


Review Article

Transformational Leadership and Healthcare Supply Chain Modernization: A Systematic Review and Research Agenda

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Abstract: This study investigates the relationship between transformational leadership and the healthcare supply chain modernization, particularly in light of the challenges posed by the COVID-19 pandemic. The introduction highlights the crucial role of leadership in adapting to the rapidly advancing digital environment, which is essential for maintaining competitiveness and resilience. This study addresses a gap in the literature concerning how transformational leadership can have an impact on supply chain modernization. The study concentrates on three principal databases, including Scopus, Web of Science, and PubMed to collect published papers. A total of 2,137 papers related to transformational leadership and supply chain management were initially identified. A systematic literature review was conducted, drawing on 22 peer-reviewed articles published between 2010 and 2025, focusing on transformational leadership and its impact on supply chain modernization. The methodology followed the PRISMA guidelines to ensure a rigorous selection process, analyzing the relationship between transformational leadership and key outcomes in supply chain performance. The findings from the included studies suggest several ways in which transformational leadership may influence aspects of supply chain modernization through knowledge sharing, digital transformation, and organizational agility.

Keywords: Supply Chain Modernization; Transformational Leadership (TL); Systematic Literature Review; Digital Transformation; Leadership Styles.

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1 Introduction

Healthcare plays a pivotal role in the nation's financial system, impacting the wellness of all 347 million Americans, and is indeed one of the fastest-growing sectors of the US economy. With over 22 million workers, it is a critical component of public health and a significant driver of economic growth (Health Industry Distribution Association, 2023). As a major contributor to the nation's economy and public health, the sector relies heavily on effective leadership and resilient systems to ensure access to high-quality care. The COVID-19 pandemic further demonstrated this dependence, as healthcare administrators were required to make rapid decisions about resource allocation, staffing, and operational continuity to maintain system stability during unprecedented disruptions (Vitasek, 2024). The modern healthcare system requires senior leadership with a high-level skillset to implement an innovative strategy adapted to the latest technology.

Persistent inefficiencies and widespread shortages, reported by 93% of healthcare leaders in 2023, demonstrate the urgent need for comprehensive supply chain modernization (Health Industry Distribution Association, 2023). Such modernization requires not only technological upgrades and process redesign but also leadership capable of guiding complex organizational change (Health Industry Distribution Association, 2023). Transformational leadership, with its focus on vision, innovation, and motivating teams, is increasingly recognized as a key driver of supply chain modernization within healthcare settings.

Although previous studies have examined the impact of transformational leadership (TL) on supply chain (SC) management, most reviews focus on contexts outside healthcare, different time periods, or specific organizational settings. These studies often do not provide a comprehensive synthesis of evidence on how transformational leadership drives modernization within healthcare supply chains, particularly in light of recent technological and digital advancements. Additionally, prior reviews frequently overlook methodological variations, contextual factors, and specific outcomes such as process improvements, efficiency gains, and digital adoption. This paper addresses these gaps by updating the literature from 2010 to 2025, focusing specifically on the healthcare context, and systematically synthesizing evidence to highlight underexplored areas and guide future research. The relationship nexus of transformational leadership and healthcare supply chain modernization is of crucial interest to practitioners and scholars alike. Thereby, the current literature will use a meta-synthesis to explore the relationship between transformational leadership and supply chain modernization from 2010 to 2025. In this systematic review, 22 articles were selected to establish the relationship between transformational leadership and supply chain modernization. Examining how transformational leaders can have an impact on the modernization of the supply chain. The structure of the research is as follows: Section 1 introduces the study by clarifying the literature gap that needs to be addressed, along with the motivation for conducting this review. Section 2 presents the study background within the review context of SC modernization and transformational leadership, highlighting the reasons for investigating the relationship between leadership behaviors and SC. Section 3 outlines the methodology, describing the systematic literature review, screening criteria, and study-level assessment based on the PRISMA protocol. Section 4 illustrates the results and findings, highlighting how transformational

leadership impacts the supply chains, and provides recommendations that guide future research. Section 5 concludes the paper by summarizing key findings and describing limitations.

This research should demonstrate the value of enhancing supply chain efficiency and effectiveness by integrating the Internet of Things (IoT), implementing the latest technology, adopting redesign strategies, and managing change. Practically, this means that organizations should invest in digital transformation to modernize their supply chain systems and maintain competitiveness. Moreover, invest in improving their leaders' skills by initiating training and development programs. On the other hand, the results of this paper should help develop a theory of the nexus between transformational leadership and supply chain modernization. The findings will aid in filling the knowledge gap by furnishing a consolidated literature review. This study would be a substantial resource for scholars and practitioners, guiding them in implementing leadership-driven modernization to improve supply chain management performance.

2 Study Background

2.1 Supply Chain Modernization

Supply Chain Modernization (SC modernization) refers to a digital transformation approach that integrates the latest technologies, data analytics, and collaborative frameworks to improve inventory management, logistics, and procurement processes (Sahoo et al., 2023). This modernization is driven by the need to enhance efficiency, resilience, and patient outcomes. Several research articles supply valuable insights into the strategies and technologies driving this transformation related to supply chain modernization. Zhang et al. (2023) investigated the impact of transformational leadership on innovativeness within the supply chain. Their research recommended that organizational leaders and decision-makers adopt transformational behavior to enhance their entire supply chain innovativeness. Similarly, Risambessy and Wairisal (2023) found that transformational leadership has a positive influence on supply chain innovation (modernization) performance, which in turn improves Micro, Small, and Medium-sized Enterprises (MSMEs) satisfaction with supply chain outcomes. The research used supply chain innovation to mediate the relationship between transformational leadership and supply chain outcomes. Results revealed the significant impact of transformational leadership on supply chain outcomes and supply chain innovation. Authors Hassan and Jakuula (2024) concluded that driving innovation through transformational leadership is a prerequisite for improving supply chain performance by supporting supplier integration and motivating employees to accomplish organizational objectives. Leadership is the primary driver of modernization (redesign) in the supply chain.

Lin and Yu (2023) addressed traditional supply chain shortcomings by examining the luxury adaptation of industry to the digital economy, emphasizing the incorporation of digital tools such as blockchain technology and artificial intelligence. The research emphasized the importance of modernizing the luxury sphere's supply chain management to sustain effectiveness and meet evolving consumer expectations (Lin & Yu, 2023). Arruda and Wyner (2023) discussed the need for healthcare organizations to consider investments in the supply chain to generate financial

benefits and enhance operational activities. The study demonstrated that there should be benefits for the hospitals adopting the SC modernization approach, such as cost savings and improved patient care within healthcare organizations (Arruda & Wyner, 2023). Investing in the SC modernization is necessary for hospitals to optimize their functions and control the growing challenges in healthcare delivery. Modernizing the supply chain allows hospitals to achieve key outcomes that benefit both patients and the organization (Arruda & Wyner, 2023).

Ning and Yao's (2023) research explored how digital transformation enhances supply chain capabilities, positively influencing sustainable organizational performance. The study suggested that organizations adapted their supply chain operations to modernization, and this digital transformation has sustained them in preserving sustainability, agility, and competitiveness in global markets (Ning & Yao, 2023). The research findings revealed that the digital transformation consists of a determining factor of SC modernization, directly contributing to improved capabilities and competitive performance (Ning & Yao, 2023). Embracing digital instruments and techniques can help organizations create customer-centric supply chains, ensuring extended success in an increasingly complicated and dynamic environment.

Furthermore, researchers Xu et al. (2024) explored the performance of independent supply chains utilizing multi-agent approaches, delivering methods, and subject analyses to illustrate valuable applications. The article examined the effects of autonomous supply chains in global disruptions to maintain efficiency and resilience (Xu et al., 2024). The research revealed that the autonomous meat supply chain (case study) was a valuable example of how decentralized systems can transform supply chain operations (Xu et al., 2024). By presenting a robust architecture, practical toolkit, and actionable guidelines, the study paved the way for similar implementations across industries (Xu et al., 2024). Supply chain modernization is a sustained key driver for all US hospitals that aspire to enhance operational efficiency, supplier collaboration, and patient care by leveraging technology processes.

The research articles together provide valuable insights into the ongoing efforts and research dedicated to modernizing supply chains across diverse industries. They highlight the critical role of digital transformation, technological integration, and strategic investments in achieving efficient, and sustainable supply chain operations.

2.1.1 What is SC modernization in healthcare setting?

Supply chain modernization (SC modernization) in healthcare affects the strategic enhancement of processes, technologies, and systems to improve healthcare delivery efficiency, resilience, and effectiveness. While a single, universally accepted definition may not be available, several authoritative sources provide comprehensive insights into this concept. Nadeau (2023) emphasized in her research that modern supply chain management in healthcare goes beyond merely meeting clinical demand; it positions healthcare logistics as a competitive advantage. The article research has focused on integrating advanced technologies, such as distributed ledger technology and knowledge engineering to improve supply chain operations, ensure timely delivery of medical supplies, and optimize costs (Nadeau, 2023). The author defines supply chain modernization in healthcare as the optimization of supply chains and the application of supply chain technology to

overcome challenges, reduce costs, and manage inventory more efficiently, resulting in less waste (Nadeau, 2023). Thus, modernization plays a crucial role in the success of the healthcare supply chain, reduces costs, and enhances inventory planning. Identifying and targeting specific supply categories, such as increased market demand for items, localized manufacturing process disruptions, and limited raw materials, is essential for effective supply chain management.

Tremblay (2024) has discussed how effective supply chain management in healthcare ensures the continuous availability of indispensable medical supplies, including personal protective equipment and medications. By establishing a seamless connection between procurement, logistics, inventory management, and distribution, the healthcare supply chain system can become more efficient and effective. The study emphasized that healthcare facilities must modernize supply chain management with the purpose of improving patient care to remain competitive and successful (Tremblay, 2024). Furthermore, healthcare should preserve a constant supply and control disruptions of necessary items by involving cooperation with standardized processes and trustworthy suppliers (Tremblay, 2024). The supply chain displayed inefficiencies relative to overspending costs in U.S. healthcare, representing 30% of all healthcare facility expenditures and a pressing need for improvement and modernization (Tremblay, 2024). The implementation of a strategic plan to modernize supply chains became substantial for U.S. healthcare to effectively improve operational performance, decrease expenses, and preserve the most elevated quality of patient care. The U.S. healthcare spending is not only a financial imperative but also a critical component of delivering effective healthcare. Moreover, Arruda and Wyner (2023) argued that establishing robust inventory administration approaches and facilitating procurement processes depend on SC modernization's investment. They recommended that such investments improve operational efficiency, cost savings, and better patient care outcomes (Arruda & Wyner, 2023). Investing in supply chain modernization can significantly contribute to proactively addressing unforeseen disruptions, such as public health emergencies and supply shortages. The supply types include medical equipment and surgical supplies.

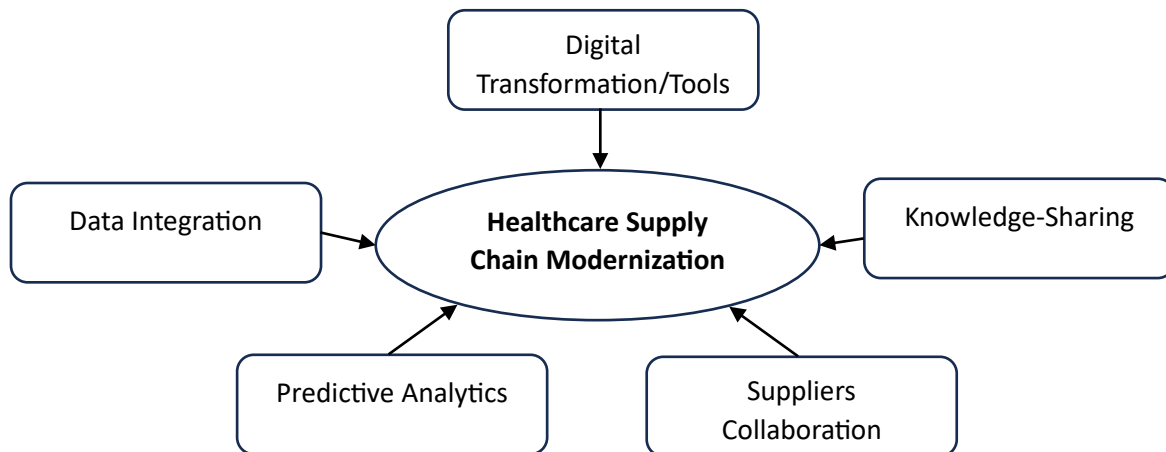


Figure 1. Conceptual Diagram of Healthcare Supply Chain Modernization.

The conceptual diagram, shown in Figure 1, describes healthcare supply chain modernization as an interconnected system of five core dimensions: digital transformation/tools, knowledge-

sharing, supplier collaboration, predictive analytics, and data integration. By focusing on these dimensions collectively, healthcare organizations can achieve significant improvements in supply chain implementation and patient outcomes (Avinash & Joseph, 2024; Kwon et al., 2016; Ivanov & Dolgui, 2020). Collectively, these studies described supply chain modernization in healthcare as the comprehensive transformation of supply chain processes by adopting advanced technologies, strategic collaborations, and standardized practices (Nadeau, 2023; Tremblay, 2024; Arruda & Wyner, 2023). The objective is to provide the timely and efficient delivery of medical supplies, reduce costs, and improve the overall quality of patient care.

This systematic review focuses specifically on the supply chains of medical and healthcare supplies, including medicines, medical devices, and equipment, which are critical for the effective functioning of healthcare organizations. These supply chains have unique complexities and require specialized procurement, storage, and distribution mechanisms. Other types of supplies, such as stationery and bed linen, are outside the scope of this review, as their supply chain processes and implications for modernization differ substantially. By clearly defining this scope, the study aims to provide targeted insights into how transformational leadership can support the modernization of healthcare supply chains that directly affect patient care and organizational efficiency.

2.1.2 Challenges associated with modernization

Modernizing supply chains, particularly in healthcare, presented several challenges that can impede progress if not adequately addressed. Many studies have identified key obstacles. According to Heeres et al. (2023), multiple challenges have been identified, such as the need for specialized skills, data security concerns, and high costs in healthcare supply chains relative to the performance of the Integration of the Internet of Things (IoT). The research recommended that healthcare providers adopt IoT to face these barriers (Heeres et al., 2023).

During the Coronavirus 2019 crisis, the healthcare industries experienced multiple hardships, including procurement challenges and shortages of critical medical supplies, which showed vulnerabilities in hospital supply chains (Spieske et al., 2022). In this context, Spieske et al. (2022) emphasized the need for techniques to enhance demand forecasting and diversify suppliers. Regarding COVID-19 treatment, various types of medical supplies were involved, including drugs, ventilators, and personal protective equipment (Spieske et al., 2022). Similarly, Nadeau (2023) explained that challenges like lack of system integration, data silos, and manual data capture hinder effective supply chain management. Handling these issues is paramount for optimizing logistics and improving patient care (Nadeau, 2023).

McBride (2024) demonstrated several factors that affect healthcare supply chain management. Emerging obstacles in healthcare supply chain services include inadequacies in resilience, visibility restrictions, cost management obstacles, integration barriers, and disparities in service provision (McBride, 2024). The US healthcare facilities should invest in technology, process optimization, and strategic planning to address challenges associated with modernization. The comprehensive approach is a leading factor in enhancing efficiency and healthcare supply chain stability (McBride, 2024). The significance of the healthcare supply chain lies in the provision of

excellent medical equipment and the accuracy of prescription drugs, ensuring the necessary resources are available and patients receive high-quality treatment.

2.1.3 Tool for modernization

Modernizing the supply chain involves integrating advanced tools and technologies to be efficient, adaptable, and competitive. Many studies have investigated miscellaneous instruments and methodologies for SC modernization. For example, Lin and Yu (2023) investigated applying digital tools such as Artificial Intelligence (AI), sustainability practices, and blockchain technology in converting supply chain standards in the context of the luxury industry. This research emphasized that digitalization is significant in handling the deficiencies of conventional SC modernization approaches (Lin & Yu, 2023). AI is a promising tool for the future in terms of IT supply chain efficiency and communication strategy and for all organizations that aspire to stay competitive. Several healthcare institutions are starting to integrate AI in their functional activities, such as enhancing supply chain processes, communication strategies, customer services, and data protection and security. Similarly, the study of Zhao et al. (2023) highlighted that digital tools enhance cost-effectiveness, information, and communication efficiency in the supply chain context, particularly during crises. Moreover, to mitigate disruptions and drive growth by integrating intelligent software solutions, healthcare administrations must build adaptive supply chain activities and processes to cope (Choudhury, 2024). Most previous research studies focus on improving supply chain management, which requires integrating modernization strategies and implementing advanced software tools to optimize inventory and mitigate risk for organizations (Choudhury, 2024). Integrating intelligent software in supply chain management as a tool could have gauged inventory levels, identified disruptions, and monitored consumer behaviors. In a geopolitical tension situation that creates supply chain disruptions, the intelligent software could pre-emptively identify vulnerabilities, highlighting dependencies on specific regions or suppliers (Choudhury, 2024). Also, the intelligent software pre-emptively managed to determine susceptibilities in geopolitical uncertainties that create supply chain disruptions, underscoring dependencies on distinctive areas or suppliers.

2.2 Transformational Leadership

From the beginning, the transformational leadership theory is described as a dynamic between political leaders and followers that creates a new path of growth and prosperity in front of the organization (Mekonnen & Bayissa, 2023; Yang et al., 2024). Transformational leadership specifies leaders as those who seek to significantly impact subordinates and the organization by creating inspirational motivation to achieve organizational objectives without exceeding their self-interests for the sake of the collective vision. Leaders who adhere to transformational leadership perceive it as a spiritual, moral, and conscious process built on development models for the organization through reliable equal-power leadership (Mekonnen & Bayissa, 2023). This leadership style is considered the most dominant leadership theory in the 20th and 21st centuries compared to other theories.

Many studies have examined several leadership styles and their effects on supply chain modernization (SC modernization). Although leadership approaches such as transactional

leadership, servant leadership, and autocratic leadership have been studied, transformational leadership has gathered substantial attention for its profound influence on supply chain innovation and performance. Many research studies emphasized that the organizational supply chain's productivity depends significantly on leadership capacity to innovate and adapt operational activity based on technological growth. Transformational leadership substantially impacts the supply chain because it considers, motivates, and values employees to come up with new approaches to work with their suppliers (Hassan & Jakuula, 2024). In their article review from 2000 to 2024, the authors concluded that transformational leadership improves supply chain implementation by promoting sustainable practices and leading innovation (Hassan & Jakuula, 2024). Furthermore, prior research has explored how organizations can investigate the outcomes of transformational leadership to increase the efficiency of their old-style leadership practices (Triyono, et al., 2023). This style aids the employees in understanding better that the organization and their leaders are supportive, which develops a work culture and helps both leaders and employees to be more productive (Triyono, et al., 2023).

Based on social learning theory, Feng et al. (2024) analyzed how transformational leadership in supply chains influences resilience through ambidextrous business models, highlighting the moderating role of paradox cognition. The research findings demonstrated an optimistic effect of transformational leaders on supply chain resilience mediated by the ambidextrous business model (Feng et al., 2024). However, the implication and motivation of employees by transformational leaders within the supportive organizational context enhance supply chain resilience. Transformational behaviors focus on the workers' interests first, which creates trust and reliable cooperation between managers and their followers in the supply chain process to achieve the organizational goal.

Zhang et al. (2023) examined how transformational leadership fosters a knowledge-sharing climate, leading to increased supply chain innovativeness, with supply base rationalization acting as a moderating factor. The research revealed that most leaders' supply chains adopted transformational behavior to increase entire supply chain innovativeness in developing countries (Zhang et al., 2023). Also, research results showed supply chain knowledge as a partial mediator between supply chain innovativeness and transformational leadership (Zhang et al., 2023). It will be profitable for the leaders to have a profound knowledge of the supply chain if they would like to use transformational behavior as a tool to impact the supply chain management. In addition, all decision-makers, directors, and leadership staff who aspire to a robust and efficient supply chain system are highly advised to embrace transformational behavior towards others in organizations such as the healthcare sector and government institutions.

2.2.1 Key Components of Transformational Leadership

Transformational leadership is a prominent theory in organizational behavior, emphasizing leaders' abilities to inspire and motivate followers to exceed expectations. Key components of transformational leadership have been considerably studied in academic literature. This systematic review uses the key components of transformational leadership from Avolio and Bass (Mekonnen & Bayissa, 2023). The key components are characterized by transformational leaders' actions and behavior below.

- **Idealized Influence.** Leaders promote trust and respect for their subordinates, which produces above-average ethical integrity and standards (Mekonnen & Bayissa, 2023). Healthcare leaders who adhere to the ideology of transformational leadership behaviors can significantly impact their followers, making them productive by realizing their jobs beyond the set goals.
- **Individualized Consideration.** Leaders are focused on the interests of their subordinates by being supportive and attentive to their needs (Mekonnen & Bayissa, 2023). Leaders act as mentors and coaches in this leadership behavior category to help subordinates improve their performance and build strong teamwork.
- **Inspirational Motivation.** Leaders boost followers to dedicate themselves to the organization's objectives by communicating a persuasive motivation and vision (Mekonnen & Bayissa, 2023). The followers benefit from their leaders providing more responsibility to finish tasks, thus strengthening the relationship between both. This leadership behavior uses employee accountability as a key motivation for delegating authority to followers to make decisions.
- **Intellectual Stimulation.** Leaders support a dynamic that encourages creativity and innovation by stimulating current views and processes where employees feel unassailable to communicate new thoughts (Mekonnen & Bayissa, 2023). Organizations or leaders that wish to have a robust SC modernization system, respond to customer needs, and remain competitive in the market must consider this leadership behavior.

2.2.2 Applications for Transformation Leadership

Transformational leadership (TL) has been widely studied across various sectors, demonstrating its applicability in enhancing organizational performance, employee well-being, and fostering innovation. Therefore, the ideology of modernizing the organization's supply chain is mostly an inspirational motive through transformational leaders, who focus on employees' interests first before themselves to achieve the organization's goals. When the followers feel supported by their leaders or organizations, they are motivated and become more creative and productive at work. Transformational leadership significantly affects healthcare SC modernization as a key solution to creating innovation in supply chains and integrating supply chain strategic goals across all directorate levels. Several research articles explore the applications of transformational leadership.

The authors Khan et al. (2020) investigated the influences of TL on employees' burnout, performance, and work outcomes. Their findings suggested that TL is an appropriate leadership behavior to enhance employee performance and reduce burnout by fostering a supportive work environment. TL is an approach that helps leaders motivate their followers to perform work and accomplish organizational goals beyond expectations. The empirical study established a positive correlation between transformational leadership and intrinsic motivation by improving followers' confidence level and preserving the optimum level of mental health (Khan et al., 2020). Moreover, the authors' research of Steinmann et al. (2018) demonstrated that transformational leaders enhance job satisfaction and proactive behavior among their followers by providing explicit definitions and communication of organizational goals. TL significantly affects job satisfaction and organizational culture compared to other leadership behaviors, such as transactional, servant, and autocratic

leadership. The subordinates that transformational leaders lead have high-quality performance work and achieve objectives more than expected. Kim and Cruz (2022) conducted a meta-analysis to investigate the association between TL and employee well-being in the service sector, and the results indicated that TL positively impacts employees' psychological well-being, increasing job satisfaction and reducing stress levels. Additionally, other authors, such as Lai et al. (2020) used the role of organizational commitment as a mediator to display the effects of transformational behavior on job performance, and their research results indicated that transformational leaders encourage the responsibility of employees, thereby improving their performance (Lai et al., 2020). Researchers have investigated TL as the most influential leadership approach in the last decade due to its beneficial impact on followers' work. Transformational leaders possess strong ethical values, which consider their employees' interests before themselves. They are constantly promoting employees' accountability and trust by placing them at the center of their leadership strategies to achieve organizational objectives.

This review framework, Table 1, illustrates how transformational leadership (TL) catalyzes organizational modernization through specific mechanisms, based on literature from 2010 to 2025.

Table 1. TL - Modernization Mechanisms Framework.

| Mechanism | Description | Supporting Articles |
|---------------------------------------|--|----------------------------|
| Commitment to Change | Transformational leaders inspire followers' emotional commitment to change, enhancing their willingness to embrace and drive modernization efforts. | (Ystaas, et al., 2023) |
| Innovative Behavior | Investigates the influence of transformational leadership on healthcare workers' innovative behavior in Jordan's private hospitals, highlighting the role of leadership in fostering innovation. | (Raoush, 2023) |
| Organizational Support for Creativity | Leaders create a culture that values and supports creativity, which is crucial for the success of modernization efforts. | (Jun & Lee, 2023) |
| Vision Communication | Effective communication of a compelling vision by transformational leaders aligns the organization towards modernization goals. | (Steinmann et al., 2018) |
| Emotional Intelligence | Analyzes the role of transformational leadership in fostering trust and enhancing job satisfaction in healthcare settings, contrasting it with other leadership styles. | (Notarnicola et al., 2024) |

The study examines transformational leadership within healthcare organizations, particularly among leaders involved in the demand side of the supply chain, including procurement, acquisition, internal logistics, and supply chain coordination. Leadership behaviors in these roles are central to driving modernization, digital adoption, and process improvement within healthcare

supply chains. Leadership on the supplier or innovation side of the chain (e.g., manufacturers or external vendors of medical devices and equipment) is excluded, as these contexts involve different stakeholder structures and operational mechanisms that do not directly influence internal healthcare supply chain modernization.

Additionally, as shown in Figure 2, the review shows how transformational leadership (TL) behaviors serve as catalysts for targeted managerial implications, facilitating hospital supply chain modernization (Kludacz-Alessandri et al., 2025; Mekonnen & Bayissa, 2023). This diagram shows how transformational leadership (TL) behaviors serve as catalysts for targeted managerial implications, facilitating hospital supply chain modernization (Kludacz-Alessandri et al., 2025; Mekonnen & Bayissa, 2023).

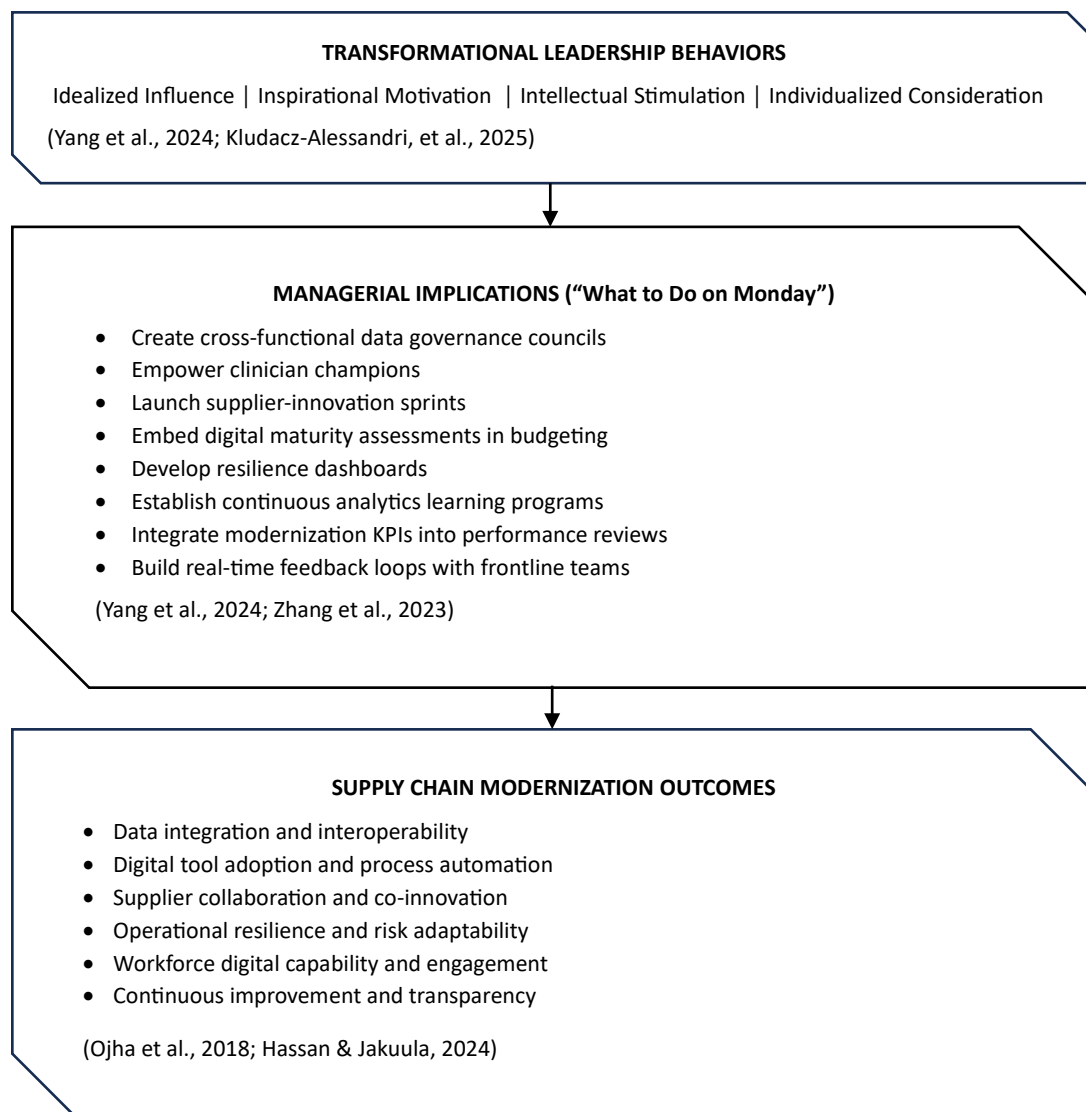


Figure 2. TL (Mekonnen & Bayissa, 2023) and Healthcare Supply Chain Modernization.

3 Methodology

This systematic review examines the relationship between transformational leadership and supply chain modernization. The review employed a structured methodology, which included a systematic literature review search across academic databases, application of screening criteria, and a study-level assessment.

3.1 Systematic Literature Review

The study approach involves a systematic literature review, which is located on three (3) central databases, including Scopus (by Elsevier), Web of Science (Clarivate Analytics), and PubMed (for health-related articles). Several subject areas and science categories were considered, such as operations research, management science, environmental sciences, transportation science, technology, and healthcare science. The choice of Scopus, Web of Science, and PubMed as the three principal databases for our systematic review is based on a combination of coverage, credibility, and relevance to the research's interdisciplinary nature. Bramer et al. (2017) evaluated how combinations of databases affect recall, precision, and number needed to read. The authors find that using a set of well-established databases (e.g., Scopus, Web of Science, and PubMed) gives a much better recall of relevant literature than using only one or two (Bramer et al., 2017). This supports the strategy of choosing several strong and complementary databases. Moreover, Scopus is well-suited for our study, as it covers articles related to leadership and supply chain modernization, making it ideal for capturing a diverse range of peer-reviewed literature (Powell & Peterson, 2017). Mongeon and Paul-Hus (2015) observed that the Web of Science ensures access to high-impact journals and improves the academic rigor of the review. PubMed was retained for its authoritative and comprehensive coverage of healthcare supply chain modernization settings (Rethlefsen et al., 2015).

The study used the following terms to define the inclusion criteria, with appropriate synonyms, and connected them using Boolean operators (Higgins, et al., 2023). For example, "transformational leadership" was combined with "leadership style" or "leadership behavior," and "supply chain modernization" was combined with "supply chain innovativeness" or "digital supply chain", focusing specifically on healthcare or hospital supply chains, including medicines, medical devices, and equipment. This approach ensured that all included studies were directly relevant to the relationship between leadership behaviors and redesign efforts within healthcare supply chains (Methley et al., 2014). These works were also used to integrate a vast body of literature on the influence of transformational leadership on supply chain modernization through digital, resilience, and transformational approaches. Even though a broad range of leadership styles exists, our paper focuses on transformational leadership due to its significance in enhancing employee engagement, fostering innovation, and boosting performance within the supply chain. The analytical review was restricted to peer-reviewed journal articles published between 2010 and 2025. Review papers written in English and published in peer-reviewed journals provide an in-depth analysis of the study's findings. Exclusion criteria included studies unrelated to healthcare settings, transformational leadership studies not connected to the supply chain, and papers focused on general supplies (e.g., stationery, linens) or Information and Communication Technology (ICT) services. Also, articles, dissertations, non-peer-reviewed sources, and investigations without an

accessible full text were excluded. Literature articles were screened using predefined inclusion and exclusion criteria, focusing on a systematic review of leadership practices, supply chain, and digital transformation in the healthcare setting.

3.2 Screening Criteria

To assist with the selection of this systematic review for inclusion and to support the prevention of inclusion bias, criteria were based on the guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Anuar et al., 2022; Agazu et al., 2025). The articles' identification followed specific inclusion criteria, which concerned published papers from 2010 to 2025. Articles issued before 2010 were excluded from the search, resulting in 2,137 research articles. Initial studies, such as leadership styles, organizational culture, and management research, are conducted, but ultimately, we narrow our focus to concentrate on transformational leadership and supply chain management subject areas only. This resulted in the additional exclusion of 199 duplicate records that were identified within the three databases. Similarly, document types were restricted to article and review papers, resulting in the exclusion of 1,257 records after a stepwise screening of the title and abstract. The keyword exclusion criteria used in the search related to the relationship between transformational leadership and supply chain modernization. The authors imported all references into an Excel spreadsheet, which served as the analytical platform for organizing records, screening titles and abstracts, and tracking inclusion/exclusion decisions.

3.3 Study-Level Assessment

This search assessed only original review papers and research articles. To maintain quality and avoid duplications of the review, the publications selected have been evaluated separately. Accordingly, the titles and abstracts of identified studies were screened carefully to determine if they were relevant enough for potential inclusion in the final review. Additionally, conducting a thorough analysis of the scholarly literature was essential for inclusion in the review and its assessment. The predefined criteria enabled the title and screening of 1,257 articles following a rigorous process. Once we had removed duplicates and reviewed the abstracts, we excluded an additional 659 articles from the dataset as deemed necessary.

The literature review systematically assessed multiple research papers and found 22 that were suitable for in-depth analysis. The articles addressed diverse methods, their ability to achieve the research's purpose, and their contribution to our understanding of the nexus between transformational leadership and healthcare supply chain modernization. The selected articles provide a framework for assessing and enhancing supply chain modernization through transformational leadership, constituting a valuable reference of theoretical advancements and empirical data. By adhering to rigorous methodology, ethical procedures, and transparency, the process of this systematic review aligns with the PRISMA statement guidelines. Figure 3 illustrates the PRISMA flowchart for the inclusion and exclusion of literature at each stage of the review process, based on the research objective.

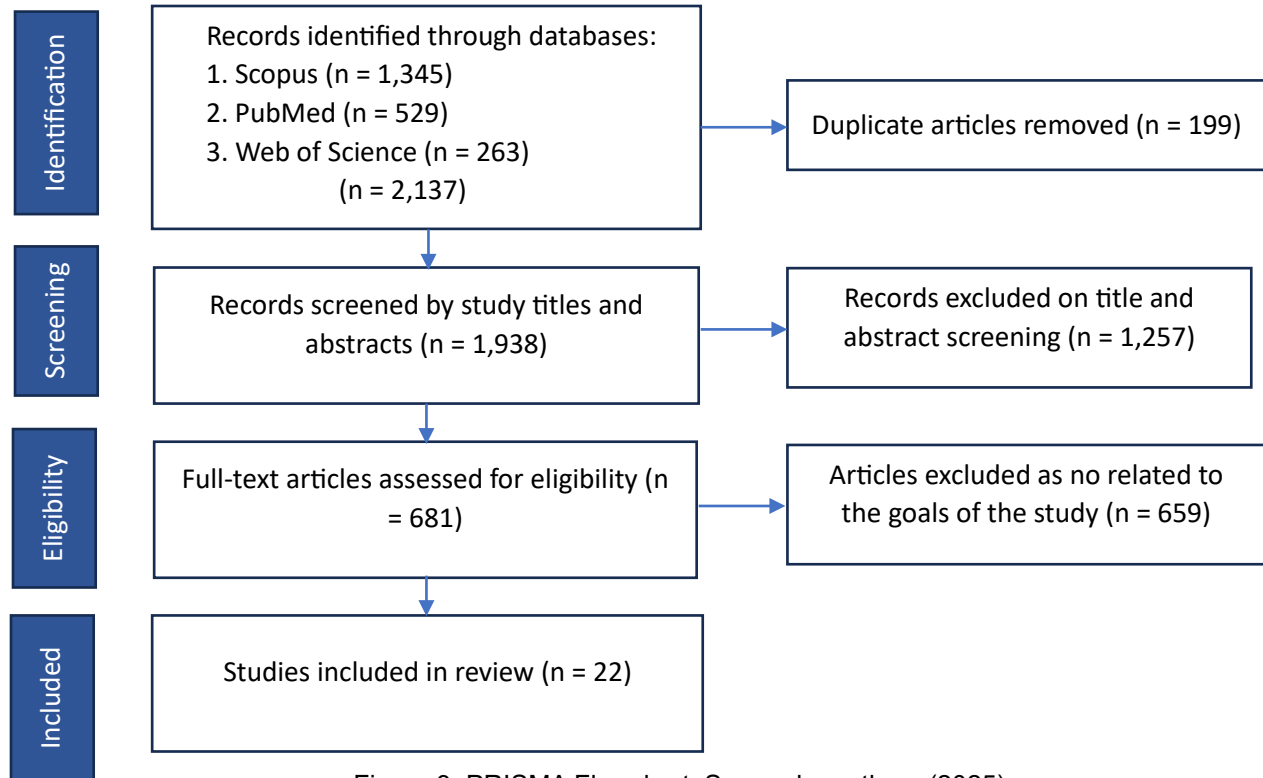


Figure 3. PRISMA Flowchart. Source by authors (2025).

In this study, we applied a systematic approach to analyze the selected publications, ensuring the validity and reliability of findings. Conforming to the study-level assessment, the initial screening was accomplished based on the inclusion and exclusion criteria set for the review. Subsequently, investigations that were not relevant to the research objectives and questions were excluded. Regarding the selected document category, the study exclusively considers journal articles recognized as peer-reviewed research, published between 2010 and 2025. Moreover, the review employed criteria to assess the degree of evidence provided by each study, including study design, sample size, and the validity of the findings. The four phases from the PRISMA flowchart considered in the review process of this research are constituent identification, screening, eligibility assessment, and inclusion (Hassan & Jakuula, 2024). The year 2010 was chosen as the starting point for this study because it marks a period during which transformational leadership and supply chain modernization gained considerable attention within the healthcare sector. This surge in interest coincided with substantial digitization efforts, the integration of advanced technologies, and the overall adoption of Electronic Medical Records (EMR) and Electronic Health Records (EHR) (Hsiao et al., 2010). This time frame captures the era most relevant to modern supply chain improvement efforts.

4 Results

Several studies confirm the significance of the interaction between transformational leadership and supply chain modernization, as summarized in this systematic literature review covering the period from 2010 to 2025. Indeed, 22 selected scientific publications are used to analyze the key findings

section. The primary goal of this study is to investigate the relationship between transformational leadership and healthcare supply chain modernization.

4.1 Findings from the Scientific Publications

The following section synthesizes the key findings from 22 selected studies, showing the variety of ways in which transformational leadership can have an impact on supply chain modernization. Most studies use quantitative methods and literature reviews, though some are qualitative. The specific aspects of TL and SC modernization examined differ across studies, including digital adoption, process improvements, knowledge sharing, and supply chain agility. Therefore, findings should be interpreted as illustrating potential mechanisms and relationships, rather than definitive causal effects. The findings align with those of earlier studies by Zhang et al. (2023) and Feng et al. (2024), among others, which establish a correlation between transformational leadership and supply chain modernization, specifically through enhanced organizational agility, digital transformation, and knowledge sharing. Table 2 presents scientific publications that offer in-depth analyses and many ways in which transformational leadership can have an impact on supply chain modernization. Providing an outline of the literature reviewed in this study, classified under six (6) principal headings: number of articles selected, authors and years of publication, research methodology, major objectives, key findings, and the names of the published journals.

Table 2. Summary of the scientific publications that illustrates the variety of ways TL can influence SC modernization.

| <i>No</i> | <i>Authors</i> | <i>Methodology</i> | <i>Major Objective</i> | <i>Findings</i> | <i>Journal</i> |
|-----------|-----------------------------------|--------------------------------------|--|--|---|
| 1 | (Kludacz-Alessandri et al., 2025) | Quantitative Analysis | The purpose of this research is to explore digital transformational leadership (DTL) increases organizations' digital intensity via organizational agility | The findings reveal that digital transformational leadership significantly enhances digital adoption (directly relevant to digitizing procurement, inventory dashboards, and supplier integration in healthcare supply chains) through organizational agility. | BMC Health Services Research |
| 2 | (Santoso et al., 2022) | Qualitative case studies, interviews | This study investigates how transformational behaviors (vision, communication, empowerment) supported crisis response. | The findings indicate that transformational leaders improved internal communication, staff engagement and supply reconfiguration. | Journal of Communication Inquiry |
| 3 | (Feng et al., 2024) | Quantitative, cross-sectional study | The goal of this research is to explore how supply-chain transformational leadership impacts supply-chain resilience via ambidextrous business models. | The findings show a positive correlation between supply-chain transformational leadership and supply-chain resilience. | Humanities and Social Sciences Communications |

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|----|-----------------------------|-----------------------|--|---|--|
| 4 | (Hiebl & Pielsticker, 2022) | Quantitative Analysis | This study tests how transformational leadership at buyer firms affects long-term supplier relations. | As a result, transformational leadership impacts collaboration and supplier trust, which is substantial for healthcare to secure reliable suppliers and joint modernization initiatives. | Business Strategy and the Environment |
| 5 | (Ali et al., 2025) | Quantitative Analysis | The objective of this research is to explore how leadership (including transformational leadership) shapes supply-chain agility when facing geopolitical or pandemic shocks. | The findings demonstrate that transformational leadership positively affects supply chain agility and adaptability during shocks. | Industrial Marketing Management |
| 6 | (Abu-Qutaish et al., 2025) | Quantitative Analysis | This study measures relationships among transformational leadership, motivation and work engagement in nursing contexts. | According to the results, transformational leadership boosts work engagement level, as evidenced by nursing staff's adoption of supply chain process changes. | BMC Nursing |
| 7 | (Patel, 2023) | Literature Review | The purpose of this review is to assess structural and supply chain changes. | The research's findings affirm that transformational leadership frequently emerges as a driver for rapid adoption of temporary and permanent supply chain process changes (centralized procurement, telehealth logistics). | Journal of Risk Financial Management |
| 8 | (Wardani, et al., 2020) | Quantitative Analysis | This study examines how transformational leadership and communication systems affect commitment to change in SC settings. | The results demonstrate that transformational leadership positively predicts commitment to supply chain modernization. | International Journal of Supply Chain Management |
| 9 | (Nkrumaha et al., 2025) | Quantitative Analysis | The objective of this research is to propose resilience strategies for the healthcare supply chain. | Transformational leadership is identified as critical to resilient stock and logistics policies. Moreover, the findings establish a direct empirical connection between transformational leadership and healthcare supply chain outcomes. | Cogent Business & Management |
| 10 | (Khusheim, 2025) | Quantitative Analysis | This article research evaluates how leadership and digital platforms jointly influence operational modernization | Leadership inclusive of transformational leadership traits accelerates platform adoption, supplier onboarding and cross-functional usage needed for supply chain modernization. | Healthcare Journal |

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|----|-----------------------------|-------------------------------------|--|--|--|
| 11 | (Bai et al., 2025) | Quantitative Analysis | This quantitative study is to understand how transformational leadership supports both exploitative and exploratory innovation. | As a result, transformational leadership enhances dual innovation capability, which in turn improves operational resilience and capacity to modernize supply chain processes. | Current Psychology |
| 12 | (Prabhu & Srivastava, 2023) | Literature Review | This review explores how CEO transformational leadership impacts supply chain agility and subsequently firm performance in small and medium enterprises. | Transformational leadership significantly enhances supply chain agility, which in turn mediates the positive impact on firm performance. | Global Journal of Flexible Systems Management |
| 13 | (Ojha et al., 2018) | Quantitative, cross-sectional study | This study investigates the effect of top management transformational leadership on supply chain organizational learning and supply chain ambidexterity. | The research result shows a significant positive correlation between transformational leadership and supply chain ambidexterity. | International Journal of Production Economics |
| 14 | (Zhang et al., 2023) | Quantitative, cross-sectional study | The purpose of this research is to examine how transformational leadership impacts innovativeness in the supply chain. | Positive correlation of transformational leadership with supply chain innovativeness. | Asia Pacific Journal of Marketing and Logistics |
| 15 | (Bui et al., 2021) | Quantitative Analysis | The objective of this study is to explore how transformational leadership affects innovation, supply chain integration, and job performance. | Positive correlation of transformational leadership with innovation, creativity, and performance mediated by supply chain integration. | Uncertain Supply Chain Management |
| 16 | (Hassan & Jakuula, 2024) | Systematic Review | This research examines the effect of transformational leadership on supply chain performance. | According to the study's findings, transformational leadership affects the performance of the supply chain by integrating innovation. | International Journal of Organization Leadership |
| 17 | (Hariyani et al., 2025) | Systematic Review | This study investigates the role of leadership in the success of sustainable digital transformation and enhancing supply chain operations. | The findings indicate that transformational, adaptive, and ethical leadership styles significantly affect sustainable digital transformation through integrated mechanisms such as change management, and strategic alignment. | Sustainable Futures |

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|----|---------------------------------------|---|--|--|---|
| 18 | (Defee et al., 2010) | Quantitative Analysis | The objective of this paper is to explore the development of supply chain leadership and supply chain followership concepts from literature. Additionally, this research proposes a theory of leadership within supply chains. | The findings reveal that supply chain follower organizations have a significant influence on operational performance than the supply chain leader. | International Journal of Physical Distribution & Logistics Management |
| 19 | (Leana-Morales & Cuevas-Vargas, 2024) | Quantitative, cross-sectional empirical study | This study's overarching purpose is to explore how transformational leadership and knowledge management practices interact to foster supply chain agility. | According to the study's findings, transformational leadership positively influences knowledge sharing and innovation, which strengthens supply chain agility and improves organizational adaptability. | Procedia Computer Science |
| 20 | (Nichols et al., 2020) | Quantitative Analysis | This research looks at how servant and transformational leadership styles influence supply chain management effectiveness. | The servant and transformational leadership styles positively affect collaboration and trust in supply chain networks, but transformational leadership was found to be more impactful in driving innovation and adaptability within supply chains. | Journal of Management and Science |
| 21 | (Fariz, 2022) | Quantitative Analysis | This paper analyzes the combined effect of supplier integration and managerial transformational leadership on supply chain performance. | Both supplier integration and transformational leadership significantly enhance supply chain performance, with leadership playing a mediating role in strengthening supplier relationships and operational outcomes. | Uncertain Supply Chain Management |
| 22 | (Risambessy & Wairisal, 2023) | Quantitative Analysis | This quantitative study examines how transformational leadership in supply chains impacts innovation performance and MSME satisfaction | According to the study's findings, transformational leadership positively influences supply chain innovation (modernization) performance, which in turn improves MSMEs' satisfaction with supply chain outcomes. | Uncertain Supply Chain Management |

Based on the selected publications above, the major findings reveal the variety of ways in which transformational leadership can have an impact on supply chain modernization. Zhang et al. (2023) in their study explore how digital transformational leadership influences supply chain innovativeness to help improve knowledge sharing and moderate rationalization. The results indicated a positive correlation nexus of transformational leadership and supply chain innovativeness partially mediated by knowledge sharing (Zhang et al., 2023). Moreover, the

mediated relationship between transformational leadership and innovativeness was positively moderated by base rationalization. In terms of practical implications, adopting transformational behavior across the supply chain is strongly recommended for Managers and Directors who want to enhance their entire supply chain modernization. Similarly, in another study, Risambessy and Wairisal (2023) demonstrated that supply chain transformational leadership had a significant and positive impact on supply chain innovation performance and the satisfaction of supply chain outcomes. The practical implication also encourages Micro, Small, and Medium Enterprises (MSMEs) managers to use transformational leadership, which increases supply chain innovation and performance. This paper emphasizes that leadership is crucial to implementing stable supply chain modernization techniques. Nevertheless, research by Hassan and Jakuula (2024) demonstrated that transformational leadership positively affects the performance of the supply chain and promotes sustainable practices by driving innovation and integrating suppliers. The conclusion from their research revealed that fostering innovation through transformational leadership is paramount for enhancing the performance of supply chains and supporting organizations.

Prior research has established that successful supply chain processes and performance depend on transformational leadership effectiveness. For example, the authors Prabhu and Srivastava (2023) concluded that transformational leadership positively affects supply chain agility, which improves overall performance. Additionally, in supply chain settings, transformational leadership benefits healthcare facilities by involving inspirational motivation and pushing employees to achieve their tasks beyond expectations. Similarly, Defee et al. (2010) found that transformational leaders create a positive impact by encouraging holistic performance and fostering informal communication and information availability when working in the context of the supply chain. Further remarks constructed starting with the investigation of prior research demonstrate that transformational leaders' efficiency and effectiveness in developing a work environment support their followers' effort to be creative and drive supply chain processes successfully for organizations (Prabhu & Srivastava, 2023). Most transformational leaders are passionate about innovation and remain optimistic regarding change theory, inspiring their employees to perform beyond expectations. The modernization of the supply chain is not optional for organizations aspiring to succeed in the global industry and adapt to rapidly advancing technology. Also, modernization involves redesign and digital transformation, which are strategic processes aimed at creating a more efficient, resilient, and customer-centric supply chain.

According to the findings of Ali et al. (2025), combining transformational leadership and crisis leadership has a more substantial impact on supply chain agility than when practiced alone. The authors highlighted a synergistic approach to ensuring sustainable organizational success. Transformational leadership emphasizes long-term approaches and continuous improvement, whereas crisis leadership prioritizes rapid action and immediate needs. Nichols et al. (2020) examined the relationship between transformational and servant leadership within supply chain management. Their model demonstrated the effect of leadership style (transformational and servant) on customer satisfaction and employee engagement in the supply chain landscape (Nichols et al., 2020). Also, Leana-Morales and Cuevas-Vargas (2024) used a quantitative causal-predictive approach to investigate the relationship between transformational leadership,

knowledge management, and supply chain agility based on diverse data sources (micro, small, and medium-sized enterprises). These research findings showed a significant influence of transactional leadership on the supply chain success (Nichols et al., 2020; Leana-Morales & Cuevas-Vargas, 2024).

Drawing on 22 selected publications, this review seeks to identify and understand relevant research traditions that have implications for the relationship nexus of transformational leadership and healthcare supply chain modernization through digital transformation, organizational agility, adoption of IoT and AI, and knowledge sharing. The research results of Ojha et al. (2018) indicated a positive correlation between transformational leadership and supply chain ambidexterity mediated by supply chain organizational learning. Their study examined how transformational leadership is pivotal to supply chain organizational learning in addressing uncertainty in the operating environment. A recent study by Nkrumaha et al. (2025) emphasized that transformational leadership moderates the negative relationship between organizational politics and healthcare supply chain performance by fostering a sustainable and collaborative climate. Moreover, their results indicated a positive influence of transformational leadership on healthcare supply chain performance. These findings suggest that strong leadership is crucial for executing a successful supply chain transformation. Our paper used the systematic review process described and employed by Snyder (2019) and Hassan et al. (2024) to select articles for inclusion in this study. To ensure the transparency, quality, and reliability of the search protocol, at least three reviewers have been involved in the review process. The majority of studies establish a positive impact of transformational leadership, although the findings are applied in various methods and contexts. The key findings employ a comprehensive analysis approach, involving a rigorous, in-depth, and systematic synthesis of existing research selection, to enrich the profession and academic discourse of supply chain leaders with a critical outlook.

This review synthesizes and characterizes existing studies that have examined or attempted to examine the relationship between transformational leadership and supply chain modernization. Our paper demonstrates that transformational leadership is a key driver in fostering modernization through strategic objectives, digital transformation, knowledge sharing, and organizational agility. Transformational leaders inspire followers to willingly contribute and invest in creating a successful supply chain, thereby helping to achieve the goals of supply chain development. Nevertheless, implementing a collaborative information-sharing system can be more effective in bringing supply chain members together, allowing them to work towards a shared objective and efficiently handle data related to supply chain management (Yang et al., 2024). Collaborative communication is a precondition for enhancing supply chain modernization. Leaders who build trust and prioritize collaborative efforts among employees can enhance organizational technology and foster long-term sustainable growth, thus promoting supply chain modernization.

4.2 Recommendations

Based on the heterogeneous but informative evidence across the 22 included studies, the following recommendations reflect what the existing literature cautiously suggests about how transformational leadership may contribute to supply chain modernization:

- Fostering leadership behaviors that support a culture of innovation and learning. Several studies indicate that transformational leadership can promote organizational learning, knowledge sharing, and motivation factors linked to modernization-oriented behaviors.
- Strengthening communication and knowledge-sharing systems led by leadership. Evidence from multiple studies suggests that modernization is facilitated when leaders create an environment that supports open communication, collaboration, and shared vision.
- Developing digital readiness among teams as encouraged by leadership. Studies on digital transformation in healthcare show that leaders who model digital openness and support staff training can accelerate digital adoption and modernization.
- Considering mediating and moderating factors (e.g., organizational learning, knowledge sharing, digital intensity) when examining TL and SC modernization links. While the evidence is still emerging, several empirical studies demonstrate that these variables can strengthen or explain how leadership relates to modernization outcomes.
- This paper could present limitations (prior years might have been missed) since publications selected only cover the period from 2010 to 2025, and future research could provide additional insights.
- Emphasis on the benefit for the organization adopting the characteristics of transformational behaviors to drive the modernization in the healthcare supply chain setting by promoting AI integration and resolving complex problems.

These recommendations do not prescribe how supply chains should modernize operationally; instead, they reflect leadership-driven influences suggested by the current literature.

5 Conclusion

This study underscores the various ways in which transformational leadership can support supply chain modernization in healthcare, including digital transformation, organizational agility, adoption of IoT and AI, enhanced process efficiency, and knowledge sharing. Through a systematic review of 22 peer-reviewed articles published between 2010 and 2025, it is evident that the results illustrate the variety of ways TL can influence SC modernization. Transformational leaders facilitate the adoption of digital tools, foster a culture of innovation, and strengthen supplier collaborations, all of which are essential for modernizing supply chains in the healthcare sector. The findings highlight that healthcare organizations must prioritize digital transformation and invest in leadership development programs to address the ongoing challenges and dynamic nature of the healthcare environment. By doing so, organizations can not only improve their operational efficiency but also ensure the timely delivery of medical supplies, reduce costs, and ultimately enhance patient care quality. Moreover, this study determines both insights and gaps in the literature, providing a foundation for future investigations by systematically exploring the relationship between transformational Leadership and supply chain modernization. It provides a comprehensive framework for understanding how leadership behaviors can influence supply chain

processes through diverse methods, thereby offering practical insights for healthcare administrators and policymakers.

Future research should develop digital readiness among teams, as encouraged by leadership. Studies on digital transformation in healthcare show that leaders who model digital openness and support staff training can accelerate digital adoption and modernization. Additionally, consider mediating and moderating factors (e.g., organizational learning, knowledge sharing, digital intensity) when examining the links between TL and SC modernization. While the evidence is still emerging, several empirical studies demonstrate that these variables can strengthen or explain how leadership relates to modernization outcomes.

This review has several limitations. First, the included studies displayed substantial heterogeneity in research design, methods, constructs measured, and outcomes assessed, which limited the ability to draw firm generalizable conclusions. Second, while the search strategy was systematic, it focused on English-language, peer-reviewed publications, potentially excluding relevant grey literature and non-English studies. Third, the evidence based on transformational leadership within healthcare supply chain modernization remains relatively small and uneven, with several studies relying on cross-sectional survey designs and literature reviews without empirical testing. Finally, variations in how transformational leadership and modernization constructs were defined across studies prevented the use of meta-analysis and required a narrative synthesis.

Overall, this research contributes to the theoretical and practical understanding of supply chain modernization in healthcare, emphasizing the indispensable role of transformational leadership. By adopting the principles of transformational leadership, healthcare organizations can navigate the complexities of modern supply chain demands, ensuring both organizational success and the highest quality of patient care.

Contributor Statement

Djako Djoman and David Thompson were responsible for conceptualization, writing the original draft preparation, literature review, methodology, the review and editing of the paper, and facilitating visualization. Provided critical revisions and ensured alignment with transformational leadership and supply chain modernization literature. We reviewed and approved this manuscript.

Use of AI

During the preparation of this work, the authors Grammarly for language editing and grammar checks to improve the clearness of the manuscript. After using this tool, the authors reviewed, edited, made the content their own and validated the outcome as needed, and take full responsibility for the content of the publication.

Conflict of Interest (COI)

There is no conflict of interest.

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