offering enhanced transparency, traceability, and efficiency. By providing a decentralized and immutable ledger, Blockchain addresses critical challenges such as data silos, information asymmetry, and trust issues among supply chain partners. One of the key applications of Blockchain in the supply chain is enhancing transparency, traceability, and accuracy. According to Elad & Kinder (2025), firms that integrated Blockchain in their SCM operations achieved transaction accuracy by 35% by reducing costly errors across a global network. Blockchain enables real-time tracking of products from origin to destination, ensuring authenticity and reducing the risk of fraud. This transparency is particularly valuable in industries like food and pharmaceuticals, where product integrity is paramount (Difrancesco et al., 2023). Moreover, incorporating Blockchain in SCM has minimized documentation expenses and increased accuracy by 30% and 20%, respectively (Mărcuță, 2024). Besides, firms that adopted Blockchain have notably improved SCM success indicators, with a 15% reduction in average lead time and a 20% reduction in inventory carrying costs (Huzaifa, 2024).

Table 1. Benefits of TDDA applications in supply chain operational performance

Technology	Benefit	Empirical Statistics	Source
BDA	Improving demand forecasting	10%	Waller & Fawcett (2013)
	Inventory forecast reduction	15-30%	
	Enhancing agility and efficiency	20-25%	(Akter et al., 2016).
	Boosting demand forecasting	83%	IBM's Watson Supply Chain (2021)
	saving inventory excess	16%	
	Demand forecast enhancement	20-50%	Quan & Hien (2023)
	high return on investment	15-20%	Barzizza et al (2023)
	Operational cost reduction	20-50%	(Handanga et al., 2021).
	Increasing production efficiency	30%	
ML	Transportation optimization	6%	Pasupuleti et al. (2024)
	Reducing forecast absolute error	2.3%	
	Reducing inventory levels	5-10%	Barzizza et al (2023)
AI	Reducing demand forecasting error	50%	Britt (2024)
	Improving logistic costs	15%	
	Controlling inventory levels	35%	
	Enhancing service levels	65%	
	Improving operational efficiency	5-10%	D'Souza & Jambhale (2025)
	Boosting warehouse productivity	30%	
	Lowering demand errors	20-50%	Bangarkar, (2024)
	Decreasing sales loss	65%	
	Reducing overstocking	20-50%	
	lowering logistic costs	15%	
	Improving inventory levels	35%	
	Boosting service levels	65%	
	Increasing warehouse productivity	22%	
	Improving SCM responsiveness	25%	
	Decreasing overstock	10%	(Intellias, 2023)
IoT	Reducing errors and shortages	40%	Linder (2025)
	Cutting operational costs	30%	
	Enhance customers' satisfaction	70%	
	Productivity improvements	10-50%	(Spears, 2023)
	Reducing equipment downtime	30%	(Crudu, 2025)
	Achieving high productivity	30%	(Strategymrc, 2023)
Blockchain	Achieving transaction accuracy	35%	Elad & Kinder (2025)
	Minimizing documentation expense	30%	(Mărcuță, 2024)
	Increasing accuracy	20%	
	Reducing lead-time	15%	(Huzaifa, 2024)
	Minimizing inventory carrying cost	20%	

Similarly, Blockchain significantly improved trust among supply chain partners. By providing a secure and transparent record of transactions, Blockchain fostered trust among supply chain participants, facilitating smoother collaboration and reducing disputes (Yavaprabhas et al., 2024). Manzoor et al. (2022) confirmed that blockchain applications improve supply chain resilience by providing a transparent and immutable record of transactions, enabling organizations to identify and respond to disruptions quickly. Recently, blockchain technology has been used in sustainability and reverse SCM through managing the reverse supply chain through tracking, visibility, and accuracy of information, promoting sustainability and responsible consumption (Difrancesco et al., 2023). In short, blockchain technology offers significant potential to revolutionize SCM by enhancing transparency, trust, and efficiency. Consequently, it can be predicted that:

HI: There is a significant effect of TDDA on IS

H2: There is a significant effect of TDDA on SCR

2.2 Information Sharing

IS is a cornerstone of effective SCM, fostering collaboration among partners to enhance operational efficiency, reduce costs, and improve customer satisfaction. Advancements in information technology have significantly facilitated this process, enabling real-time data exchange and seamless coordination across the supply chain to enhance operational performance, enhance IS through leveraging advanced technologies, and address information asymmetry. Improving operational efficiency is one of the optimal goals in the business industry. Studies demonstrated that IS leads to improved decision-making, cost reductions, and overall supply chain competitiveness, enhancing organizational performance. For instance, research by Flynn et al. (2010) indicated that firms with greater IS achieve better operational performance, including faster delivery times, lower inventory levels, and higher customer satisfaction. Moreover, IS in supply chains has become more effective by introducing long-term cooperation and coordination to improve companies' competitive advantages (Lotif et al., 2013). For instance, research conducted by Loftware Incorporation (2024) found that 90% of industry professionals said there is a demanding need for connection and collaboration across the global supply chain, supported by disruptive technologies to improve efficiency, ensure compliance, and reduce overall operational costs. In contrast, when IS is not that fast, supplier stock prices become less efficient in terms of relevant customer information because suppliers depend relatively on their customers' feedback to guide their decision-making (Cen et al., 2024).

IS has been promoted drastically in recent years by integrating advanced technologies, such as blockchain, which have enhanced IS capabilities remarkably. Blockchain technology provides a decentralized platform that ensures data authenticity, integrity, and transparency, building trust among supply chain partners. An experimental study by Longo et al. (2022) demonstrated that blockchain-enabled supply chains can overcome collaboration and trust issues, increase overall performance, and minimize the negative consequences of information asymmetry. Besides, empirical research conducted by Raweewan & Ferrell (2018) offered a helpful quantitative approach that assessed the value of IS to promote competition, cooperation, and coordination strategies. Moreover, according to Matchette & Seikel (2004), collaboration through information sharing reduced inventory levels by 30%, cut transportation costs by 10%, lowered warehouse costs by 13%, shortened lead time by 50%, and improved customer service by 10%. Regarding agility, the empirical study by Alzoubi & Yanamandra (2020) found that IS mediated in agile supply chains to achieve superior performance.

Asymmetric information among supply chain partners can lead to a disconnected supply chain. Information asymmetry can lead to inefficiencies and mistrust among supply chain partners. Implementing effective IS strategies can mitigate these issues by ensuring all parties can access accurate and timely data (Tang et al., 2022). For instance, an empirical study by Huo et al. (2020) found that IS enhanced knowledge and learning among supply chain partners. Equally important, quantitative research by Baah et al. (2020) found that IS positively correlates with supply chain visibility, collaboration, agility, and performance. This transparency is crucial for making informed decisions to foster a collaborative environment to increase profit and decrease costs. For example, a report issued by Supply Chain Movement (2021) found that through information sharing, companies can increase their revenue by 8% and reduce supply chain costs by 7%.

Table 2. Benefits of IS applications in supply chain operational performance

Variable	Benefit	Empirical Statistics	Source
IS	Reducing inventory levels	30%	Matchette & Seikel (2004)
	Cutting transportation costs	10%	
	Lowering warehouse costs	13%	
	Shorten lead-time	50%	Quan & Hien (2023)
	Improving customer service	10%	
	Increasing sales revenue	8%	
	Reduce SC operational costs	7%	

Hence, IS is vital for the success of modern supply chains. It enhances operational performance, facilitates collaborative planning, and leverages advanced technologies to build customer trust and efficiency. According to a survey conducted by Brown (2019), 75% of the surveyed consumers confirmed that transparency builds trust, leading to higher sales ratios.

Hence, as supply chains become increasingly complex, the role of IS will continue to be pivotal in achieving competitive advantage and meeting customer expectations. Therefore, it can be hypothesized that:

H3: IS mediates the relationship between TDDA and SCR

2.3 Supply Chain Responsiveness

SCR refers to the supply chain-level capability to respond to market dynamics in a time-effective manner (Ghobakhloo et al., 2025). So, SCR is about adapting swiftly and effectively to changes in customer demand, market conditions, and unforeseen disruptions. This responsiveness will enable organizations to meet customer expectations promptly, maintain competitive advantage, and optimize operational efficiency. Moreover, Giannakis et al. (2019) defined SCR as the ability of the supply chain to respond to market demand promptly and effectively. In the extant body of existing literature, SCR has multiple dimensions, including customer sensitivity (Van et al., 2001), supply chain response lead-time (Holweg, 2005), agility (Blome et al., 2013; Kim et al., 2013), and IS (Handfield & Bechtel, 2002), and demand transparency (Catalan & Kotzab, 2003).

SCR positively impacts the supply chain and overall firms' performance because the more the supply chain responds to market demands, the more market shares and competitive advantage the firm can achieve. A study by Eckstein et al. (2015) on 143 German firms found that responsive firms to market demand can achieve better cost and operational performance. Besides, the empirical study of Qrunfleh & Tarafdar (2013) found that SCR is associated with firm performance. Similarly, Mandal (2015) found that SCR has a significant relationship with logistics firms' performance in terms of operational and financial gains. Equally important, Ayoub & Abdallah (2019) concluded that SCR fully mediates the relationship between supply chain agility and firms' export performance. SCR is not only significant for firms' performance but also in terms of customer development. The quantitative study performed by Asamoah et al. (2021) found that supply chain system operations responsiveness and supplier network responsiveness enhance supply chain logistics systems responsiveness. Besides, Thatte (2007) concluded that SCR impacts firms' competitive advantage. Findings of Thatte (2007), supported by Thatte et al. (2013), indicated that SCR directly and positively impacts firms' competitive advantage in terms of price, cost, quality, delivery dependability, time to market, and product innovation. In addition, according to a study by the Institute of Supply Management, firms with responsive supply chains are 60% more likely to meet customers' expectations consistently. Moreover, firms that actively measure supply chain agility can respond to market changes 25% faster than their counterparts (Faster Capital, 2024). The Institute of Supply Management findings were supported by a recent study by McKinsey, confirming that firms with highly agile and responsive supply chains achieved 15% higher profit margins than their peers (Relearnx, 2024). To achieve a competitive advantage, firms need to define SCR strategy in terms of product range, frequency, and innovations of product offerings. Moreover, firms must provide key implementation practices in terms of IS with customers, collaboration with suppliers, and use of advanced manufacturing technology to achieve responsiveness in the market (Roh et al., 2013).

Table 3. Benefits of SCR applications in supply chain operational performance

Variable	Benefit	Empirical Statistics	Source
SCR	Improving meeting customers' expectations	60%	(Faster Capital, 2024)
	Faster adaptability to market changes	25%	
	Achieving higher profit margins	15%	(Relearnx, 2024).

Achieving SCR involves several key factors, as highlighted in recent literature. First, regarding organizational factors and mutual understanding, Yapa (2018) found that organizational factors and mutual understanding among supply chain partners significantly influence responsiveness. Second, adequate information flow and collaborative decision-making are crucial for enhancing SCR. Research indicated that these elements and organizational factors correlate highly with responsiveness (Hayat et al., 2012). Third, Flexibility in supply chain operations, including adaptable manufacturing processes and transportation options, enables quick responses to demand fluctuations and disruptions (Jafari et al., 2022). Flexibility is crucial for maintaining customer satisfaction and a competitive advantage. Fourth, integrating digital technologies and data analytics enhances supply chain visibility and decision-making. Advanced analytics facilitate accurate demand forecasting and real-time monitoring, allowing for proactive responses to the market (Li et al., 2023). Hence, these factors collectively contribute to a supply chain's ability to respond effectively to changing market conditions and unforeseen events.

3. METHODOLOGY

Based on the literature review and subsequent hypotheses, this study's conceptual model was developed to explain the relationship among the variables examined. Resource-based view (RBV) theory underpinned the developed conceptual framework. RBV is a strategic management framework that explains how firms achieve and sustain competitive advantage by acquiring, developing, and deploying valuable resources. Initially developed by Wernerfelt (1984) and later expanded by Barney (1991), RBV asserts that firms' resources and capabilities are the primary drivers of their performance and competitive edge. RBV categorizes firms' resources into tangible and intangible assets. Tangible

resources include physical assets like machinery, infrastructure, financial capital, and raw materials. Intangible resources include intellectual property, brand reputation, knowledge, human capital, and organizational culture. To provide a sustainable competitive advantage, resources must be valuable, rare, inimitable, and organized (Barney, 1991).

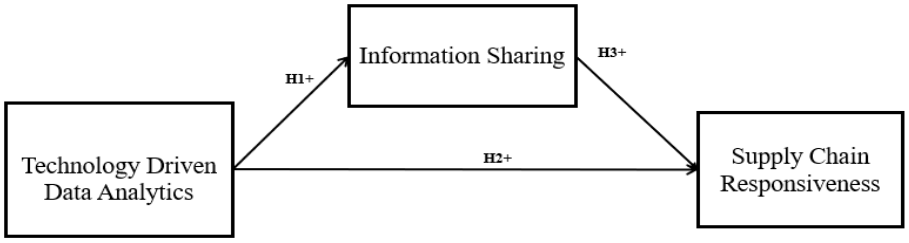

Figure 1. Conceptual framework

4. RESULTS AND DISCUSSION

The framework was developed based on TDDA, IS, and SCR relationships. The correlation among variables was supported by RBV theory, which affirmed that the availability of internal resources and capabilities was indispensable to achieving firm performance and competitive advantage. This conceptual model was developed based on the assumption that firms can sustain their competitive advantage in the market by utilizing their resources. The conceptual framework depicted in Figure 1 suggests that disruptive TDDA are crucial internal resources a firm can practice strengthening its SCR to achieve competitive advantage and market share in terms of essential themes, including market presence, market penetration, expanding brand, and increasing customer satisfaction and loyalty. Furthermore, the developed conceptual framework was consistent with previous studies (Hasan et al., 2022; Zamani et al., 2023). SCR cannot be obtained without incorporating and implementing TDDA in firms' supply chain operations. Moreover, TDDA cannot be fully utilized unless there is IS among the supply chain network to build trust among different supply chain partners. As a dependent variable, SCR could only be optimized if firms invest and develop their tangible and intangible resources to promote or maintain their competitive advantage compared to their competitors. Hence, the reviewed literature supported the study hypotheses. As a result, this paper proposed a conceptual framework to help firms benefit from their internal and external resources and excel among their business counterparts.

5. CONCLUSIONS

This study presented a comprehensive conceptual framework elucidating the intricate relationship between TDDA, IS, and SCR. Grounded in RBV theory, the framework posited that TDDA, when integrated with robust IS mechanisms, serves as a critical strategic resource that significantly enhances SCR. The systematic literature review revealed that advanced technologies—such as BDA, ML, AI, IoT, and Blockchain—collectively empower organizations to make faster, data-driven decisions, thereby fostering agility, resilience, and competitive advantage in increasingly dynamic market environments. The findings highlighted that TDDA enables real-time visibility, accurate demand forecasting, and predictive risk management, all essential for responsive supply chains. Moreover, IS acted as a key enabler that facilitated seamless coordination and trust among supply chain partners, mitigating issues of information asymmetry and enhancing operational transparency. The mediating role of IS reinforced the assertion that data analytics alone cannot achieve optimal SCR outcomes without effective information dissemination and collaborative practices.

This research contributed to both theory and practice. Theoretically, it advanced current understanding by integrating TDDA and IS into a unified model to explain their combined impact on SCR. Practically, it offered a strategic roadmap for firms seeking to improve supply chain performance through digital transformation. Managers are encouraged to view TDDA not merely as technological adoption but as a capability that must be aligned with information governance and inter-organizational cooperation. In conclusion, this study underscored the imperative for manufacturing firms and supply chain stakeholders to invest in technological infrastructure and collaborative frameworks. Doing so will enable them to respond swiftly to market fluctuations, enhance customer satisfaction, and secure long-term competitive positioning. As supply chains become more complex and interdependent, the synergy between TDDA and IS will be pivotal in shaping the future of responsive and resilient supply chain systems.

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AUTHORS CONTRIBUTION

Zayed Saleh (Conceptualization, Methodology; Writing - original draft)

Mohammed Shabir (Discussions and Conclusions – Review)

AVAILABILITY OF DATA AND MATERIALS

The data supporting this study's findings are available on request from the corresponding author.

ETHICAL STATEMENT

Not applicable.

CONFLICT OF INTEREST

It should disclose any financial or non-financial interests such as political, personal, or professional relationships that may be interpreted as having influenced the manuscript. The phrase "The authors declare no conflicts of interest" should be included if there is no conflict of interest.

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