

Integration of Strategic CSR and Digital Leadership to Supply Chain Sustainability in Jordanian Public Hospitals: Moderating Role of Green Technology and E-Knowledge Sharing

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Abstract. The aim of this study was to analyze the effect of strategic corporate social responsibility and digital leadership on supply chain sustainability in Jordanian public hospitals. It also examined the moderating effects of green technology and e-knowledge sharing in these relationships. The study population consisted of public hospitals in Jordan, including Ministry of Health hospitals, military hospitals, and university hospitals. A stratified sampling technique was applied to reflect the structure of the Jordanian public healthcare system. Data were collected through an online questionnaire distributed via official e-mail and administrative communication channels. A total of 370 valid responses were obtained from employees working in supply chain, procurement, logistics, pharmacy, and quality management departments. The questionnaire items were measured using a five-point Likert scale, and the data were analyzed using SmartPLS. The findings indicate that strategic corporate social responsibility has a positive and significant effect on supply chain sustainability. Digital leadership also has a positive and significant effect on supply chain sustainability. The results further show that green technology positively and significantly moderates the relationship between strategic corporate social responsibility and supply chain sustainability, as well as the relationship between digital leadership and supply chain sustainability. However, e-knowledge sharing does not significantly moderate the relationship between strategic corporate social responsibility and supply chain sustainability. The moderating effect of e-knowledge sharing on the relationship between digital leadership and supply chain sustainability was not retained in the final interpretation due to concerns regarding an unusually large initial interaction coefficient requiring further robustness verification. Based on these findings, the study emphasizes the importance of aligning responsible strategic practices, digital leadership capabilities, and green technology adoption to support sustainable supply chain practices in Jordanian public hospitals. The study recommends strengthening digital leadership competencies, encouraging the adoption of green technologies, and developing structured digital knowledge-sharing mechanisms to enhance the resilience and sustainability of healthcare supply chains in Jordanian public hospitals.

Keywords: Supply Chain Sustainability, CSR, Digital Leadership, Green Technology, E-Knowledge Sharing, Public Hospital, Jordan

1. Introduction

Today, supply chain sustainability is a key management issue, as organizations are required to manage their operations as efficiently as possible while demonstrating economic, environmental and social responsibility within the supply chain, customers and stakeholders Kempston, Coles, Dahlmann, and Kirwan (2025). This is particularly relevant in the context of public hospitals in Jordan, as continuity and quality of health services rely on the consistent availability of medicines, medical supplies, equipment, information systems, and logistical resources in a financial, environmental and public accountability environment (Abdallah, Ghaith, Alzghoul, Khaldoun, & Alhareth, 2025; Alkhodour, Mohammad, & Mahyadin, 2025; T. Hasan, Hasan, & Fatima, 2025). Recent research has demonstrated that supply chain sustainability benefit from embedding sustainability in all aspects of supply chain planning, purchasing, manufacturing, logistics, and partner relationship management, with the aim of enhancing sustainable performance and minimizing environmental and social risks (Han & Li, 2025; A. M. Obeidat, Hindawi, Alomari, & Al jazi, 2025; Panigrahi, Singh, & Muduli, 2025). Therefore, the study of organizational, digital, technological and knowledge related aspects that influence sustainable hospital supply chains are both academically and practically relevant (Jia, Aboagye, Shahzadi, & Chen, 2026). Strategic corporate social responsibility (CSR) is a higher-level form of CSR than regular CSR, which includes social and environmental concerns in the corporation's strategy, governance and operational decisions (Abidin, Jalal, & Sodiq, 2025). Strategic CSR can manifest itself in responsible procurement, ethical supply chain management, fair distribution of services, safe disposal of waste, efficient resource management, and accountability reporting to patients, employees, regulators, suppliers and society in hospitals (Al-Zubi & Ghaith, 2024). In this way, CSR can be seen as a strategic tool which can direct the decisions taken by the supply chain toward sustainability, instead of being a side social activity. The benefits of supply chain social responsibility CSR for sustainable performance have been confirmed in recent literature, and the impact of CSR reaches not only economic, but also environmental and social aspects, including stakeholder and supplier relationship management (Liu, Dong, Zhao, He, & Zhang, 2026; Sadiq, Mehmood, Leong, Ghani, & Usman, 2025; Yu, Xu, Huo, Zhang, & Cao, 2023; Zhao, Chau, Dong, Chong, & Khudoykulov, 2026). In this way, strategic CSR can serve as a value-based basis for public healthcare organizations in sustainable supply chain management.

Digital leadership is also a key factor in the sustainability of the supply chain as it helps to lead the digital transformation, redesign working processes and boost data-driven decision making (Spanaki, Dennehy, Papadopoulos, & Dubey, 2025; S. Wang, Gao, & Zhang, 2025). From a service science view, a public hospital supply chain is a service-information system, where the generation of clinical demand, procurement planning and logistics execution are dynamically interconnected and coordinated with each other by means of digital infrastructure, and realize real-time coordination between healthcare service needs and supply chain responsiveness (Fallahnezhad, Langarizadeh, & Vahabzadeh, 2024). Digital leadership has a specific significance in Jordanian public hospitals due to the need for hospitals' supply chains for accurate information, swift coordination, electronic documentation, visibility of inventories, and interaction between clinical, administrative, procurement, finance and logistics departments (Al-Hindi, 2022; Alqudah, Abualrejal, & Elias, 2021). Most crucially, digital leadership is a key enabler of logistics information systems architecture by supporting integration of Enterprise Resource Planning (ERP) system in various departments of hospitals, rapid digitalization of procurement processes, real-time inventory visibility and smooth flow of data in the supply chain between clinical, administrative, financial and logistics functions. In this way, digital leaders contribute to the end-to-end coordination, optimization of resources, transparency and responsiveness in hospital supply chains (Gorbenko, Romanchuk, Sagliocca, & Mazumdar, 2023).

Digital leadership is not just about the technology, it's about developing a digital vision, inspiring people to adopt it, investing resources in innovation and preparing for digital transformation (Malik, Raziq, Sarwar, & Tariq, 2025; Tawalbeh, Alzghoul, & Ghaith, 2025). In recent years, digital leadership

is associated with sustainability in the fields of green innovation, artificial intelligence preparedness and big data analytical skills (Aftab, Stan, Srivastava, Wei, & Abid, 2025; Zada, Zada, Dhar, Ping, & Sarkar, 2025). Likewise, in complex logistical contexts, supply chain leadership, corporate sustainability strategies and digital supply chain practices lead to better sustainable performance (Esangbedo, Zhang, Pérez, & Skitmore, 2024; Ghaith, Albhirat, & Alzghoul, 2025).

With the expansion of digitalization in the supply chain and technologies of Industry 4.0, the correlations between digital leadership and supply chain sustainability become more pronounced (Belhadi, Kamble, Gunasekaran, & Mani, 2022). The digitalization facilitates the traceability, visibility in real time, data exchange and coordination between the actors in the supply chain, thus contributing to the environmental performance and social responsibility and governance (Al-Ghalabi, Ghaith, Al-Shamaileh, & Altarawneh, 2024; Feng, Zheng, & Shen, 2024). Digitalized supply chain processes in Jordanian public hospitals can help to monitor medicine-stocks, avoid the time lag in the procurement process, manage expired materials, optimize the use of resources and coordinate with external suppliers (Nalebe, 2024). The latest studies have shown that digitalization of the supply chain has a positive impact on the environmental, social and governance (ESG) performance and can help with green transformation by providing more efficient information flows and decision-making capabilities (Chen, Leng, & Luo, 2024; Ghaith, AlNawafleh, Obeidat, Husam, & Al-Adwan, 2026; Tian, Tian, & Guo, 2025; T. Wang & Shen, 2025). Besides, any suspected improvement in the performance of the sustainable supply chain also performs well in the digital transformation (Elnadi, Gheith, Troise, Abdallah, & Abdelaziz, 2026) with the support of the capabilities of the supply chain, which has been discussed here as enabling mechanisms.

While strategic CSR and digital leadership are both beneficial, their combination gives a more holistic picture of the Jordanian public hospitals' supply chain sustainability. Digital leadership is about the technological and behavioral capability that is needed to undertake the practices in a strategic CSR. In public hospitals, an integration is essential because good or bad decisions in the supply chain can impact service continuity, patient safety, public trust, cost efficiency and environmental responsibility (Schneller, Abdulsalam, Conway, & Eckler, 2023). In this regard, recent studies have confirmed this holistic perspective, revealing that sustainability gains through the simultaneous implementation of CSR and such other enablers as artificial intelligence, green supply chains, digital maturity, circular economy capabilities, and green innovation (Ying, Chang, Moslehpour, Ismail, & Pardaev, 2026; Zhao et al., 2026). Therefore, strategic CSR and digital leadership are best examined together, providing a more robust ground for the understanding of how public hospital supply chains can progress towards sustainable outcomes.

Green technology is a middleman which turns into practical environmental use the strategies and digital functions for sustainability (Böttcher, Empelmann, Weking, Hein, & Krcmar, 2024). Green technology in the Jordanian public hospitals could comprise energy-efficient facilities, digital procurement systems, environmentally-friendly waste management technologies, electronic inventory systems that cut waste, and systems that enable rational use of medical materials, water and electricity (Alkaabi & Aljaradin, 2022; Nazir, Nazir, Zaheer, & Haq, 2025). The confluence of green technology and strategic CSR and digital leadership can lead to better sustainability results when it is easy to implement and monitor greener actions (Zada et al., 2025). In contrast, there is a risk of weak green technology implementation, which can hinder the realization of strategic and digital initiatives in terms of actual environmental performance (Wu & Tham, 2023; Zhu, Liang, Lee, Yeung, & Zhou, 2025). The recent study reveals that the adoption of green technology provides support to the sustainability of supply chains, and the capability of green technology innovation and knowledge integration improves performance in green supply chain knowledge networks (Hou, Li, Jin, Zhang, & Luo, 2025; Singh, 2025). Green innovation, green supply chain management, green intellectual capital and green human resource management have also been found to be related to improved environmental performance (Diva Awatara, Susila, & Saryanti, 2025; Ud Din, Zhu, Li, & Ahmad, 2025).

E-knowledge sharing is also considered as an important knowledge-based approach to enhance sustainable supply chains since in order to achieve sustainable supply chains it is essential to share information, knowledge and practices continuously between the different actors of the chain and between different departments of the organization (Jalil, Md Isa, Awang Marikan, & Jais, 2025). E-knowledge sharing is defined from a logistics informatics point of view as the ability of the information platforms of the supply chain to enable the exchange of data, the integration of data and the coordination of services among supply chain partners and organizational units in real time. e-knowledge sharing allows the effective and timely transmission of all procurement transactions, inventory updates, demand forecast, supplier information and logistics operations through digital platforms, databases, enterprise systems and collaborative networks, giving better visibility, interoperability and the effectiveness of the decision making in the supply chain (Zaid, Farooqi, & Azmi, 2025).

E-knowledge sharing is a tool that can be employed to facilitate sharing of procurement information, clinical supply requirements, inventory information, supplier performance history, sustainability information, and environmental practices in Jordanian public hospital. E-knowledge sharing can be used to facilitate sharing of procurement information, clinical supply requirements, inventory information, supplier performance history, sustainability information, and environmental practices in hospital (Warkentin, Bapna, & Sugumaran, 2001). Digital platforms and collaborative systems mitigate the difficulties of information silos between procurement, stores, financial administration and clinical departments and suppliers, leading to better purchasing, storing, distribution and disposal decisions. Recent studies have indicated that green knowledge sharing positively impacts the sustainable business performance and enhances green performance by organizational and knowledge based mechanism (Zairbani, 2025). Furthermore, the knowledge sharing fosters green innovation particularly in relation to digital transformation and the top management environmental awareness (Ghaith, 2023; Martínez Falcó, Sánchez-García, Marco-Lajara, & Akram, 2025; Negi, Jaiswal, & Mathur, 2025; A. Obeidat, 2026). In addition, evidence from developing-country contexts suggests that other factors such as green knowledge sharing, green innovation, big data-driven supply chains, and digital knowledge sharing are also associated with the sustainable and green innovative performance (Gao, Wang, & Zhang, 2025; Jalil et al., 2025; Junejo et al., 2025).

From the above discussion, it is clear that there is a gap in the research. There are several studies that explore CSR and digital leadership, knowledge sharing and green technology separately or focus primarily on them as direct or moderating variables. However, limited studies offer a combined perspective or model to explain how supply chain sustainability can be achieved by both strategic CSR and digital leadership, and test the moderating effect of green technology and e-knowledge sharing. This gap is significant in Jordanian public hospitals, as supply chain sustainability is linked to public value, patient safety, resource efficiency, environmental responsibility, and pressures related to digital transformation. The most important contribution of this study is the establishment of an integrative framework that clarifies the influence of strategic CSR dimensions and digital leadership on enhancing the supply chains sustainability of public hospitals in Jordan and their effectiveness in the presence of green technology and e-knowledge sharing as a moderating. The study makes a theoretical contribution to the current CSR and digital leadership and sustainable supply chain knowledge by moving from a linear perspective to a perspective that focuses on interactions.

2. Literature Review and Hypothesis Development

The present study examines how technological and strategic elements work together to influence supply chain sustainability. Supply chain sustainability is the management of a company's supply chain, integrating the environmental, societal and economic aspects to create benefits and mitigate harm to the stakeholders (Silva & Figueiredo, 2020). The independent variables are strategic corporate social responsibility and digital leadership, which are respectively the firm's devotion and the expert ability. The moderating variables are green technology and E-Knowledge Sharing, which are functioning assets

that improve the effectiveness of the strategic drivers (Huo, Haq, & Gu, 2021; A. M. Obeidat, 2025).

Strategic corporate social responsibility involves incorporating public social and environmental concerns beyond philanthropic engagements (Lantos, 2001; Lin, Li, Cheng, & Lam, 2021). Integration of corporate social responsibility with the business strategy, however, is different than traditional corporate social responsibility (Ho, Hsu, & Lee, 2022). Unlike traditional corporate social responsibility, which is often reactive or purely involves social responsibility for the sake of enhancing company image, strategic corporate social responsibility is proactive and aims to create shared value by addressing societal needs to the benefit of the company (Ardiansyah & Alnoor, 2024). The dimensions of strategic corporate social responsibility most often aligned with the triple bottom line include economic responsibility (e.g. ethical governance, and fair competition), environmental responsibility (e.g. preventing pollution, and resource efficiencies), and social responsibility (e.g. responsible labor practices, and community participation). Of all the dimensions, strategic corporate social responsibility is perhaps the most important for the dependent variable corporate social responsibility as it provides the necessary framework and commitment for embedding sustainability deeply into the supply chain as a core principle guiding all sourcing, production, and distribution decisions to optimize for sustainability in the long term (Omidvar & Palazzo, 2025).

2.1. The Relationship between Strategic Corporate Social Responsibility and Supply Chain Sustainability

The connection between strategic corporate social responsibility and supply chain sustainability is primarily anchored in the stakeholder theory. Stakeholder theory puts forth the argument that a firm's long-term success depends on its ability to foster and build positive relationships with the primary stakeholders of the firm (Aguinis & Glavas, 2012). Thus, when corporate social responsibility is strategic, it signifies a genuine concern for those stakeholders like the customers, the regulators, and the community, whose interests are concerned with the sustainability of the supply chain. This concern is demonstrated in actions like implementing ethical sourcing, investing in sustainable logistics, and deploying fair labor practices across the entire supply network, which qualitatively contributes to the sustainability of the supply chain (Agyapong, Aidoo, Acquah, & Akomea, 2023; M. M. Hasan & Shehun, 2022).

Moreover, strategic corporate social responsibility cultivates a culture of transparency and accountability, which is essential for effective supply chain sustainability. Firms are able to address compliance, reputational, and supply chain disruption risks (Hariyani, Hariyani, & Mishra, 2025). For example, firms with a strong focus on strategic corporate social responsibility are more likely to conduct environmental and human rights compliance audits on their suppliers which enhances social and environmental responsibility of their supply chains (Hariyani et al., 2025; Phakamach, Panjarattanakorn, & Onsompant, 2023). Such an approach not only manages the risks to the firms, but also contributes to the sustainability and resilience of the entire value chain, resulting in a higher availability of supply (Ngo, Quang, Hoang, & Binh, 2024).

There is a plethora of strategic corporate social responsibility and supply chain sustainability performance studies which indicate a positive relationship between the two, confirming that the more the strategic corporate social responsibility, the more the supply chain sustainability performance (Panigrahi et al., 2025). The supply chain incorporating corporate social responsibility results in increased social welfare and enhances social, economic and environmental sustainability, the core objectives of supply chain sustainability (Le, Nhu, & Behl, 2025). Thus, the firm's focus, strategy, and planning of social and environmental objectives integration greatly influence how well they can achieve an excellent sustainable supply chain (Oubrahim, Sefiani, & Happonen, 2023). Therefore, the following hypothesis is proposed:

H1: Strategic corporate social responsibility has a significant positive effect on supply chain sustainability.

2.2. The Relationship between Digital Leadership and Supply Chain Sustainability

Digital leadership signifies the role of an organization's management in conceptualizing, advocating, and executing digital transformations that alter the functioning and value creation mechanisms of a company (Chatterjee, Chaudhuri, & Vrontis, 2023). In the context of supply chain sustainability, digital leadership requires more than the simple acceptance of new tools; it requires the nurturing of a digital-first mentality that incorporates the use of Internet of Things, big data analytics, and block chain for the achievement of sustainability (Khaw, Teoh, Abdul Khalid, & Letchmunan, 2022; Zada et al., 2025). A digitally led organization has the unique opportunity to obtain unparalleled visibility over its supply chain, allowing for realtime environmental performance monitoring, ethical sourcing and logistics carbon optimization (Khaw et al., 2022).

Regarding the impact of digital leadership on corporate social responsibility, it's first important to note the importance of leadership in driving innovation and operational efficiencies. Digital leadership shapes the corporate social responsibility strategy and directs spending toward the adoption of agile digital technologies that supporting the implementation of corporate social responsibility initiatives (Al-Taie, Ghaith, & Tweiqat, 2025). Digitally led firms, for example, are more likely to use socially and environmentally compliant traceability systems built on block chain technologies to verify and trace the origin of raw materials (Calvão & Archer, 2021). Without strong digital leadership, initiatives aimed to support the digital empowerment of corporate social responsibility remain unintegrated or are forced to pivot and fail. Furthermore, as agility and responsiveness to changing norms and systems are digital leadership's byproducts, the visibility of digital leaders on the challenge to rapidly evolving sustainability demands systems (Alam, Razzak, Khreis, Al Balushi, & Al Lawati, 2025). Digital leaders have the possibility of rapidly changing supply chain processes by pivoting on a culture of ongoing learning and experimentation to responsiveness, thereby integrating new green logistics and circular economy models (Siems, Seuring, & Schilling, 2023). Digital leadership enables organizations to effectively integrate and leverage advanced digital technologies across the supply chain. These technologies enhance visibility, coordination, and data-driven decision-making, allowing firms to proactively address sustainability challenges and create long-term value for stakeholders. As a result, supply chains become more resilient, efficient, and sustainable (Li, Zhu, Lu, & Zhang, 2025). Thus, the hypothesis below is suggested:

H2: Digital leadership has a significant positive effect on supply chain sustainability.

2.3. The Moderating Role of Green Technology

Green technology is defined as processes and innovations aimed at reducing pollution, waste, and resource depletion (Gunduz Songur, Turkstarhan, & Cobanoglu, 2023; Guo et al., 2020). In relation to supply chains, green technology can refer to anything from tools and techniques that achieve energy efficiency and renewable energy generated electricity, to green closures and green parceling (J. Wang, Duan, & Zheng, 2025). Green technology constitutes a significant operational resource for digitally-advanced businesses that seek to address strategic corporate social responsibility issues (Gunduz Songur et al., 2023).

Green technology is expected to strengthen the correlation between strategic corporate social responsibility and sustainable corporate social responsibility. Strategic corporate social responsibility provides the motivation commitment to environmental stewardship. In contrast, green technology provides the means the instruments and methodologies that lead to outstanding levels of measurable environmental performance (Debrah, Kaodui, Ying, & Sulemana, 2025). Green technology is expected to have a greater impact on sustainable corporate social responsibility outcomes, such as reducing carbon footprints and zero waste, for a strategic corporate social responsibility aligned organization (Le, Tran, Lam, Tra, & Uyen, 2024).

In the same manner, positive moderation of the relationship between corporate digital leadership and corporate sustainability is also expected in the context of green technology. While digital leadership

is the vision and the backbone of any transformational digital vision, green technology is the sustainable support framework. Digital technology is best used when it helps improve the efficiency of a particular process. A case in point is when business leadership utilizes an advanced digital tool in the management of a facility. That facility must, however, be equipped with a green, flexible, and efficient technology in order to optimize energy use. Hence, green technology improves the impact of digital techniques in the management and optimization of key sustainability processes (Abbas & Khan, 2023; Shneikat, 2024). Therefore, the following hypotheses is proposed:

H3: Green technology moderates between strategic corporate social responsibility and supply chain sustainability.

H4: Green technology moderates between digital leadership and supply chain sustainability.

2.4. The Moderating Role of E-Knowledge Sharing

E-knowledge sharing is distributing and exchanging information and practices among supply chain members using digital technologies and platforms (Jalil et al., 2025). It uses information technologies, shared databases, collaborative tools, and communication networks to enhance learning and flow coordination along the value chain (Esangbedo, Zhang, Perez, & Skitmore, 2024; Vivek, 2022). E-knowledge sharing is a significant organizational capability that strengthens the relational and informational aspects of the corporate sustainability triad sustainability (Quttainah & Ayadi, 2024).

E-knowledge sharing is likely to enhance the moderating effect of strategic corporate social responsibility on sustainable corporate sustainability by means of strengthening the social and ethical sustainability dimensions. Strategic corporate social responsibility necessitates the organization to broaden its ethical boundaries to its suppliers, which is achievable only through a system that enables the sharing of compliance, best practices, and performance metric (Abood, Abdulrasool, Saleh, Amanah, & Hasan, 2024). E-knowledge sharing systems enable the organization to quickly communicate its corporate social responsibility policies, provide instructive support to suppliers on ethical labor practices, and collectively address social challenges, which, in turn, enhances the organization's strategic corporate social responsibility engagement on the social pillar of sustainable corporate social responsibility (Dubey et al., 2021).

Moreover, fostering e-knowledge sharing is likely to have a positive moderation effect on the link between digital leadership and sustainable corporate sustainability. It is acknowledged that digital leadership motivates the use of digital tools, but e-knowledge sharing implementation makes certain that these tools are deployed and used cooperatively across the entire supply chain (Jalil et al., 2025). If all stakeholders in the supply chain are able to collaborate and use the knowledge and insights in a coordinated manner for sustainability purposes, like collaborative carbon footprint reduction or resource pooling, then a digital leadership driven investment in a supply chain management system enhances corporate sustainability (Onukwulu, Agho, & Eyo-Udo, 2021). It is the e-knowledge sharing that turns these disparate digital skills into collective advantages in system-wide sustainability. Thus, the hypotheses is shown below:

H5: E-knowledge sharing moderates between strategic CSR and supply chain sustainability.

H6: E-knowledge sharing moderates between digital leadership and supply chain sustainability.

3. Theoretical Framework

The study theory is centered on the combination of stakeholder theory and the resource-based view (Kero & Bogale, 2023). The research considers external and internal factors concerning sustained corporate sustainability and needs the integration of both theories.

This research considers stakeholder theory as the main focal point for the integration of corporate social responsibility and strategy (Kalra, 2024). Stakeholder theory states that businesses should recognize and respond to the needs of all the stakeholders they interact with and that should be done for

the businesses to maintain their legitimacy and continue to operate profitably. In sustained corporate sustainability, stakeholders require businesses more than ever to be transparent, accountable, ethically responsible with the sourcing of their materials, and respect the environment (Mahajan, Lim, Sareen, Kumar, & Panwar, 2023). Businesses also need to track their corporate social responsibility and integrate stakeholders proactively, and for businesses to respond to these corporate social responsibility needs, it integration needs to be embedded. Therefore, integration of corporate social responsibility and sustained corporate sustainability is directly spelled out, but also why these businesses should care about the ethical and environmental needs of their supply chain partners (Ullah, 2021).

The roles of digital leadership, green technology, and e-knowledge sharing is explained by the Resource Based View of Theory. The resource-based view states that a firm gains competitive advantage from its internal resources and capabilities that are internal, unique, valuable, rare, and non-substitutable (Shneikat, 2024; Willie, 2025). In the present study, digital leadership is interpreted more positively than other organizational capabilities because a firm is able to attain and efficiently apply other resources that are important. On the other hand, green technology and e-knowledge sharing are digital leaders' deployed, invaluable, inimitable resources that consolidate to create a sustainable competitive advantage in the form of superior sustainable corporate citizenship performance (Willie, 2025).

The resource-based view combined with the stakeholder theory explains and predicts the pursuit and achievement of sustainable corporate sustainability. This synthesis is particularly valuable for understanding the contextual environmental determinants of the sector (Bhandari, Ranta, & Salo, 2022). Here, the resource base emphasizes how the firm's unique resources enable it to manage external environmental challenges, such as resource scarcity and stringent regulations, in the case of Jordan (Fernandez De Arroyabe Fernandez, Ozdemir, Sena, & Gupta, 2023). Figure 1 below show the theoretical framework for this study.

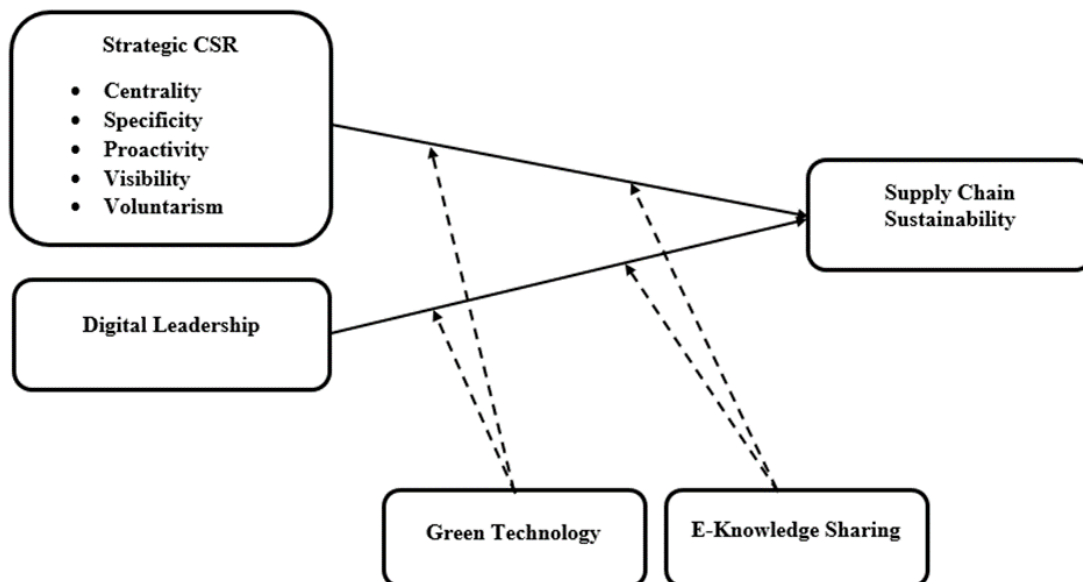


Fig.1: Theoretical Framework

4. Research Methodology

This study aims to evaluate the sustainability of the supply chain in the public hospitals in Jordan using

a descriptive analytical research method. The target population for the study is all the officially operating public hospitals in Jordan, that is, hospitals under the Ministry of Health, university hospitals, and military hospitals. A stratified sampling method is used to ensure proportionality in various stratification categories of public hospitals. Stratification was based on the type of hospital administration to comply with the actual distribution of the hospitals in the Jordanian public healthcare system.

The study sample comprised 370 participants from the hospitals who were selected from various departments, such as supply chain departments, procurement units, logistics departments, pharmacy departments, and quality management units. They were supply chain managers, procurement managers, logistics officers, pharmacy managers, and quality managers directly involved in the supply chain activities and sustainability practices. The number of hospitals and employees in the public hospitals was used to calculate the proportional distribution of the sample.

The data was collected by a data collection technique in the form of questionnaires with 5-Item Likert scales, which consisted of items ranging from “Strongly Disagree” to “Strongly Agree”. Questionnaires were electronically sent out by official e-mail addresses and administrative communication within the Jordanian public healthcare system.

The study employed SMART-PLS software for data analysis to assess the measurement model, construct reliability, and validity, and examine the relationships of the structural model associated with the supply chain sustainability practices in public hospitals in Jordan.

5. Measurement and Instrumentation

The author collected the data for this study by using a structured self-administered questionnaire created for the purpose of operationalizing the variables stated in the theoretical framework as follows: strategic corporate social responsibility, digital leadership, green technology, e-knowledge sharing, and supply chain sustainability. The measurement variables were all based on established and validated measures found in literature in order to predict the content and construct validity (Lim, 2024).

The instrument used in this study was made up of several constructs that were developed to investigate the relationships between the study variables. The dependent variable, supply chain sustainability, was assessed with the six measures borrowed from previous scales developed by Das (2017) and Searcy (2017).

The first independent variable Strategic corporate social responsibility was also measured with six items based on the study by Hoejmose, Brammer, and Millington (2013), and the second independent variable Digital leadership was also measured with six items based on the study of Abbu, Mugge, Gudergan, Hoeborn, and Kwiatkowski (2022) and Munsamy, Dhanpat, and Barkhuizen (2023).

Two additional moderating variables were added to the study. In addition to Afum, Sun, Agyabeng-Mensah, and Baah (2023) and Andaregie and Astatkie (2022), among others, six items were adapted from the literature to measure green technology. The last, E-knowledge sharing was measured with five items that were modified from the digital collaboration literature, specifically from Alotaibi, Crowder, and Wills (2014).

6. Data Analysis

In this section, we summarize the most important findings from the 400 questionnaires distributed. Of these, 370 were completed and returned, resulting in a response rate of 92.5%, which is considered excellent for quantitative analysis. This analysis focuses on the ascertainment of the reliability and validity of the constructs, the measurement model, and then the structural model concerning the hypotheses of the study one after the other (Hair, Sarstedt, Ringle, & Mena, 2012).

Demographic Characteristics of the Respondents

The demographic profile of the 370 participants Table (1) shows that the study sample was comprised of professionals from different public hospitals in Jordan who are directly involved in the supply chain related functions. The sample was relatively balanced in terms of gender; it was also mainly composed of relatively well-experienced professionals with ages between 30 and 49 years, as such. The majority of participants had a bachelor's degree, with a high number also having master's and doctoral degrees, indicating a relatively highly educated workforce. The respondents came from key functional areas and were selected for providing a broad representation of the hospital supply chain, such as supply chain management, procurement, logistics, pharmacy, and quality management. Furthermore, most of the participants were experienced in the field of sustainability and healthcare supply chain, with over 5 years of practical experience.

Table 1. Demographic Characteristics of the Respondents

Variable	Category	Percentage
Gender	Male	58.9
	Female	41.1
Age	< 30 years	17.3
	30–39 years	38.6
	40–49 years	29.5
	≥ 50 years	14.6
Education	Bachelor	65.1
	Master	26.2
	PhD	8.7
Job Position	Supply Chain Manager	19.2
	Procurement	23.2
	Logistics Officer	24.9
	Pharmacy Manager	17.0
	Quality Manager	15.7
Experience	< 5 years	21.4
	5–10 years	39.5
	> 10 years	39.1

Table (2) shows the measurement model reliability and validity, where the reliability of the measurement model was measured by Cronbach's alpha, Composite Reliability, and Average Variance Extracted (AVE). The values of Cronbach's alpha for all the constructs were greater than the benchmark which is 0.70. This shows that there is high reliability (internal consistency) for these constructs. In addition, the values for composite reliability (the two indices, rhoa and rhoc) were also in the ranges which are considered acceptable and excellent; therefore, the items were representing the constructs they were measured for in a consistent manner. The values for AVE were also greater than the benchmark which is 0.50 for all the constructs. This indicates that the constructs had adequate convergent validity and therefore these constructs were able to explain over 50% of the variance in the indicators.

After several rounds of refinement, the final measurement model is shown in Figure 2. Indicators with factor loadings less than 0.70 were dropped to increase the reliability of the indicators and convergent validity. The deleted indicators were DL1, DL3, DL5, GT1, GT3, GT4, EKS4, EKS5, SCSR2, SCSR5, SCS3, SCS4, and SCS5. Those same indicators that were retained were then checked for multicollinearity with the Variance Inflation Factor (VIF). The VIF values for all the retained indicators were lower than the recommended value of 3.0, which indicated that multicollinearity is not a problem. Based on this, the final measuring model passed the criteria for reliability, convergent validity and collinearity, and was then used to test the structural model.

Table 2. Construct Reliability and Validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Digital Leadership	0.876	0.878	0.924	0.802
E-knowledge Sharing	0.765	0.795	0.864	0.681
Green Technology	0.751	0.787	0.854	0.662
Strategic CSR	0.807	0.816	0.874	0.635
Supply Chain Sustainability	0.752	0.761	0.857	0.666

The measurement model was refined using a measurement-driven procedure rather than a structural-outcome-driven procedure. In the initial estimation, several constructs showed very high reliability values, suggesting possible item redundancy, while some indicators produced outer loadings below the recommended threshold. Therefore, indicator retention was assessed using outer loadings, internal consistency reliability, convergent validity, and indicator collinearity. Indicators were deleted only when they showed weak measurement performance and when their removal did not compromise the conceptual meaning of the construct.

The deleted indicators were DL1, DL3, DL5, GT1, GT3, GT4, EKS4, EKS5, SCSR2, SCSR5, SCSR3, SCSR4, and SCSR5. After refinement, the final model retained acceptable reliability and validity values, with Cronbach's alpha ranging from 0.751 to 0.876 and AVE values exceeding 0.50 for all constructs. The reduction in reliability values compared with the initial model should not be interpreted as deterioration of the measurement model. Rather, it reflects the removal of weak or potentially redundant indicators and the adoption of a more conservative measurement structure. The structural model was interpreted only after the final measurement model satisfied reliability, convergent validity, discriminant validity, and collinearity criteria.

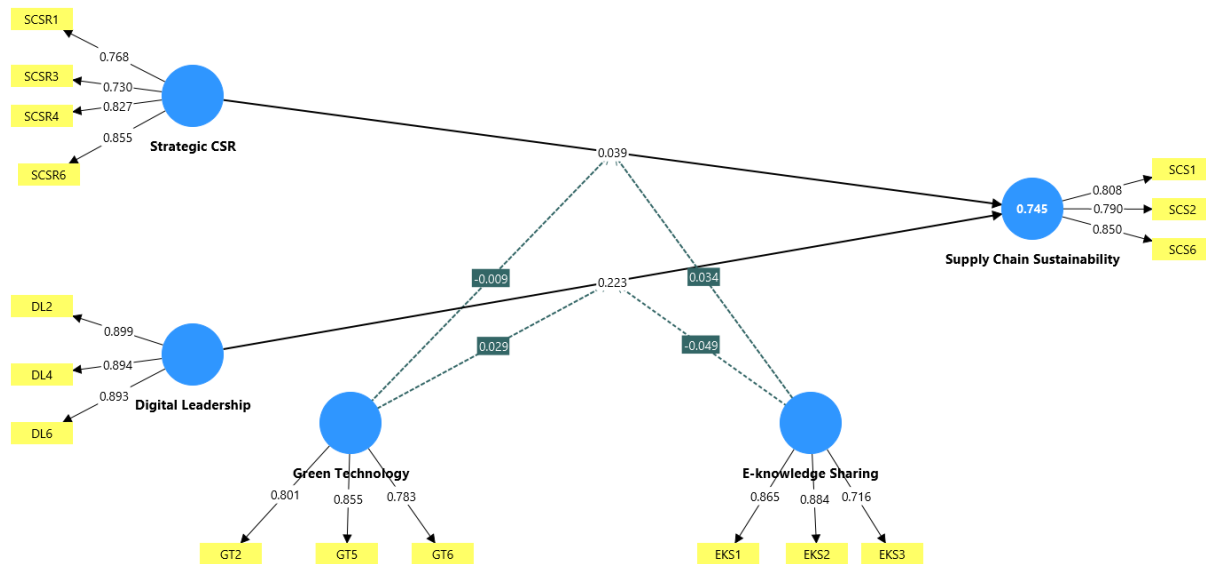


Fig.2: Evaluation of the Measurement Model

The discriminant validity among the constructs of the study is assessed using Fornell–Larcker criterion as presented in Table (3). The results indicate that the square root of the Average Variance Extracted (AVE) for each construct is greater than its correlations with the other constructs. In particular, the diagonal values for Digital Leadership (0.895), E-Knowledge Sharing (0.825), Green Technology (0.813), Strategic CSR (0.797), and Supply Chain Sustainability (0.816) are higher than the inter-construct correlation values. The Fornell–Larcker results indicate that the square roots of AVE for all constructs are higher than their correlations with other constructs. However, the correlation between

Green Technology and Supply Chain Sustainability is relatively high $r = 0.807$ and is very close to the diagonal values for Green Technology 0.813 and Supply Chain Sustainability 0.816. Therefore, although the Fornell–Larcker criterion is technically satisfied, the small margin suggests borderline discriminant validity between the moderator and the outcome. To further address this concern, the HTMT criterion was computed and reported for all construct pairs. Particular attention was given to the Green Technology–Supply Chain Sustainability pair because Green Technology serves as the moderator in H3 and H4, while Supply Chain Sustainability is the endogenous construct. The HTMT value for Green Technology and Supply Chain Sustainability was 0.887, which is below the recommended threshold of 0.90. Therefore, discriminant validity between these two constructs was established. However, because the value is close to the threshold, the moderation results involving Green Technology are retained but interpreted cautiously.

Table 3. Discriminant Validity (Fornell-Larcker Criterion)

	Digital Leadership	E-knowledge Sharing	Green Technology	Strategic CSR	Supply Chain Sustainability
Digital Leadership	0.895				
E-knowledge Sharing	0.655	0.825			
Green Technology	0.503	0.583	0.813		
Strategic CSR	0.568	0.634	0.602	0.797	
Supply Chain Sustainability	0.646	0.671	0.807	0.615	0.816

As demonstrated the multicollinearity was assessed using the Variance Inflation Factor (VIF). After dropping out the indicators that had loadings of less than 0.70, all indicators of the remaining measurement model were within the recommended range of <3.0 ; the minimum VIF was 1.336 and the maximum was 2.453. Moreover, the VIF values of the interaction terms were 1.000, which means there were no multicollinearity problems. The results agree with the assumption that there is no problematic collinearity between these retained indicators and they can be used for further analysis using PLS-SEM.

Table 4: Heterotrait–Monotrait Ratio HTMT

Construct	Digital Leadership	E-Knowledge Sharing	Green Technology	Strategic CSR	Supply Chain Sustainability
Digital Leadership	—				
E-Knowledge Sharing	0.721	—			
Green Technology	0.568	0.648	—		
Strategic CSR	0.629	0.701	0.674	—	
Supply Chain Sustainability	0.724	0.746	0.887	0.692	—

Note. HTMT Heterotrait–Monotrait ratio. The results indicate that all HTMT values are below the recommended threshold of 0.90, suggesting acceptable discriminant validity among the study constructs. The highest HTMT value was observed between Green Technology and Supply Chain Sustainability HTMT = 0.887. Although this value is close to the recommended threshold, it remains below 0.90, indicating that the two constructs are empirically distinguishable. Therefore, the moderation hypotheses involving Green Technology were retained, but interpreted with appropriate caution.

Table 5: Variance Inflation Factor (VIF)

Indicators	VIF
DL2	2.423
DL4	2.453
DL6	2.287
EKS1	1.776

EKS2	1.919
EKS3	1.347
GT2	1.577
GT5	1.430
GT6	1.531
SCS1	1.336
SCS2	1.664
SCS6	1.817
SCSR1	1.523
SCSR3	1.466
SCSR4	1.839
SCSR6	1.996
E-knowledge Sharing x Digital Leadership	1.000
E-knowledge Sharing x Strategic CSR	1.000
Green Technology x Digital Leadership	1.000
Green Technology x Strategic CSR	1.000

The model fit results are shown in Table 6. The SRMR values for the saturated model and the estimated model were 0.062 and 0.065, respectively, and were below the recommended value of 0.08, showing a good model fit. The value of d_{ULS} for the saturated model and the estimated model were 2.384 and 2.412, respectively, and the value of d_G for the saturated model and the estimated model were 1.975 and 1.982, respectively. The chi square values for the saturated model and estimated model were 1,845.21 and 1,852.94, respectively. The NFI values were also in the range of 0.918 and 0.915, which is acceptable. In general, the results indicated that the estimated model is well-fitted which is suitable for further interpretation of the structural model.

Table 6: Model of Fit

	Saturated model	Estimated model
SRMR	0.062	0.065
d_{ULS}	2.384	2.412
d_G	1.975	1.982
Chi-square	1,845.21	1,852.94
NFI	0.918	0.915

Coefficient of determination R^2 , adjusted R^2 , Q^2 predictive relevance, and f^2 effect sizes were used to assess the explanatory, predictive, and substantive relevance of the structural model. As shown in Table 7, Supply Chain Sustainability achieved an R^2 value of 0.823 and an adjusted R^2 value of 0.819, indicating substantial explanatory power. The Q^2 value was 0.564, which is greater than zero, confirming predictive relevance for the endogenous construct. In addition, f^2 values were reported for all structural paths to assess the substantive contribution of each direct and moderating effect.

Table 7: Structural Model Assessment

Endogenous Construct	R^2	Adjusted R^2	Q^2	Predictive Relevance
Supply Chain Sustainability	0.823	0.819	0.564	Supported

Note. The explanatory power of the structural model was determined by the R^2 and adjusted R^2 values, and predictive relevance was determined by the Q^2 value. This means that the predictors and interaction terms account for 82.3% of the variation in Supply Chain Sustainability (R^2 value of 0.823). The value of Q^2 is greater than zero (0.564), suggesting that the model has sufficient predictive power for the endogenous construct.

As presented in Table 8 and Figure 3, The results of the structural model assessment showed that the model had considerable explanatory power and good predictive relevance. For Supply Chain Sustainability, as seen in Table 6, the R^2 is equal to 0.823, while the adjusted R^2 is 0.819, thus showing that a significant portion of the variance is explained by the predictors and interaction terms. Moreover, the Q^2 value of 0.564 is higher than 0 which indicates that the model is predictive.

The substantive contribution of each of the structural paths was then explored with f^2 values. As shown in Table 7, Strategic CSR was found to have a medium level effect on Supply Chain Sustainability ($f^2 = 0.286$) and this is indicative of the fact that Strategic CSR is the strongest direct effect in the model. Digital Leadership proved to be a small effect, $f^2 = 0.037$, which was less than Strategic CSR but nonetheless statistically and practically significant. Moderating effects of Green Technology were also small but significant: $f^2 = 0.029$ for the Green Technology $\times$ Strategic CSR interaction and $f^2 = 0.024$ for the Green Technology $\times$ Digital Leadership interaction. The E-Knowledge Sharing $\times$ Strategic CSR interaction in contrast, had a negligible effect $f^2 = 0.004$, which is in accord with the hypothesis result of not being significant.

Table 8. Hypothesis Testing

Hypothesis	Original Sample β	Sample Mean M	STDEV	T Statistics	P Values	f^2	Effect Size	Decision
H1: Strategic CSR $\rightarrow$ Supply Chain Sustainability	0.418	0.418	0.029	14.357	<0.001	0.286	Medium	Supported
H2: Digital Leadership $\rightarrow$ Supply Chain Sustainability	0.089	0.090	0.032	2.820	0.005	0.037	Small	Supported
H3: Green Technology $\times$ Strategic CSR $\rightarrow$ Supply Chain Sustainability	0.068	0.067	0.025	2.667	0.008	0.029	Small	Supported
H4: Green Technology $\times$ Digital Leadership $\rightarrow$ Supply Chain Sustainability	0.065	0.064	0.026	2.483	0.013	0.024	Small	Supported
H5: E-Knowledge Sharing $\times$ Strategic CSR $\rightarrow$ Supply Chain Sustainability	0.028	0.028	0.033	0.840	0.401	0.004	No effect	Not Supported

Note. Effect size was measured by f^2 , with f^2 of 0.02, 0.15 and 0.35 signifying small, medium and large effect sizes, respectively. The result of Strategic CSR was medium, while the relationship of Strategic CSR and Supply Chain Sustainability was positive. Small but significant effects were found for the Digital Leadership and Green Technology moderation paths. As was the case with the non-significant E-Knowledge Sharing $\times$ Strategic CSR interaction, no meaningful difference was found. H6 was not kept in the final confirmatory model because of imperfections in its specification and is treated separately in the discussion on robustness assessment.

Unlike the other moderation paths, the interaction between E-Knowledge Sharing and Digital Leadership produced an unstable and disproportionately large coefficient in earlier specifications. The initial model produced an interaction coefficient of $\beta = 1.006$, while the revised specification produced

$\beta = 0.789$. These values were considerably high compared with the direct effect of Digital Leadership on Supply Chain Sustainability $\beta = 0.089$, suggesting possible specification instability, suppression effects, scaling sensitivity, or conceptual overlap. Therefore, the E-Knowledge Sharing $\times$ Digital Leadership interaction was not retained in the final confirmatory model. H6 is treated as unsupported after robustness assessment and is discussed separately rather than included in the final hypothesis-testing table.

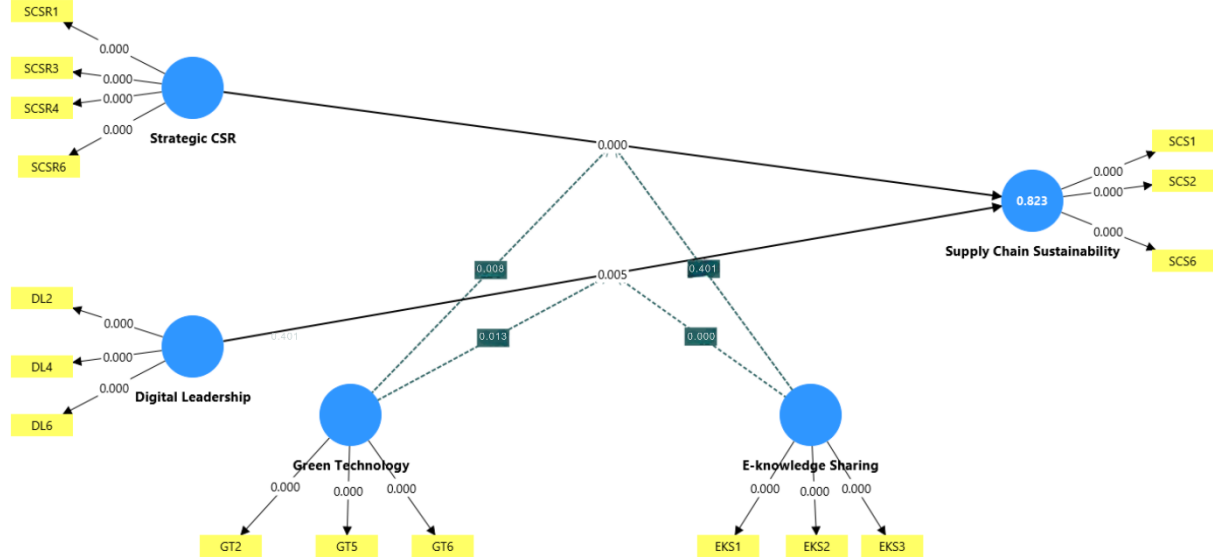


Fig.3: Evaluation of Structural Model

7. Discussion

This study aimed at examining the influence of strategic corporate social responsibility (CSR) and digital leadership on supply chain sustainability in public hospitals operating in Jordan as well as the moderating role of green technology and e-knowledge sharing. A significant level of explanatory power was found for the structural model, as R^2 value was 0.823 and the adjusted R^2 value was 0.819, which means the model explains a high percentage of the variance in supply chain sustainability. The results indicate that strategic, technological and knowledge-based factors do contribute to the sustainable performance of SCs in public healthcare.

From the findings of H1 it can be seen that strategic CSR is positively and significantly associated with supply chain sustainability ($\beta = 0.418$, $t = 14.357$, $p < 0.001$). This finding corroborates the claim that strategic CSR leads to more sustainability as it balances social, ethical, environmental and stakeholder aspects in supply chain related activities. According to stakeholder theory, an organization's success depends on how it reacts to the stakeholders' expectations, such as patients, scholars, staff, suppliers, regulators and the community (Aguinis & Glavas, 2012). In the case of Jordanian public hospitals, this means that CSR activities like responsible purchasing, ethical supplier relations, transparency, environmental consideration and waste management are tremendously important in achieving sustainable supply chain solutions. This finding aligns with previous research by Agyapong et al. (2023), Hasan and Shehun (2022), Le et al. (2025), and Panigrahi et al. (2025), which indicated that CSR practices positively influence environmental impact, ethical sourcing, stakeholder satisfaction, and sustainable supply chain practices. More crucially, the coefficient is relatively strong, highlighting that strategic CSR is one of the most significant direct factors contributing to supply chain sustainability in public hospitals.

H2 results showed that digital leadership has a positive and significant impact on supply chain sustainability ($\beta = 0.089$, $t = 2.820$, $p = 0.005$). This finding aligns with the theoretical argument that digital leadership enables digital transformation, increases information visibility and enables data-driven decision making and supply chain actor coordination (Chatterjee et al., 2023; Khaw et al., 2022).

Digital leadership in Jordan's public hospitals can enhance transparency in procurement processes, inventory management, electronic documentation, supplier coordination, and operational efficiency. The identified finding is in line with Siems et al. (2023), Stroumpoulis and Kopanaki (2022), Stroumpoulis et al. (2024), and Zada et al. (2025) which detected that digitally oriented leadership leads to increased agility, operational responsiveness, traceability, and sustainable performance in the organization. Though the impact size is lower compared with strategic CSR, the result shows that digital leadership is still a significant driver to supply chain sustainability.

Based on the results of H3, green technology positively and significantly moderates the relationship between strategic CSR and supply chain sustainability ($\beta = 0.068$, $t = 2.667$, $p = 0.008$). This result shows that the positive effect of strategic CSR increases in the presence of green technologies in public hospitals. This finding confirms the hypothesis that CSR introduces a strategic approach to sustainability, which is then supported by green technologies to implement tangible practices within the supply chain (Chen & Jin, 2023; Le et al., 2024). Green technologies implemented in public hospitals can include environmentally friendly procurement systems, energy-efficient equipment, digital inventory systems and sustainable waste-management systems. The findings are also aligned with the studies of Gunduz Songur et al. (2023), Guo et al. (2020), and Wang et al. (2025), which highlighted the significance of green technologies to decrease environmental impact, enhance resource efficiency, and promote sustainable analysis of the supply chain.

Based on the results of H4, it was found that green technology positively moderates the relationship between Digital leadership and Supply chain sustainability ($\beta = 0.065$, $t = 2.483$, $p = 0.013$). From this outcome, it is possible to interpret that the sustainability impacts of digital leadership are accentuated by green technological capabilities. Digital leadership in itself, in other words, is not enough to realize sustainability goals if it is not accompanied by technologies that can monitor the environment, support energy efficiency, promote waste reduction and support sustainable operating practices. These findings align with earlier research, which proposed that green technologies can complement the digital transformation process and optimize resource use, decrease green waste, and enhance environmental performance (Abbas & Khan, 2023; Shneikat, 2024). Within Jordan public hospitals, digital leadership might be more effective for sustainability if there are green technologies to support digital and environmental initiatives. Hence, green technology acts as an enabling moderator and enhances the impact of digital leadership on supply chain sustainability.

As for H5, the results reveal that the relationship between strategic CSR and supply chain sustainability is not significant moderated by e-knowledge sharing ($\beta = 0.028$, $t = 0.840$, $p = 0.401$). This finding opposes with the proposed hypothesis and indicates that only the e-knowledge sharing by itself is not sufficient to improve the sustainability benefits gained from strategic CSR. While prior research proposed that e-knowledge sharing can help to disseminate sustainability practices, compliance information, and CSR-related policies (Abood et al., 2024; Abdulrasool et al., 2024; Dubey et al., 2021), the current study highlights that knowledge-sharing mechanisms do not necessarily convert CSR activities into actual sustainability results. This could be due to the lack of standardization, actionability or integration with hospital decision making processes of information regarding CSR. Thus, organizational commitment, implementation quality and a formal sustainability governance process could be more critical than CSR knowledge-sharing activities for translating CSR strategies into sustainable supply chain practices.

The moderating role of E-Knowledge Sharing in the relationship between Digital Leadership and Supply Chain Sustainability should be interpreted with caution. Although the interaction coefficient appeared statistically large in the initial and revised specifications, its magnitude was disproportionate to the direct effect of Digital Leadership, indicating possible specification instability. Therefore, this study does not claim support for H6 and recommends future studies to re-examine this moderation effect using additional robustness checks and alternative model specifications.

The results, generally, indicate the need to combine strategic, technological and leadership-related

capacities for supply chain sustainability in public hospitals in Jordan. Strategic CSR proved to be the most influential direct determinant of sustainability – highlighting the need for responsible and stakeholder-driven supply chain operations. Digital leadership also played a positive role in the sustainability of supply chains, establishing the relevance of digital vision, coordination through data and decision-making using technology. Meanwhile, it emerges that the green technology has a noticeably moderating impact, meaning that environmental technologies amplify the impact of strategic CSR and digital leadership on sustainable supply chain results. In the case of e-knowledge sharing, however, it seems more complicated. It can potentially help in the coordination and communication of hospital's supply chain, but its moderating influence was not significant or remained in the model overall. Hence, it could be concluded that e-knowledge sharing is a potentially useful organizational capability that needs to be more strongly supported by empirical analysis in future studies.

This study does have several implications on the theoretical level. First, it is an extension of an area of study sustainable supply chain management that has not been as well explored in the public healthcare industry as it has been in manufacturing and private business settings. Second, it serves as a proof to the stakeholder theory, which highlights the importance of stakeholder-oriented practices, environmental responsibility, supplier management, and responsible procurement as important stakeholders to manage in order to improve the sustainability outcomes through strategic CSR. Thirdly, the results confirm the resource-based view and illustrate that digital leadership and green technology are indeed capabilities which can have a positive impact on sustainable supply chain performance. Consequently, the study can be considered as a part of the emerging literature on interaction effects on sustainability by proving that the interaction with green technology is an important moderator, and the moderation effect of e-knowledge sharing should be further validated through empirical research.

The results also have practical implications for managers and policy makers of Jordanian public hospitals. Establishing CSR principles into procurement, supplier evaluations, inventory controls, logistics and environmental management should be executed by the hospital administrators. Additionally, public hospitals need to develop digital leadership potential, leadership development training, build a digital transformation program, and establish cross-functional coordination mechanisms. In addition, investments in green technologies should be focused upon as they enhance both supply chain sustainability and CSR and digital leadership. While the moderating effect of e-knowledge sharing was not clearly supported, there is a strong need to establish a firm and structured digital knowledge-sharing procedure in hospitals to enhance communication, documentation, learning and coordination between the procurement and logistics, pharmacy and quality management and administrative departments. Formal sustainability policies, operational procedures, and digital infrastructure might further enhance the benefits of these systems.

To sum up, the study concludes that strategic CSR, digital leadership and green technology are major elements in enhancing the sustainability of supply chains in Jordanian public hospitals. The results also indicate that the green technology increases the impact of strategic CSR and digital leadership, thus it is a critical factor to support the sustainable healthcare supply chains. The results of the study about e-knowledge sharing are, however, mixed and have to be read with caution. There is a need for future research to further explore e-knowledge sharing with robustness checks, alternative model specifications and longitudinal data to support the evidence of the moderating role of e-knowledge sharing in sustainable healthcare supply chain.

8. Conclusion

This study investigated the role of strategic corporate social responsibility (CSR) and digital leadership on the sustainable supply chain (SC) in Jordanian public hospitals, in addition to moderating the effect of green technology and e-knowledge sharing. According to the results, strategic CSR and digital leadership have both shown to be meaningful and contributing aspects to supply chain sustainability. Strategic CSR proved to be the most significant direct predictor, highlighting the need for an ethically-

managed supply chain, environmental considerations, stakeholder engagement, and responsible procurement practices in order to reach sustainability goals.

The study additionally confirmed that the role of green technology is significant and positive moderating effect. Green technology enhanced the relationship between strategic CSR and supply chain sustainability, and the relationship between digital leadership and supply chain sustainability. The results show that the environmentally sustainable technologies are important enablers, and support the effectiveness of strategic and digital programs in the healthcare supply chain.

The results regarding E-Knowledge Sharing were mixed. The interaction between E-Knowledge Sharing and Strategic CSR was not significant, indicating that digital knowledge-sharing mechanisms did not strengthen the relationship between Strategic CSR and Supply Chain Sustainability. In addition, the E-Knowledge Sharing $\times$ Digital Leadership interaction was not retained in the final confirmatory model due to specification instability. Therefore, this study does not claim empirical support for the moderating role of E-Knowledge Sharing. Instead, E-Knowledge Sharing is discussed as a potentially useful organizational capability that requires further validation through more stable model specifications and future empirical testing.

The study adds to the literature by introducing the concept of sustainable supply chain management in public healthcare sector and by showing how the interaction of capabilities can be strategic, technological and knowledge based, and how these capabilities can affect sustainable supply chain performance. From a practice perspective, the findings indicate that CSR principles need to be embedded in the supply chain practices of policyholders and hospital administrators, digital leadership skills should be enhanced, digital technologies need to be developed and digital knowledge-sharing structures should be created to further promote the sustainability experiences.

This study has some drawbacks, however. This study is only applicable to the public hospital sector in Jordan, which can restrict the broader applicability of the study. The cross-sectional survey data limited causal interpretations and the study did not use operational indicators but instead used the perceptions of the respondents. For future research, the model could be extended to other healthcare environments, with longitudinal designs and with objective measures of performance like procurement efficiency, inventory accuracy, waste reduction and supplier sustainability performance. Other factors to be explored in future research could relate to digital readiness, organizational culture, regulatory support and financial resources, contributing to a holistic understanding of sustainable healthcare supply chains.

Based on the findings, there is a need for public hospitals in Jordan to integrate CSR principles into their procurement and supply chain policies, increase the importance of digital leadership within public hospitals by training and e-transformation projects, and expand the use of green technologies, as well as the implementation of a structured e-knowledge sharing mechanism. These can help to ensure more sustainable, efficient and resilient health supply chains that can address current and future health challenges.

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Appendix A

Initial Outer Loadings and Final Status of Deleted Indicators

Construct	Indicator	Initial Outer Loading	Final Model Status
Digital Leadership	DL1	0.641	Deleted
Digital Leadership	DL3	0.593	Deleted
Digital Leadership	DL5	0.676	Deleted
Green Technology	GT1	0.622	Deleted
Green Technology	GT3	0.566	Deleted
Green Technology	GT4	0.649	Deleted
E-Knowledge Sharing	EKS4	0.684	Deleted
E-Knowledge Sharing	EKS5	0.612	Deleted
Strategic CSR	SCSR2	0.629	Deleted
Strategic CSR	SCSR5	0.587	Deleted
Supply Chain Sustainability	SCS3	0.691	Deleted
Supply Chain Sustainability	SCS4	0.604	Deleted
Supply Chain Sustainability	SCS5	0.558	Deleted

Note. The outer loading of the indicators that were removed in the measurement model refinement process are reported as the initial outer loadings in the table. All the deleted indicators showed outer loadings less than the recommended 0.70. Following the removal of these indicators, the remaining measurement model had acceptable convergence, discrimination, and collinearity. There are no final outer loadings for deleted indicators.