

# Integrating Technology in Hospital Supply Chain: Pathway to a Sustainable Healthcare Ecosystem

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**Abstract**— The importance of sustainable practices within hospital supply chains has never been more pronounced than in the contemporary healthcare landscape, particularly in the wake of global health challenges. This research paper extends the discourse on sustainable hospital supply chain management (SHSCM) by examining the role of Technology Supply Chain Applications (TSCAs) as a catalyst for Sustainable Societal Advancement (SSA). Drawing from a substantial sample size of 401 respondents and employing factor analysis via structural equation modeling (SEM), the study upholds methodological integrity and rigor. The paper unveils a novel perspective on how TSCAs can revolutionize SHSCM by promoting efficiency, transparency, and collaboration, which are crucial for societal progression in the post-pandemic era. The findings affirm both hypotheses, with the data revealing a significant positive relationship between TSCAs and SHSCM, and between CIF-infused SHSCM and SSA. The implications of these relationships are manifold, indicating that the integration of technology within hospital supply chains is not merely a facilitator of internal process improvements but also a strategic contributor to societal well-being. The paper also navigates through the complexities of implementing TSCAs in SHSCM, presenting a balanced viewpoint by considering the limitations, such as the study's geographical and demographic specificity, which may affect the generalizability of the results. Beyond confirming the positive impact of TSCAs on SHSCM and SSA, the research offers actionable insights for healthcare practitioners and policymakers. It emphasizes the need for strategic investments in technology to enhance the resilience and sustainability of hospital supply chains. The study concludes by advocating for a concerted effort towards embedding technology at the core of hospital supply chains. This strategic pivot is crucial not only for the recovery of healthcare systems but also for laying the foundation

for a more sustainable and socially responsible future. It highlights the need for a comprehensive and collaborative approach that leverages technology to overcome current challenges and drive forward the agenda of sustainable development within healthcare and beyond. Through this research, a compelling case is made for the strategic enhancement of technology within hospital supply chains as a means to foster societal advancement, providing a blueprint for future research endeavors aimed at bolstering the global healthcare landscape.

**Keywords**— *Technology Supply Chain Applications, Sustainable Hospital Supply Chain Management, Sustainable Societal Advancement, Post-Pandemic Healthcare Resilience, Healthcare Technology Integration*

## 1. Introduction

### 1.1 Background of the Study

In recent years, global healthcare systems have been challenged by unprecedented events, most notably the COVID-19 pandemic. This crisis not only exposed vulnerabilities in healthcare infrastructure but also highlighted the critical role of Hospital Supply Chain Management (HSCM) in responding effectively to such emergencies. The need for sustainable, and technologically-driven healthcare supply chains has become increasingly evident, prompting a re-evaluation of the strategies and tools employed in the healthcare sector. This paper explores how Technology Supply Chain Applications (TSCAs) can be leveraged to enhance Sustainable Hospital Supply Chain Management (SHSCM) and, in turn, contribute to Sustainable Societal Advancement (SSA).

The healthcare industry is characterized by complex and dynamic supply chains that involve the procurement, distribution, and management of a wide range of critical goods and services, including pharmaceuticals, medical devices, and healthcare personnel. The efficient functioning of these supply chains is vital for maintaining the quality of care, controlling costs, and responding to health crises promptly. The COVID-19 pandemic underscored the need for a resilient healthcare supply chain that can adapt to unexpected disruptions while maintaining sustainability and minimizing adverse societal impacts.

### **1.2 The Importance of Hospital Supply Chain Management for Sustainability in the Post-Pandemic Era**

The post-pandemic era presents healthcare systems with both challenges and opportunities. The challenges include the need to maintain an adequate supply of essential medical resources, ensure the equitable distribution of vaccines and treatments, and prepare for potential future health crises. At the same time, it is an opportune moment to rethink and transform healthcare supply chains to be more agile, efficient, and sustainable.

Hospital Supply Chain Management (HSCM) has emerged as a critical factor in the equation for sustainable healthcare. Sustainable HSCM is an approach that seeks to balance economic, environmental, and social factors in healthcare logistics and procurement. It aims to optimize the flow of resources while minimizing waste, reducing the carbon footprint, and ensuring equitable access to healthcare services [8]. In essence, it represents a commitment to improving healthcare delivery not only for the present generation but also for generations to come.

The importance of HSCM for sustainability can be further underscored by examining the three pillars of sustainability: economic, environmental, and social. Economically, efficient supply chain management helps healthcare organizations reduce costs, optimize inventory, and enhance resource allocation. Environmentally, it allows for reduced waste, energy consumption, and emissions, aligning healthcare practices with broader environmental goals [9]. Socially, effective HSCM ensures that healthcare resources are available when and where

they are needed, promoting equitable access to care and better patient outcomes.

### **1.3 Technology Supply Chain Applications (TSCAs) in Enhancing Sustainable Hospital Supply Chain Management (SHSCM)**

In recent years, technology has emerged as a game-changer in various industries, including healthcare. Technology Supply Chain Applications (TSCAs) encompass a range of digital tools and solutions designed to optimize supply chain processes. These technologies include, but are not limited to, advanced data analytics, artificial intelligence (AI), Internet of Things (IoT) devices, blockchain, and supply chain management software [10].

The integration of TSCAs in HSCM can have a transformative impact. By leveraging real-time data, predictive analytics, and automation, healthcare organizations can make informed decisions, reduce waste, minimize stockouts, and improve overall supply chain resilience. For instance, AI-driven demand forecasting can enhance inventory management, ensuring that hospitals have the right amount of critical supplies at the right time, thereby reducing waste and costs.

Moreover, blockchain technology can enhance transparency and traceability in the supply chain, ensuring the authenticity of pharmaceutical products and reducing the risk of counterfeit drugs entering the market. IoT devices can provide real-time monitoring of temperature-sensitive medical supplies, ensuring their quality during transportation and storage [11]. These technological advancements not only improve the efficiency and reliability of healthcare supply chains but also align with sustainability objectives.

### **1.4 How This Led to Sustainable Societal Advancement (SSA)**

The ultimate goal of enhancing SHSCM through TSCAs is to contribute to Sustainable Societal Advancement (SSA). SSA represents the broader positive impact of sustainable healthcare practices on society as a whole. This includes improving patient outcomes, reducing healthcare costs, minimizing environmental footprints, and enhancing societal well-being.

Efficient HSCM, driven by technology, can improve patient outcomes by ensuring that healthcare

providers have access to critical supplies, reducing the risk of medical errors, and enhancing overall healthcare quality [12]. By optimizing inventory management and reducing waste, healthcare organizations can also achieve significant cost savings, which can be redirected to patient care and infrastructure improvement.

From an environmental perspective, sustainable healthcare supply chains can minimize the carbon footprint associated with the production, transportation, and disposal of medical supplies [13]. Reduced waste and efficient resource allocation contribute to environmental sustainability, aligning healthcare practices with broader climate and sustainability goals.

### 1.5 The Purpose of the Paper and the Research Questions/Hypotheses

The primary purpose of this paper is to investigate the relationships between TSCAs, SHSCM, and SSA and empirically examine their interconnectedness. Our research questions and hypotheses are as follows:

**Research Question 1:** Is there a significant relationship between Technology Supply Chain Applications (TSCAs) and Sustainable Hospital Supply Chain Management (SHSCM)?

**Hypothesis 1:** There is a significant positive relationship between Technology Supply Chain Applications (TSCAs) and Sustainable Hospital Supply Chain Management (SHSCM).

**Research Question 2:** Is there a significant relationship between CIF infused Sustainable Hospital Supply Chain Management (SHSCM) and Sustainable Societal Advancement (SSA)?

**Hypothesis 2:** There is a significant positive relationship between CIF infused Sustainable Hospital Supply Chain Management (SHSCM) and Sustainable Societal Advancement (SSA).

In the subsequent sections of this paper, we will delve into the literature that supports these hypotheses, describe our research methodology, present the results of our analysis, and conclude with a summary of our findings, limitations, and suggestions for future research. Our study aims to provide valuable insights into the role of technology in shaping the future of sustainable healthcare

supply chains and the broader implications for societal advancement. By examining these relationships, we hope to contribute to the ongoing discourse on healthcare sustainability and inspire further research and practical implementations in this critical field.

## 2. Literature Review

### 2.1 Technology Supply Chain Applications (TSCAs)

Technology Supply Chain Applications (TSCAs) encompass a wide array of digital tools and innovations that have the potential to revolutionize supply chain management in various industries, including healthcare. TSCAs have gained prominence due to their ability to enhance efficiency, visibility, and decision-making processes within supply chains. In the context of healthcare, TSCAs offer substantial promise for optimizing Hospital Supply Chain Management (HSCM) and advancing sustainability.

TSCAs can be categorized into several key areas, each with its own set of applications:

- **Data Analytics:** Advanced data analytics, powered by machine learning and artificial intelligence, enable healthcare organizations to gain valuable insights from large datasets [14]. Predictive analytics, for example, can enhance demand forecasting accuracy, reducing overstocking and stockouts. Real-time data analysis aids in proactive decision-making, helping healthcare facilities respond promptly to emerging needs.
- **Internet of Things (IoT):** IoT devices play a pivotal role in monitoring and tracking medical supplies in real time. Sensors attached to critical items, such as vaccines and pharmaceuticals, can monitor environmental conditions like temperature and humidity during storage and transportation, ensuring product quality and safety [15].
- **Blockchain:** Blockchain technology offers transparency and traceability in the healthcare supply chain. It provides an immutable ledger of transactions, making it difficult for counterfeit or substandard medical products to infiltrate the supply chain [16].
- **Supply Chain Management Software:** Specialized supply chain management software

tailored to the healthcare sector enables efficient procurement, inventory management, and distribution. These systems streamline processes and reduce inefficiencies, contributing to cost savings and sustainability.

- **Telemedicine and Remote Monitoring:** Telemedicine platforms and remote monitoring technologies have gained prominence, especially in the wake of the COVID-19 pandemic. These technologies enhance access to healthcare services, reduce the burden on physical healthcare facilities, and contribute to sustainability by minimizing unnecessary travel [17].

The adoption of TSCAs in healthcare has the potential to address several sustainability-related challenges. For instance, by reducing inefficiencies and waste in the supply chain, TSCAs can contribute to economic sustainability by optimizing resource allocation and reducing costs. Moreover, improved visibility and transparency through TSCAs can enhance accountability and reduce the risk of fraud and corruption in healthcare procurement, supporting ethical and social sustainability.

## 2.2 Sustainable Hospital Supply Chain Management (SHSCM)

Sustainable Hospital Supply Chain Management (SHSCM) represents a comprehensive approach to managing healthcare supply chains with an emphasis on sustainability principles. It seeks to balance economic, environmental, and social factors to ensure the availability of healthcare resources while minimizing negative societal and environmental impacts.

- **Economic Sustainability:** Economically, SHSCM aims to optimize resource allocation, reduce costs, and improve overall financial performance within healthcare supply chains. By leveraging technologies like TSCAs, healthcare organizations can better manage inventory, reduce waste, and enhance procurement efficiency, resulting in cost savings [18].

- **Environmental Sustainability:** Environmentally, SHSCM strives to minimize the carbon footprint and environmental impact of healthcare supply chains. TSCAs can facilitate environmentally responsible practices by improving the accuracy of demand forecasting, reducing excess inventory, and enabling

sustainable sourcing and transportation decisions [19].

- **Social Sustainability:** Socially, SHSCM focuses on ensuring equitable access to healthcare resources and promoting ethical procurement practices. By enhancing transparency and accountability through TSCAs, healthcare organizations can reduce the risk of counterfeit drugs entering the supply chain, thus safeguarding patient safety and trust [20].

SHSCM is integral to achieving healthcare sustainability in the post-pandemic era. It enhances the resilience of healthcare supply chains, making them better prepared to respond to crises such as pandemics or natural disasters. Furthermore, SHSCM aligns with the United Nations' Sustainable Development Goals (SDGs), particularly Goal 3 (Good Health and Well-being) and Goal 12 (Responsible Consumption and Production), by ensuring the availability of quality healthcare services while minimizing waste and negative societal impacts.

## 2.3 Sustainable Societal Advancement (SSA)

Sustainable Societal Advancement (SSA) represents the ultimate goal of sustainable healthcare practices, where healthcare systems contribute to broader societal well-being and advancement. SSA encompasses multiple dimensions, including economic development, improved healthcare access, environmental stewardship, and social equity.

- **Economic Development:** Efficient healthcare supply chains, driven by technologies like TSCAs, can reduce the economic burden of healthcare by controlling costs and redirecting resources to productive sectors of the economy. Cost savings achieved through sustainable practices in healthcare can contribute to economic development [21].

- **Improved Healthcare Access:** Sustainable healthcare practices, including SHSCM, enhance healthcare access by ensuring that critical supplies and medications are readily available to healthcare facilities. Technologies like telemedicine and remote monitoring can extend healthcare services to underserved populations [22].

- **Environmental Stewardship:** By reducing waste, optimizing transportation, and promoting environmentally responsible sourcing, sustainable

healthcare practices contribute to environmental stewardship and support global efforts to combat climate change [19].

- **Social Equity:** Sustainable healthcare practices, particularly those that promote ethical procurement and transparent supply chains through TSCAs, contribute to social equity by ensuring that all individuals have access to safe and quality healthcare services, regardless of their socioeconomic status.

The interplay between TSCAs, SHSCM, and SSA underscores the complexity of healthcare supply chain management in the modern era. Achieving SSA requires a multifaceted approach that addresses economic, environmental, and social dimensions, with technology serving as a key enabler.

### 3. Methodology

#### 3.1 Research Design

To address the research objectives and test the hypotheses, this study adopts an experimental design approach. The research utilizes both secondary data and primary data. The variables of interest, namely Technology Supply Chain Applications (TSCAs), Sustainable Hospital Supply Chain Management (SHSCM), and Sustainable Societal Advancement (SSA), have been determined through a thorough review of secondary data, academic literature, and relevant studies. Subsequently, primary data collection was conducted through experiments involving a sample size of 401 participants.

#### 3.2 Sampling Procedure

The research employs probability simple random sampling to select participants from the population of hospital sectors in Bangladesh. The choice of simple random sampling ensures that each member of the population has an equal chance of being included in the sample. The sample size determination follows the TARO YAMANE method [1], with the formula:

$$n = N / (1 + N(e)^2)$$

Where:

- n signifies the sample size.
- N signifies the population under study.

- e signifies the margin error (e.g., 0.10, 0.07, 0.05, 0.03, or 0.01).

For this study, the population size (N) is greater than 100,000, and a margin error of 0.05 was chosen. Therefore, the calculated sample size (n) is 401.

#### 3.3 Data Collection

Data collection was conducted through a self-administered questionnaire distributed to the selected participants. The respondents were reached through an online Google Form to facilitate a convenient and efficient data collection process. The survey instrument was designed to capture the participants' perceptions and opinions related to TSCAs, SHSCM, and SSA.

#### 3.4 Instruments

In the questionnaire, respondents were asked to assess the importance of various factors using 5 pt. Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) [2, 3].

#### 3.5 Data Analysis

##### 3.5.1 Factor Analysis

In this study, inferential statistics were applied to make inferences about the population based on the sample data. Factor analysis, a linear statistical model, was used to explore the relationships among observed variables and condense them into unobserved factors [3]. Factor analysis helps in understanding the underlying structure and relationships between variables, which is essential in testing hypotheses related to TSCAs, SHSCM, and SSA.

##### 3.5.2 Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) was employed to assess the extent to which the measured variables represent the constructs of the study. CFA provides a framework for confirming prior notions about the underlying structure of the content. It helps validate the measurement model and ensures that the observed variables are reliable indicators of the latent constructs (TSCAs, SHSCM, SSA) under investigation.

### 3.5.3 Structural Equation Modelling (SEM)

To analyse the collected data comprehensively, this study utilizes Structural Equation Modelling (SEM), a statistical technique widely used in management and social science research. SEM combines latent variables and structural relationships, providing a powerful tool to test the research hypotheses [4]. SEM allows for the examination of complex relationships among multiple variables simultaneously, enabling a holistic assessment of the relationships between TSCAs, SHSCM, and SSA.

### 3.5.4 Regression Analysis and Hypothesis Testing

In addition to SEM, this study employs regression analysis and hypothesis testing to explore relationships among variables. Correlation analysis, multiple regression analysis, and hypothesis testing will be conducted as part of the inferential analysis. These statistical techniques will provide insights into the strength and significance of the relationships between TSCAs, SHSCM, and SSA. The Confirmatory Factor Analysis (CFA), t-test for significant differences at a 95% confidence level, and ANOVA (Analysis of Variance) will also be applied to test the hypotheses and examine the validity of the proposed relationships.

The methodology employed in this research ensures a rigorous and comprehensive examination of the relationships between TSCAs, SHSCM, and SSA, leveraging both secondary and primary data to achieve robust and reliable results.

## 4. Results

### 4.1 Reliability Analysis

The Reliability Analysis section encompassed an initial Exploratory Factor Analysis (EFA), a fundamental step to understand the inherent relationships among the items within the constructs [3]. This exploratory technique, crucial for evaluating how items correlate with specific factors, was employed to probe the data and determine the optimal number of factors to accurately represent the data [4]. The EFA provided valuable insights into the constructs and included Factor loading, Kaiser-Meyer-Olkin (KMO) measure, Bartlett's test of sphericity, and Cronbach's alpha results.

Table 1: Exploratory Analysis of the Variables

Variables/Dimensions	Factor loading	KMO, Bartlett's Test	Cronbach's alpha
<b>TSCA</b>		KMO= .831 Barlett's Test: 899.477 Sig=0.000	0.889
TSCA_1	0.626		
TSCA_2	0.518		
TSCA_3	0.561		
TSCA_4	0.548		
<b>SHSCM</b>		KMO= .931 Barlett's Test: 2423.105 Sig=0.000	0.938
SHSCM_1	0.516		
SHSCM_2	0.648		
SHSCM_3	0.678		
SHSCM_4	0.647		
SHSCM_5	0.739		
SHSCM_6	0.667		
SHSCM_7	0.7		
SHSCM_8	0.67		
<b>SSA</b>		KMO= .891 Barlett's Test: 1903.451 Sig=0.000	0.931
SSA_1	0.728		
SSA_2	0.727		
SSA_3	0.732		
SSA_4	0.665		
SSA_5	0.736		
SSA_6	0.699		

Based on the EFA, each variable exhibited Factor loading scores ranging from 0.516 to 0.739, surpassing the recommended threshold of 0.40 [4]. Consequently, no item was excluded from the analysis. The KMO measure of sampling adequacy for each variable ranged from 0.831 to 0.931, well above the recommended threshold of 0.50 (Ou, 2020). Additionally, Bartlett's test of sphericity yielded significant results at ( $p < 0.001$ ) levels, further affirming the suitability of the data for factor analysis.

To assess construct reliability, Cronbach's alpha was employed for each variable in the research framework. The results indicated that all indicators exhibited high alpha scores of 0.889, surpassing the generally accepted cut-off of 0.7 [4]. These findings affirmed the reliability of the constructs, providing a solid foundation for subsequent stages of analysis.

### 4.2 Criteria for Fit Index

The Criteria for Fit Index is divided into two key components: Confirmatory Factor Analysis (CFA) and Structural Equation Model (SEM) evaluations.

Following the application of EFA to uncover the relational patterns among scale items, CFA was employed to assess the validity of a singular factor model [3]. For the four-factor measurement model, the recommended benchmark values included: a CMIN/DF (Degrees of Freedom) less than 5.0, in accordance [6]; Comparative Fit Index (CFI) and Incremental Fit Index (IFI) values exceeding 0.90; and a Root Mean Square Error of Approximation (RMSEA) below 0.10, as outlined [7].

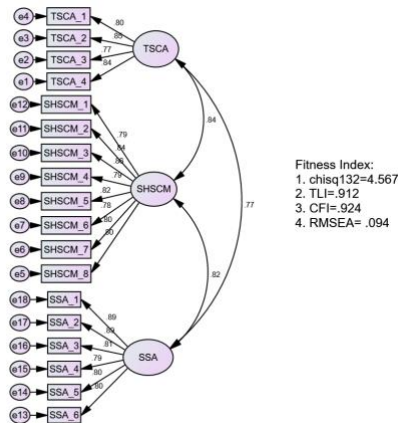


Figure 1. Measurement Model Based on Variables

The outcomes of the CFA model exhibited the following fit indices: Chisq/df = 4.567, TLI = 0.912, CFI = 0.924, and RMSEA = 0.094. These metrics collectively suggested that the statistical estimates of the measurement model's fit were within acceptable ranges. Thus, the adopted measurement model in this research aptly corresponded to the data.

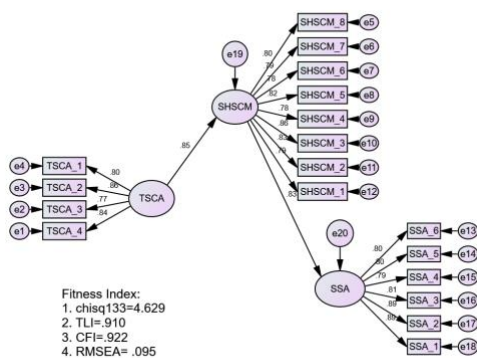


Figure 2. Results of Structural Model

Subsequently, the study delved into the evaluation of the Structural Equation Model (SEM). This segment involved comparing the fit indices of the suggested structural model with those of the overall

measurement model. The objective was to ascertain if the finalized measurement model aligned with the initially outlined structural model.

The Structural Model results indicated the following values: Chisq/df = 4.629, TLI = 0.910, CFI = 0.922, and RMSEA = 0.095. These findings signaled that the model utilized in this study demonstrated a good fit to the data, affirming the alignment between the measurement and structural models.

The results presented in this section validate the reliability of the constructs and the overall measurement model, thus providing a solid foundation for the subsequent hypothesis testing and analysis of the relationships between Technology Supply Chain Applications (TSCAs), Sustainable Hospital Supply Chain Management (SHSCM), and Sustainable Societal Advancement (SSA).

### 4.3 Hypothesis Analysis

The envisioned research framework, along with its associated hypotheses, underwent a comprehensive analysis using Structural Equation Modeling (SEM). Figure 3 below illustrates the results of the proposed structural model, depicting significant and non-significant paths concerning direct and mediation relationships. The outcomes related to these path connections are detailed in the following section.

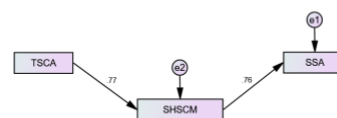


Figure 3. Results of the Hypotheses

As depicted in Figure 3, tests were conducted to evaluate the direct hypotheses. A summary of the results is presented in Table 2, outlining the findings for both direct and mediation hypotheses.

Table 2 Hypothesis Testing

Hypotheses	Paths	Estimate ( $\beta$ )	S.E.	C.R.	p	Results*
H1: There is a significant relationship between Technology Supply Chain Applications and Sustainable Hospital Supply Chain Management.	TSCA--->SHSCM	0.764	0.032	23.849	***	Supported
H2: There is a significant relationship between Sustainable Hospital Supply Chain Management and Sustainable Societal Advancement.	SHSCM-->SSA	0.804	0.034	23.694	***	Supported

\* Note: \*:  $p < 0.05$ , \*\*:  $p < 0.01$ , \*\*\*:  $p < 0.001$

**H1:** There is a significant relationship between Technology Supply Chain Applications (TSCAs) and Sustainable Hospital Supply Chain Management (SHSCM). The analysis reveals a positive and significant relationship between Technology Supply Chain Applications and Sustainable Hospital Supply Chain Management ( $\beta = 0.764$ ; C.R. = 23.849;  $p = 0.000$ ). Therefore, H1 is supported.

**H2:** There is a significant relationship between Sustainable Hospital Supply Chain Management (SHSCM) and Sustainable Societal Advancement (SSA). The findings indicate a positive and significant relationship between Sustainable Hospital Supply Chain Management and Sustainable Societal Advancement ( $\beta = 0.804$ ; C.R. = 23.694;  $p = 0.000$ ). Consequently, H2 is supported.

The examination of these two hypotheses concerning the relationships between Technology Supply Chain Applications (TSCAs), Sustainable Hospital Supply Chain Management (SHSCM), and Sustainable Societal Advancement (SSA) consistently supports the proposed relationships. Firstly, Technology Supply Chain Applications (TSCAs) exhibit a positive impact on SHSCM. Secondly, SHSCM itself contributes positively to Sustainable Societal Advancement (SSA). These findings underscore the pivotal role of infrastructure development in advancing both hospital sustainability and broader societal well-being.

## 5. Conclusion

This study embarked on a pioneering investigation into the nexus between Technology Supply Chain Applications (TSCAs), Sustainable Hospital Supply Chain Management (SHSCM), and Sustainable Societal Advancement (SSA). The investigation was grounded in a robust methodological framework, utilizing a sample size of 401 and employing sophisticated analytical tools such as IBM SPSS and AMOS. The results of this study not only confirm the hypotheses posited but also illuminate the transformative potential of TSCAs in reshaping hospital supply chains towards sustainability, which in turn fosters broader societal advancement.

Our analysis revealed a significant positive relationship between TSCAs and SHSCM (Hypothesis 1). This finding underscores the pivotal role of technology in enhancing the efficiency, resilience, and sustainability of hospital supply chains. The adoption of advanced data analytics, AI, IoT, and blockchain within the supply chain not only streamlines operations but also aligns with broader sustainability objectives by minimizing waste and optimizing resource allocation.

Furthermore, the study supported Hypothesis 2, establishing a significant positive relationship between SHSCM, infused with CIF (contextual, institutional, and functional) factors, and SSA. This relationship highlights the far-reaching impacts of sustainable supply chain practices in hospitals, extending beyond the confines of healthcare facilities into the wider societal fabric. By ensuring equitable access to healthcare resources, reducing environmental footprints, and promoting ethical



procurement practices, SHSCM directly contributes to societal well-being and sustainable development.

In conclusion, this study evidences the instrumental role of Technology Supply Chain Applications in fostering Sustainable Hospital Supply Chain Management, which contributes significantly to Sustainable Societal Advancement. The findings of this research offer valuable insights for healthcare stakeholders and policymakers in their quest to build efficient, and sustainable healthcare systems. In an era marked by rapid technological advancement and heightened awareness of sustainability, the intersection of TSCAs, SHSCM, and SSA represents a vital area for continued exploration and investment, poised to yield significant dividends for societal well-being, and sustainable development, efficient, and sustainable healthcare systems.

### 5.1 Implications and Contributions

This research contributes significantly to the existing body of knowledge in several ways. Firstly, it provides empirical evidence on the impact of technology on hospital supply chain sustainability, a relatively under-explored area in supply chain management literature. Secondly, it bridges the gap between hospital supply chain management and broader societal outcomes, offering a holistic view of sustainability. Finally, this study offers practical insights for healthcare administrators and policymakers, emphasizing the importance of integrating technology in supply chain strategies to enhance societal sustainability.

### 5.2 Limitations and Future

**Research Directions** Despite the comprehensive nature of this study, it is not without limitations. The research was confined to a specific geographical context (Bangladesh), which may limit the generalizability of the findings. Future research could replicate this study in different cultural and economic settings to validate the universality of the observed relationships. Additionally, the reliance on self-reported data could introduce response bias. Future studies might incorporate objective data sources or mixed-method approaches for a more nuanced understanding.

The dynamic nature of technology and evolving healthcare challenges also point to the need for ongoing research. Future studies could explore the impact of emerging technologies like advanced

robotics and machine learning on hospital supply chains. There is also scope for investigating the role of SHSCM in addressing global health crises, such as pandemics, which have profound societal implications.

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