THE ROLE OF ADVANCED TECHNOLOGICAL INNOVATION ON STRATEGIC SUPPLY CHAIN MANAGEMENT IN HEALTHCARE INDUSTRY

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ABSTRACT

Advanced technologies show drastic improvement in the operations, shaping out the processes in a way that assists disentanglement of operational services with decision making, which improves the tendency of healthcare organizations towards their patients and brings back economy into the organizations (Kumar & Singh, 2023). In this regard, this study examines the role of advanced technological innovation on strategic supply chain management. Resourced-based theory was used to understand and explain how advanced technologies could improve healthcare service delivery. Quantitative approach to research was adopted whereby questionnaires were administered to healthcare professionals. Statistical methods of data analysis were applied by carrying out descriptive as well as inferential statistics. Pearson Moment Correlation Coefficient test was carried out to determine direction of relationship in the variables. It was discovered that, firstly, there is a direct, very strong and significant impact of advanced technological innovations on transparency of strategic supply chain management in the health industry. Secondly, there is a direct, very strong and significant influence of advanced technological tools on the decision-making processes and operational performance of healthcare supply chain. Lastly, there is a very strong and significant relationship between advanced technological in the healthcare sector and efficiency of service delivery. To this end, it was recommended that healthcare organizations should implement big data analytics and AI-powered tools to accurately forecast demand for medical supplies, optimize inventory levels, and reduce the risk of stockouts or overstocking. Secondly, the adoption of blockchain technology can improve data integrity, enhance traceability, and reduce the prevalence of counterfeit products in the healthcare supply chain. Lastly, IoT devices should be deployed to track medical supplies and equipment in real time, ensuring proper storage conditions and improving supply chain visibility.

Keywords: Advanced Technology, Healthcare, Industry, Supply Chain, Management.

1.0 INTRODUCTION

Health is one of the pillars of human existence that requires, among other things, an effective system of supply chain management to help transport medical supplies and equipment as well as medicines for every citizen who needs them at the right time. It has become increasingly necessary to implement advanced systems because of the ever-evolving demand for health care which incorporates more personalized care due to advances in technology and the markets within which services are offered. New age technologies that include Artificial Intelligence (AI), and blockchain technologies are now revolutionizing supply chain strategic management systems in health care among other sectors. The results of these technologies we present below

are drastic improvement in the operations, shaping out the processes in a way that assists disentanglement of operational services with decision making, which improves the tendency of healthcare organizations towards their patients and brings back economy into the organizations (Kumar & Singh, 2023). Thus, this article looks at how advanced technologies are enabling optimized supply chain management in connection to the healthcare sector. The centrality of health to individual, family, community, country and world at large; implies that there is need to improve its service discharge to humanity especially in developing countries. Another similar reason is the increased age and spread of diseases or viruses that are new or already known to most of the population. Therefore, the health industry must also be advanced enough to combat these diseases or viruses, or to help sick people in general.

1.1 Significance of Study

The inclusion of technology such as blockchain and artificial intelligence is poised to reinvent supply chain management in a large extent, enhancing both efficiency and transparency. For instance, AI-driven predictive analytics can synchronize inventory levels, manage demand more effectively, and mitigate supply chain issues hence always ensuring availability of essential healthcare products (Chang & Wu, 2022). In contrast, blockchain ensures complete clarity by means of a tamper-proof record of transactions that allows accuracy. Healthcare institutions to follow the path of the products within the supply chain in a more accurate manner (Gupta & Desai, 2021). These technologies are, however, more useful in the fight against fake medicines and in enhancing compliance with the law, thus making the healthcare supply chain more reliable. However, the introduction of high technologies into the healthcare system does not only focus on ensuring faster or immediate provision of the goods and services; it also assures the quality and authenticity of the products offered, which is very pertinent in gauging the effectiveness of the health sector. In this manner, this article explains how the evolution of technology in the healthcare sector and its widespread usage can lead to the advancement of the world.

1.2 Research Objectives

i. To examine the impact of advanced technological innovations like AI and blockchain on transparency of strategic supply chain management in the health industry.
ii. To analyze how integration of advanced technological tools influences the decision-making processes and operational performance of healthcare supply chains.
iii. To examine the relationship between advanced technologies in the healthcare sector and efficiency of service delivery.

2.0 LITERATURE REVIEW

It is apparent that the advent of advanced innovations such as AI, Bitcoin and others has transformed supply management strategies in the health sector. Such technologies resolve various issues that contemporary healthcare supply chains experience by increasing transparency, efficiency, and facilitating the use of rational evidence in decision-making. The progression of the health sector implies that such technologies must be embraced to sustain good quality of healthcare, control expenses, and protect critical healthcare resources. New scientific insights and practical use will be necessary to the full understanding of the capacities of such technologies in the supply chain of healthcare services. On this pedestal, a literature

review was conducted in this study to explore works of scholars on various advanced technologies that are available for adoption in healthcare supply chain management to improve the quality of medical products available for consumption.

2.1 The Role of Advanced Technologies in Healthcare Industry

The future of technological innovation in healthcare supply chain management appears to be bright with the advent of new technologies like quantum computing and augmented reality (AR). The introduction of quantum computing may offer additional processing power thereby enhancing supply chain predictive analytics capability (Dhamija et al., 2023). AR can be used to help keep medical consumables in check on a real-time basis and allow better training of supply chain managers. Also, thanks to the advances in the field of AI, most specifically natural language processing, it would be possible to provide more sophisticated decision- support systems which are capable of aiding supply chain management with more complex data such as clinical notes (Pereira et al., 2022). Lee and Kwan (2024) further this study by outlining the advancing applications of Artificial Intelligence, automation of processes, and inventory control along with predictability analytics. Decisions are thought to be largely enhanced and streamlined through AI by anticipating patient needs and regulating stock levels. It is projected that in the coming years, more integration of AI systems with IoT appliances will be seen for the purpose of monitoring the supplies in real time.

Hence, Brown and Taylor (2024) propose how blockchain technology can be utilized to ensure trustworthiness and visibility in supply chain transactions. The possibility of curtailing corruption and assuring the traceability of drugs is stressed. The authors forecast that the growth of blockchain technology in the healthcare sector will be stimulated by increasing legislation about data protection. In another study by Singh and Gupta (2024), they analyze the potential effects of telemedicine on supply chains as it pertains to the movement of medical devices and remote patient monitoring trends point towards enhanced integration of telehealth services and supply chains to send patients' medications on time. Similarly, in an article by Johnson and Kumar, they elaborated on how the connected devices capable of monitoring the inventory levels and their usage practices will enhance the efficiency of the supply chain via IoMT. It has been reported that with the increase in usage of IoMT, there will be an increased importance in the implementation of security protocols, to help safeguard the health systems' data. Research on 3D printing technology by Parker and Thompson (2024), focuses on its future use in medical supply and prosthetics- manufacturing on fast turning demand. Based on this fact, they opine that soon, hospitals will make use of on-site 3D printers for various processes in a bid to reduce the cost and the time delay in procuring certain items. James and Nguyen (2024) examine how modern analytics can improve forecasting and demand planning in supply chains. Predictive analytics would be more pronounced in the future in helping healthcare centers adjust to patient demand or inventory supply. In their study, Rodriguez and Lee (2024) discuss the application of automation technology in fulfilling supply chain operations like sourcing, transportation, and inventory control operations. They speculate that with robotic progression for infirmaries, operational efficiency will greatly increase while there will also be a reduction in the number of staff required.

In addition to this, Owen and Zhao (2024), tackle the topic of usage of AI in supply chains within the healthcare sector with regards to the privacy of data and the potential for bias within

systems. Trends in the future indicate that the demand for ethical issues concerning the deployment of such technologies will be a paramount concern that will need to be addressed as the technologies mature. The analysis provided by Martinez and Singh (2024) explores the changing trends in supply chain models owing to the coronavirus disease, with a call for newer and more flexible models. The research proposes that integrating technology into the supply chain using big data and real-time data integration will be crucial in future supply chains. Cheng and Foster (2024) suggest how augmented reality (AR) serves to train the personnel involved in the healthcare supply chain; thus, enhancing productivity and curtailing mistakes; suggesting a prospective rise of AR application in logistics management during orientation phases and recurrent training. Sustainability is fast becoming a key issue for health care supply chains due to evolving technologies (Jenkins & Barlow, 2024). The findings provide an argument that firms that are taking on environmentally friendly development will most likely outperform their rivals in the same industry. Healthcare supply chains are examined in the context of the case for smart contracts by Ali and Rao (2024). Smart contracts represent a new stream in procurement since they offer the potential for automation, deterrence to fraud and increased transparency.

Wallace and Kim (2024) addressed the role of cloud computing in healthcare supply chains and how it improves their level of integration in terms of data sharing and cooperation. The research forecasts that these cloud-based solutions will be embraced by more of these smaller players as the cost of cloud technology declines. Bennett and Clarke (2024) underline the crucial importance of adopting advanced cybersecurity techniques as the health care supply chains are becoming more computerized. According to Bennett and Clarke (2024), expending resources towards security technology will readily become among the topmost priorities for most of the healthcare providers. Moreover, Green and Patel (2024) provide insights on the use of predictive analytics to reduce the likelihood of drug shortages. The authors add that such remedies help institutions controlling their stocks against this eventuality hence minimizing the effects on continuity of care.

2.2 Resource-Based Theory

The Resource-Based Theory (RBT) postulates that internal resources of the organization, and especially those characterized by value, rarity, inimitability and non-substitutability, can grant a nearly perpetual edge over competitors (Barney, 1991). In healthcare supply chain management advanced technologies can be considered as a strategic resource, looking at the way implementation of Artificial Intelligence (AI) and blockchain technology facilitates integration within the various arms of healthcare. These developments allow healthcare facilities to enhance their operational systems while cutting down on wastage and increasing the quality of care, which is very vital in the context of competition. Such advanced integration of the technology tools into the strategic management of the supply chain demonstrates the emerging need for the healthcare service providers to incorporate technological resources in their operations to keep up with the changing demands in the market (Nguyen et al., 2023). This theory showed how advanced technology could be helpful in improving supply chain management in the health industry.

3.0 METHODOLOGY

3.1 Research Design

This study employs a quantitative research design to investigate the impact of advanced technology in supply chain management on the health industry in Nigeria. The quantitative approach allows for the systematic collection and analysis of numerical data to examine relationships between the use of advanced technology and its impact on supply chain efficiency within the healthcare sector. This design aligns with the study's objective of generating statistically reliable findings (Creswell, 2014).

3.2 Study Location

The study was conducted in Lagos State, Nigeria, a metropolitan area that houses numerous healthcare facilities, including public and private hospitals, labs, and pharmaceutical centers. Lagos was chosen for its advanced healthcare infrastructure, high population density, and diversity of healthcare workers, making it a suitable location to evaluate the integration of advanced technology in healthcare supply chains.

3.3 Study Population

The population for this study consists of nurses, pharmacists, and doctors working in healthcare institutions in Lagos. These professionals were selected because they are actively involved in, or significantly impacted by, supply chain management processes. Their insights provide a comprehensive understanding of how advanced technology affects operational efficiency in the healthcare sector.

3.4 Sampling Technique

A non-probability sampling technique was used to recruit participants:

1. Purposive Sampling: Healthcare workers who have direct knowledge or experience with supply chain management and technology usage were deliberately selected for their expertise.
2. Accidental Sampling: Participants who were readily available and willing to participate during the data collection period were included to enhance accessibility and response rates (Etikan et al., 2016).

3.5 Sample Size

A total of 120 healthcare workers, comprising nurses, pharmacists, and doctors, were recruited for the study. This sample size ensures adequate representation of the target population while maintaining feasibility within the research timeline and available resources.

4.0 RESEARCH INSTRUMENT

A structured questionnaire was designed and used as the primary data collection instrument. The questionnaire included closed-ended questions categorized into sections covering demographic details, awareness and usage of advanced technology in supply chain

management, and the perceived impact on healthcare service delivery. The structured format ensured uniform responses and facilitated ease of analysis (Kothari, 2004).

4.1 Method of Data Collection

Data collection was conducted through face-to-face administration of questionnaires. This method allowed the researchers to directly engage with participants, clarify any ambiguous questions, and ensure accurate completion of the instrument. Face-to-face data collection also minimized non-response rates and enhanced the reliability of the collected data (Bryman, 2012).

4.2 Method of Data Analysis

The collected data was analyzed using statistical analysis, specifically the correlation method. Correlation analysis was employed to identify and quantify the relationships between the adoption of advanced technology in supply chain management and various performance outcomes in the healthcare industry. Statistical software such as SPSS was utilized to compute descriptive and inferential statistics, with results presented in tables and graphs for clarity.

4.3 Ethical Considerations

This study adhered to standard ethical principles to protect participants:

   i.   Informed Consent: Participants were provided with detailed information about the study and required to give voluntary consent before participation (Resnik, 2020).
  ii.   Anonymity: Respondents' identities were kept anonymous by excluding any personal identifiers from the data collection process.
 iii.   Confidentiality: Data collected was stored securely and used solely for research purposes.
  iv.   No Harm: The study ensured that participants were not exposed to any physical, psychological, or social harm.
   v.   Withdrawal Rights: Participants were informed of their right to withdraw from the study at any time without any negative consequences.

These measures ensured the study's compliance with ethical standards and enhanced participants' trust and cooperation.

5.0 RESULTS

Table 1: Sociodemographic variables of the respondents

S/N	QUESTION	Frequency	Percentage %
1.	**Gender**		
	Male	47	42
	Female	66	58
	Total	**113**	**100**
2.	**Ethnic group**		
	Yoruba	24	21

		Hausa	11	10
		Igbo	23	20
		Others	55	49
		Total	**113**	**100**
3.		**Work status**		
		Nurses	57	**51**
		Doctors	24	21
		Pharmacists	32	28
		Total	**113**	**100**
4.		**Position in the healthcare facility**		
		Top	21	19
		Middle	48	41
		Junior	44	40
		Total	**113**	**100**
5.		**Level of satisfaction as a healthcare worker**		
		High	21	19
		Moderate	48	41
		Low	44	40
		Total	**113**	**100**
6.		**What is your average monthly income**		
		Less than #100000	52	46
		#100000 #499999	33	29
		#500000 and above	28	25
		Total	**113**	**100**

Source: Author's Survey, 2025

Table 1 above reveals that most respondents are female, accounting for 58%, while males constitute 42% of the sample. Ethnic diversity is evident, with 49% identifying as "Other" ethnic groups beyond Yoruba (21%), Igbo (20%), and Hausa (10%). The table also shows from the work status that nurses form the largest professional group at 51%, followed by pharmacists (28%) and doctors (21%). Regarding positions within healthcare facilities, middle-level roles are the most prevalent at 41%, followed by junior-level positions (40%), and top-level roles (19%). Healthcare worker satisfaction levels vary, with the majority reporting moderate satisfaction (41%), followed by low satisfaction (40%), and high satisfaction (19%). In terms of income, 46% of respondents earn less than #100,000 monthly, 29% earn between #100,000 and #499,999, and 25% earn #500,000 or more.

Table 2: Advanced technological innovations on transparency of strategic supply chain management in the health industry

S/N	ITEM	SA	A	N	D	SD	Frequency %
1.	The high level of advanced technologies in SCM has transformed the healthcare industry	65 58%	43 38%	5 4%	0 0	0 0	**113** **100%**
2.	Advanced technologies in SCM have made it easy to understand medicines for patients	55 49%	29 25%	13 12%	10 9%	6 5%	**113** **100%**

S/N	ITEMS	SA	A	N	D	SD	Frequency %
3.	Advanced technologies in SCM have made it easy to track medical supply	58 51%	39 34%	8 7%	4 4%	4 4%	**113 100%**
4.	Supply chain management in healthcare industry makes fraudulent act difficult in medical products	49 43%	51 46%	7 6%	6 5%	0 0	**113 100%**
5.	Advanced technologies in SCM have improved in delivery process of medical supplies	57 50%	41 36%	8 7%	4 4%	3 3%	**113 100%**
6.	It is now possible for patients to be involve in their medical supplies before arrival	44 40%	35 30%	23 20%	8 7%	3 3%	**113 100%**
7.	Advanced technologies in SCM have open buying and selling of medical products and made it seamless	68 60%	27 24%	9 8%	5 4%	4 4%	**113 100%**
8.	I believe that advanced technologies in SCM will continue to make healthcare supplies trustworthy	53 47%	45 40%	8 7%	7 6%	0 0	**113 100%**

Source: Author's Survey, 2025

Table 2 above shows that (58%) of respondents strongly agree, (38%) agree, (4%) are neutral, and none disagree or strongly disagree. This indicates overwhelming positive sentiment toward the transformative impact of advanced technologies in SCM. Nearly half of the respondents (49%) strongly agree, (25%) agree, (12%) are neutral, (9%) disagree, and (5%) strongly disagree. While the majority view this as a benefit, a small portion remains neutral or disagrees. Over half (51%) strongly agree, (34%) agree, (7%) are neutral, (4%) disagree, and (4%) strongly disagree. This implies that most respondents believe tracking medical supplies has improved significantly, though a minority is neutral or disagrees. The table also shows that a substantial proportion (43%) strongly agree, 46% agree, 6% are neutral, 5% disagree, and no one strongly disagrees. This implies that a strong consensus exists about the effectiveness of SCM in reducing fraud, with minimal disagreement. Half of the respondents (50%) strongly agree, (36%) agree, (7%) are neutral, (4%) disagree, and (3%) strongly disagree. This shows that the majority recognize improvements in delivery processes, though a few express neutrality or disagreement. Fewer respondents (40%) strongly agree, (30%) agree, (20%) are neutral, (7%) disagree, and (3%) strongly disagree. While the majority agree, a substantial portion is neutral or disagrees, suggesting mixed experiences with patient involvement. A majority (60%) strongly agree, (24%) agree, (8%) are neutral, (4%) disagree, and (4%) strongly disagree. This indicates strong support for the role of advanced technologies in streamlining commerce, though a small fraction remains neutral or dissatisfied. Lastly, (47%) strongly agree, (40%) agree, (7%) are neutral, (6%) disagree, and no one strongly disagrees. The majority believe in the sustained trustworthiness of healthcare supplies due to SCM, with minimal disagreement.

Table 3: Integration of advanced technologies tools influence decision-making processes and operational performance of healthcare supply chains

S/N	ITEMS	SA	A	N	D	SD	Frequency %

1.	Integrating advanced technologies has made decision-making process faster than before in healthcare industry	62 54%	32 28%	11 10%	4 4%	4 4%	**113 100%**
2.	Operational activities of healthcare workers have improved significantly due to advanced technologies in SCM	49 43%	44 40%	13 11%	7 6%	0 0	**113 100%**
3.	Many lives have been improved ever since advanced technologies have been integrated into the healthcare industry SCM	53 47%	38 34%	16 14%	0 0	6 5%	**113 100%**
4.	Many healthcare workers now rely heavily on advanced technologies before making decisions for optimum performance	42 37%	49 43%	15 13%	3 3%	4 4%	**113 100%**
5.	Integrating advanced technologies into healthcare supply chain has built patients trust in the industry	41 36%	52 46%	11 10%	6 5%	3 3%	**113 100%**
6.	Management of most healthcare facilities now save more due to advanced technologies adoption in the industry	33 29%	59 53%	9 8%	5 4%	7 6%	**113 100%**
7.	Integrating advanced technologies into decision-making process improves quality of medical products and supplies	51 45%	45 39%	13 12%	4 4%	0 0	**113 100%**
8.	Applying advanced technologies into supply chain has reduced the rate of fake drugs in the country	32 28%	58 51%	11 10%	5 4%	7 7%	**113 100%**

Source: Author's Survey, 2025

Table 3 shows that (54%) of respondents strongly agree, (28%) agree, (10%) are neutral, and (8%) disagree (4% disagree and 4% strongly disagree). This indicates that most respondents perceive a significant positive impact, although a small minority remains neutral or disagrees. A substantial proportion (43%) strongly agree, (40%) agree, (11%) are neutral, and (6%) disagree. While the majority agree with the improvement, a notable minority express neutrality or disagreement. Nearly half of the respondents (47%) strongly agree, (34%) agree, (14%) are neutral, and (5%) strongly disagree. The responses suggest a predominantly positive perception, though some respondents remain neutral or critical. A small proportion (37%) strongly agree, (43%) agree, (13%) are neutral, (3%) disagree, and (4%) strongly disagree. A strong consensus exists around the reliance on technology, with a minority expressing neutrality or disagreement. The table further shows that (36%) strongly agree, (46%) agree, 10% are neutral, 5% disagree, and 3% strongly disagree. This indicates widespread agreement on increased patient trust, although a few remain neutral or skeptical. A few (29%) strongly agree, (53%) agree, (8%) are neutral, and (10%) disagree (4% disagree and (6%) strongly disagree. Most respondents perceive cost savings, but a small percentage express doubt or neutrality. About half respondents (45%) strongly agree, (39%) agree, (12%) are neutral, and (4%) disagree. The majority agree on quality improvement, but some respondents are neutral or disagree. Fewer respondents (28%) strongly agree, (51%) agree, (10%) are neutral, and (10%) disagree (4% disagree and (7%) strongly disagree. While most respondents believe in the reduction of fake drugs, a minority remains neutral or skeptical.

Table 4: Advanced technologies in the healthcare sector and efficiency of service delivery of supply chain management in healthcare industry

S/N	ITEMS	SA	A	N	D	SD	Frequency %
1.	The treatment timing of patients drastically reduced due to advanced technologies in SCM	52 46%	43 38%	12 11%	6 5%	0 0	**113 100%**
2.	Advanced technologies in SCM create more room for healthcare workers and patients to have cordial relationship	33 29%	49 43%	21 19%	7 6%	3 3%	**113 100%**
3.	Advanced technologies in SCM have created a situation where there is no scarcity of medical products	42 37%	52 46%	15 13%	4 4%	0 0	**113 100%**
4.	Medical products and supplies have become cheaper due to the adoption of advanced technologies in SCM in the healthcare sector	38 34%	43 38%	21 19%	5 4%	6 5%	**113 100%**
5.	Advanced technologies in SCM have made it possible for health workers to treat serious medical cases	42 37%	47 42%	11 10%	8 7%	5 4%	**113 100%**
6.	Advanced technologies in SCM have ensured that medical products needed for emergencies are available	51 45%	49 41%	9 8%	7 6%	0 0	113 100%
7.	Advanced technologies in SCM have contributed to effective collaboration between healthcare workers for availability and accessibility of medical supplies	53 47%	42 37%	11 10%	0 0	7 6%	113 100%
8.	The healthcare industry has benefitted more in SCM by showing the quality of healthcare workers across the country	41 36%	59 52%	13 12%	0 0	0 0	**113 100%**

Source: Author's Survey, 2025

Table 4 above shows that (46%) strongly agree, 38% agree, 11% are neutral, and 5% disagree. Most respondents see a significant positive impact on treatment timing, though some remain neutral or disagree. Few respondents (29%) strongly agree, (43%) agree, (19%) are neutral, (6%) disagree, and (3%) strongly disagree. While the majority agree, nearly one-fifth are neutral, and a small portion expresses disagreement. Fewer respondents (37%) strongly agree, (46%) agree, (13%) are neutral, and (4%) disagree. A clear majority believe in the elimination of medical product scarcity, with minimal disagreement or neutrality. The table also shows that (34%) strongly agree, 38% agree, 19% are neutral, 4% disagree, and 5% strongly disagree. While the majority agree, a notable portion remains neutral or disagrees, indicating mixed experiences regarding cost reductions. A small proportion (37%) strongly agree, (42%) agree, (10%) are neutral, (7%) disagree, and (4%) strongly disagree. Most respondents view this positively, though some neutrality and disagreement are observed. Nearly half of the respondents (45%) strongly agree, (41%) agree, (8%) are neutral, and (6%) disagree. A strong

majority recognize the role of advanced technologies in ensuring emergency medical product availability, but a small portion disagrees. A substantial proportion (47%) strongly agree, (37%) agree, (10%) are neutral, and (6%) strongly disagree. Most respondents appreciate the collaborative benefits, though some express neutrality or dissent. Finally, a few respondents (36%) strongly agree, (52%) agree, and (12%) are neutral, with no disagreement. This reflects a strong consensus on the benefits of SCM in highlighting healthcare worker quality.

6.0 TEST OF HYPOTHESIS

6.1 Analysis of Research Hypothesis Using Pearson Product-Moment Correlation Coefficient

Correlation measures the degree of relationship or variation between one variable and another. This is determined by the value of the correlation coefficient (r). The correlation coefficient (r) borders between -1 through 0 to +1. Positive values indicate direct relationships where increase in one variable leads to an increase in the other variable. However, negative values of r signify inverse or indirect relationship which depicts that increase in one variable leads to decrease in another. Values close to 1 are assumed strong relationships either positive or negative, values close to 0.5 are assumed fair and values close to zero are assumed weak. A correlation of Zero indicates no relationship exists among variables, while a correlation of 1 indicates a perfect relationship, which can only be gotten when measuring a variable against itself.

6.2 Decision Rule for Acceptance or Rejection of Hypothesis

If returned p-value of Correlation coefficient statistic is <0.05 (0.05 level of significance), then, the relationship is significant, vice-versa.

Research Hypothesis One

There is no significant impact of advanced technological innovations like AI and blockchain on transparency of strategic supply chain management in the health industry.

Table 5 Correlations

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.710	.070	10.626	.000[c]
Ordinal by Ordinal	Spearman Correlation	.535	.087	6.675	.000[c]
N of Valid Cases		113			

Table 5 shows that the returned Correlation Coefficient (r) was calculated as +.710, indicating a very strong impact of advanced technological innovations on transparency of strategic supply chain management in the health industry, while p=.000 shows a significant impact. Hence, the answer to the research hypothesis one is that there is a direct, very strong and significant impact

of advanced technological innovations on transparency of strategic supply chain management in the health industry.

Research Hypothesis Two

Integration of advanced technologies tools does not significantly influence the decision-making processes and operational performance of healthcare supply chains.

Table 6: Correlations

		Value	Asymp. Std. Error^a	Approx. T^b	Approx. Sig.
Interval by Interval	Pearson's R	.913	.022	23.581	.000^c
Ordinal by Ordinal	Spearman Correlation	.878	.035	19.296	.000^c
N of Valid Cases		113			

Table 6 shows that the returned Correlation Coefficient (r) was calculated as +.913, indicating a very strong influence of advanced technological tools on the decision-making processes and operational performance of healthcare supply chain, while p=.000 shows a significant influence. Hence, the answer to the research hypothesis two is that there is a direct, very strong and significant influence of advanced technological tools on the decision-making processes and operational performance of healthcare supply chain.

Research Hypothesis Three

There is no significant relationship between advanced technologies in the healthcare sector and efficiency of service delivery.

Table 7: Correlations

		Value	Asymp. Std. Error^a	Approx. T^b	Approx. Sig.
Interval by Interval	Pearson's R	.964	.013	38.147	.000^c
Ordinal by Ordinal	Spearman Correlation	.978	.015	49.293	.000^c
N of Valid Cases		113			

Table 7 shows that the returned Correlation Coefficient (r) was calculated as +.964, indicating a relationship between advanced technological innovation in the healthcare sector and efficiency of service delivery, while p=.000 shows a significant relationship. Hence, the answer to the research hypothesis three is that there is a direct, very strong and significant relationship

between advanced technological innovation in healthcare sector and efficiency of service delivery.

7.0 DISCUSSION OF FINDINGS

The findings of this first hypothesis reveal a direct, very strong, and significant impact of advanced technological innovations on the transparency of strategic supply chain management in the health industry. This result aligns with previous studies of Ivanov & Dolgui (2020) who emphasized the transformative role of technology in enhancing visibility, accountability, and operational efficiency within supply chain frameworks. Advanced technological innovations, such as blockchain, artificial intelligence, and IoT (Internet of Things), have proven to increase data traceability, reduce fraud, and foster real-time communication between stakeholders, ultimately enhancing transparency (Wamba & Queiroz, 2020). Transparency in the health industry is especially critical, as it directly affects the quality and timeliness of patient care. The integration of technologies like blockchain enables immutable record-keeping, which can reduce counterfeit drugs and improve regulatory compliance (Kumar et al., 2022). Furthermore, IoT devices facilitate real-time tracking of medical supplies and equipment, ensuring their timely delivery to healthcare facilities. These technological advancements address common bottlenecks in traditional supply chain systems, such as lack of visibility and inefficiency in communication (Tiwari et al., 2021).

The findings from the second hypothesis indicate a direct, very strong, and significant influence of advanced technological tools on the decision-making processes and operational performance of the healthcare supply chain. This conclusion is consistent with existing literature that highlights the transformative role of advanced technologies such as big data analytics, artificial intelligence (AI), Internet of Things (IoT), and blockchain in optimizing decision-making and enhancing operational performance in healthcare supply chain management (Wamba et al., 2020; Ivanov & Dolgui, 2020). Also, operational performance in the healthcare supply chain also benefits significantly from these technological advancements. Tools such as IoT devices facilitate real-time tracking of medical supplies, enhancing visibility and accountability across the supply chain (Wamba et al., 2020). Moreover, blockchain technology ensures the integrity and transparency of supply chain data, which is critical for regulatory compliance and reducing the risk of counterfeit drugs in the system (Queiroz & Wamba, 2021). These tools collectively enhance operational efficiency, reduce costs, and improve the overall quality of healthcare delivery.

The findings of the third research hypothesis reveal a direct, strong, and statistically significant relationship between the adoption of advanced technology in the healthcare sector and the efficiency of service delivery. This underscores the critical role technological advancements play in improving speed, accuracy, and quality of healthcare services. Advanced technological tools, such as electronic health records (EHRs), artificial intelligence (AI), and telemedicine platforms, enhance the efficiency of healthcare delivery by streamlining processes, reducing errors, and enabling real-time decision-making. Studies have shown that hospitals that adopt EHR systems experience a 15% to 20% reduction in administrative errors, which significantly improves workflow efficiency (Kruse et al., 2016). Similarly, Jiang et al., (2017) asserts that AI-powered systems play a pivotal role in early disease detection and diagnosis. For example, AI algorithms in radiology can analyze imaging data with a higher degree of accuracy and

speed compared to manual methods, reducing diagnostic delays and improving patient outcomes. Furthermore, robotic-assisted surgeries have demonstrated improved precision, minimized human error, and reduced recovery times for patients, showcasing how technology directly enhances both clinical and operational efficiency (Moustris et al., 2011).

8.0 CONCLUSION

In conclusion, advanced technologies are transforming supply chain management in the healthcare sector by enabling real-time visibility, predictive analytics, and enhanced operational efficiency. Tools such as blockchain, artificial intelligence (AI), Internet of Things (IoT), and big data analytics play a pivotal role in optimizing inventory management, reducing waste, improving transparency, and ensuring timely delivery of critical medical supplies. These innovations not only strengthen decision-making processes but also enhance collaboration and accountability across the supply chain. By integrating advanced technologies, the healthcare sector can better navigate disruptions, improve service delivery, and meet patient needs effectively, making supply chain operations more resilient and responsive.

8.1 Recommendations

- Healthcare organizations should implement big data analytics and AI-powered tools to accurately forecast demand for medical supplies, optimize inventory levels, and reduce the risk of stockouts or overstocking.
- The adoption of blockchain technology can improve data integrity, enhance traceability, and reduce the prevalence of counterfeit products in the healthcare supply chain.
- IoT devices should be deployed to track medical supplies and equipment in real time, ensuring proper storage conditions (e.g., temperature-sensitive drugs) and improving supply chain visibility.

REFERENCES

Ali, M., & Rao, S. (2024). Smart Contracts in Healthcare Procurement. Journal of Blockchain in Healthcare, 5(1), 34-50.

Barney, J. (1991). Firm resources and sustained competitive advantage. Journal of Management, 17(1), 99-120.

Bennett, T., & Clarke, J. (2024). Cybersecurity in Healthcare Supply Chains. International Journal of Healthcare Management, 13(2), 90-105.

Brown, A., & Taylor, S. (2024). Blockchain for Enhanced Security and Transparency. Journal of Healthcare Logistics, 19(1), 50-66.

Bryman, A. (2012). Social research methods (4th ed.). Oxford University Press.

Chang, J., & Wu, Y. (2022). AI applications in healthcare supply chain management: A review of emerging trends and future directions. Journal of Supply Chain Innovation, 15(2), 75- 92.

Cheng, W., & Foster, R. (2024). The Role of Augmented Reality in Supply Chain Training. International Journal of Supply Chain Management, 15(2), 64-78.

Creswell, J. W. (2014). Research design: Qualitative, quantitative, and mixed methods approach (4th ed.). Sage Publications.

Dhamija, P., Gupta, S., & Jain, D. (2023). Future trends in healthcare supply chain management: Quantum computing and augmented reality applications. Healthcare Logistics Journal, 6(1), 34-50.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. American Journal of Theoretical and Applied Statistics, 5(1), 1-4.

Green, M., & Patel, K. (2024). Predictive Analytics for Drug Shortage Management. Journal of Healthcare Supply Chain Management, 14(1), 55-72.

Gupta, R., & Desai, S. (2021). Blockchain technology and its impact on healthcare supply chains: A systematic review. International Journal of Health Logistics, 12(3), 214-230.

Ivanov, D., & Dolgui, A. (2020). Viability of interconnected supply chains: A digital twin perspective in the context of COVID-19. International Journal of Production Research, 58(10), 2904-2915.

James, P., & Nguyen, T. (2024). The role of modern analytics in forecasting and demand planning within healthcare supply chains. Journal of Supply Chain Analytics, 15(1), 34-48.

Jenkins, R., & Barlow, J. (2024). Sustainable Technologies in Healthcare Supply Chains. Journal of Sustainable Healthcare Practices, 10(1), 40-55.

Jiang, F., Jiang, Y., Zhi, H., Dong, Y., Li, H., Ma, S., ... & Wang, Y. (2017). Artificial intelligence in healthcare: past, present, and future. Stroke and Vascular Neurology, 2(4), 230–243.

Kothari, C. R. (2004). Research methodology: Methods and techniques (2nd ed.). New Age International Publishers.

Kruse, C. S., Stein, A., Thomas, H., & Kaur, H. (2016). The use of electronic health records to support population health: A systematic review of literature. Journal of Medical Systems, 40(12), 262.

Kumar, A., Sharma, K., & Singh, H. (2022). Role of blockchain technology in improving transparency and efficiency in supply chain management: A review. Journal of Business Research, 145, 435-448.

Lee, Y., & Kwan, J. (2024). The Rise of Artificial Intelligence in Healthcare Supply Chains. Healthcare Technology Review, 16(1), 12-28.

Martinez, E., & Singh, R. (2024). Emerging Supply Chain Models Post-Pandemic. International Journal of Logistics Management, 23(2), 77-89.

Moustris, G. P., Hiridis, S. C., Deliparaschos, K. M., & Konstantinidis, K. M. (2011). Evolution of autonomous and semi-autonomous robotic surgical systems: a review of the literature. International Journal of Medical Robotics and Computer Assisted Surgery, 7(4), 375–392.

Nguyen, T. H., Luo, J., & Sharma, P. (2023). Artificial intelligence in supply chain decision-making: Implications for healthcare operations. Journal of Operations Research in Healthcare, 9(1), 89-102.

Owen, P., & Zhao, H. (2024). Artificial Intelligence and Supply Chain Ethics. Ethics in Healthcare Supply Chains, 8(1), 21-39.

Parker, A., & Thompson, G. (2024). 3D Printing in On-Demand Supply Chains. Journal of Medical Manufacturing, 9(1), 30-45.

Pereira, V., Gupta, M., & Nath, K. (2022). Barriers and facilitators of AI and blockchain adoption in healthcare: Insights from developing economies. Journal of Technology Adoption in Healthcare, 8(3), 192-208.

Queiroz, M. M., & Wamba, S. F. (2021). Blockchain adoption challenges in supply chain: An empirical investigation of the healthcare industry. International Journal of Information Management, 57, 102271.

Resnik, D. B. (2020). The ethics of research with human subjects: Protecting people, advancing science, promoting trust. Springer.

Rodriguez, J., & Lee, T. (2024). The Impact of Robotics on Supply Chain Efficiency. Journal of Healthcare Automation, 7(2), 18-33.

Singh, R., & Gupta, K. (2024). Telemedicine and Supply Chain Resilience. Journal of Telemedicine and Health, 12(3), 23-41.

Tiwari, S., Wee, H.-M., & Daryanto, Y. (2021). Big data analytics in supply chain management: A state-of-the-art literature review. Computers & Industrial Engineering, 158, 107043.

Wallace, F., & Kim, L. (2024). Supply Chain Integration Through Cloud Computing. International Journal of Healthcare Systems, 20(2), 56-74.

Wamba, S. F., & Queiroz, M. M. (2020). Blockchain in the operations and supply chain management: Benefits, challenges and future research opportunities. International Journal of Information Management, 52, 102064.