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Technology Adoption and Healthcare Supply Chain Performance in Ghana: The Role of User Attitude

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Abstract

The study investigates how integrating technology into the healthcare Supply Chain affects operational performance. Using a sample of 212 healthcare facilities in the Accra Metropolitan Area, the study observed that user perceived usefulness and ease-of-use of healthcare supply chain management systems have positive impact on performance. It was also noticed that attitudes of the users of the healthcare supply chain management system do not mediate the linkage between perceived usefulness and healthcare supply chain performance but rather mediate the relationship between perceived ease-of-use and healthcare supply chain performance. As indicated in the United Nations Development Goals 3, the study recommends that structures should be put in place to ensure the use of technology and other related infrastructures, and commitment from both the public and private sectors to ensure the attainment of health and wellbeing for all Ghanaians by the year 2030.

Keywords: healthcare, Ghana, technology, supply chain, technology acceptance theory

1. Introduction

The growing trend in the use of smart devices across the globe have had significant influence on the management of the supply chains. This unprecedented growth in the usage of technology across industries have not left behind the health sector (Taboada and Shee, 2021). Globally, health systems are adopting appropriate technology to help in the delivery of health services. The use of technology aids in reducing the complexity and risk of the health supply chain (Clauson *et al.*, 2018). The adulteration of information negatively affects the management of the flow of goods and services internally and externally across the health supply chain. It is however significant the learn that accurate and timely information enhance the better management of the flow of goods or services within the health supply chain process (Szymczak *et al.*, 2018).

Undoubtedly, technology if properly applied can become an effective tool that enhances performance and increase productivity in organisations. The continuous creative development of digitization has given rise to enormous application in the management of health systems (Khezr *et al.*, 2019). The interoperability of data is essential in the health management system because it makes it easy for different parties to exchange real-time information within the system. Interoperability of data has been facilitated by the ideal of electronic data interchange and enterprise resource planning. Interoperability provides for easy access to information by parties within the health systems. Even though the surge in the digitization in the health management system has improved the administration of data within the health system, there are inherent risk associated with the development of these technologies in Ghana (Khezr *et al.*, 2019).

According to the World Health Organization, digital technology affects at least 12 functional areas of healthcare delivery. These functional areas include the provision of better and more direct information to everyone about health and safety; provision of direct support to health workers and supervisors regarding the diagnosis and treatment of patients; the provision of verifiable and searchable records about births, deaths, and health encounters; and the provision of health managers at every level with operational and strategic information about drug availability, finances, and human resource management (Mitchell and Kan, 2019). Digitalization of healthcare supply chain offers lots of benefits to the healthcare delivery system. Besides the benefits of digitizing the healthcare supply chain, there is evidence to suggest that there are inherent risks and challenges associated with its deployment and usage in Ghana. Functional sustainability, usability, security, and privacy are some of the risks and challenges that come with the technological innovation within the healthcare system (Meinert *et al.*, 2018; Virginio and Ricarte, 2015). For instance, the breakdown or failure of a car engine, break or any fault has a potential effect on the functionality of the car. The growing understanding of the usage of digital technology within the healthcare system in Ghana makes the assessment of technology very important, especially along the supply chain. The objective of this paper is to investigate the effect of the adoption and usage of modern technology within the healthcare supply chain in Ghana.

The deployment of digital technology within the healthcare delivery system of developing economies is quite new. The growing interest in technology within the health delivery system in Ghana has seen a study conducted by Demuyakor (2020), which suggests that the introduction of technology in healthcare delivery has positively impacted the flow of medical supplies to effectively improve the management of healthcare delivery systems in Ghana. Lefevre *et al.* (2017) studied the effectiveness of the Mobile Technology for Health (MOTECH) program in Ghana. Another study relating to technology and the healthcare system in Ghana examined the relationship between e-health usage and health workers' motivation and job satisfaction (Atinga *et al.*, 2020). The systematic review of papers on technology and healthcare delivery in Ghana shows a paucity of knowledge in relation to how it impacts on the entire supply chain in Ghana. This paper therefore contributes significantly to the field of healthcare supply chains in Ghana.

2. Technology and Healthcare Delivery in Ghana

The emerging and changing technological development has led to a rethinking in the way technology can be harnessed in delivering efficient healthcare in Ghana. Technology-enabled systems allow healthcare providers to deliver better support at a lower cost and contribute to quality health services. These systems collectively drive e-health and provide life saving data and information for clinical and non-clinical use. Research has shown that in a growing and innovative world, healthcare systems are now largely dependent on technology. Indeed, technology has led to major growth in harmonizing and integrating healthcare systems in many countries including emerging economies. Digitization healthcare systems provide for better management of health resources (Meskó *et al.*, 2017; Panzitta *et al.*, 2015).

Ghana has seen growth in the use of technology in the health delivery sector. The drive for technological digitization and its significance to healthcare delivery in Ghana has led to the development of e-health strategy by the Ministry of Health (MoH) and the Ghana Health Service (GHS). The aim of these two bodies is to operationalize technology to improve the healthcare delivery system of Ghana by providing technological support to healthcare managers, customers of the health system, and other stakeholders along the healthcare supply chain in Ghana. The ultimate goal for this integration is to strengthen the healthcare delivery system in Ghana to be more responsive to the needs of individuals, families, and communities (Dery *et al.*, 2016).

This goal has led to the deployment of several digital technologies within the healthcare delivery system of Ghana. For instance, from the usage of hospital administration management system (HAMS), Medi nous among others (software's which enable the management of information within a particular hospital) to the launching of Lightwave Health Information Management System (LHIMS) by the Ministry of Health and the Ghana Health Service in 2017 to help in integrating the entire healthcare delivery system in Ghana. The drive for improving digital technology in Ghana has also seen the deployment of the Ghana Integrated Logistics Management Information System (GhiLMIS), which coordinates and integrates the procurement and supply of health supplies in Ghana, and most recently the Ghana Electronic Procurement System (GHANEPS) to bring sanity in the procurement of supplies to health facilities. The internet and digitization have become significant sources of health information and doubles as one of the main channels of healthcare-related deliveries. The use of digital technologies, including drones and mobile phone applications, are widely used to examine, maintain, and improve the general wellbeing of citizens in Ghana. The outcome of the Health Information National Trends Survey found out that the internet and digital technologies were the first sources of information that are mainly related to healthcare delivery in the USA (Demuyakor, 2020)

It is imperative to know that although the use of digital technology has the potential of transforming and improving the delivery of healthcare in many countries, it raises many concerns about risks inherent in its deployment. These include but is not limited to how individual privacy and confidentiality are addressed, the lack of data infrastructure, software bugs, transcription errors, data loses, theft, among others (Mitchell & Kan, 2019; Dery *et al.*, 2016). The development in the use of digital technology within the healthcare delivery system suggests the creation of large data set, which can become the basis for national monitoring and international comparisons of achievement.

However, the creation of such data sets bring in its wake challenges and risks. Information technology infrastructural development is necessary to sustain the continuous usage of digital technology within the healthcare delivery system in the supply chain. The development and mounting of severs to accommodate data assess to the network are some infrastructural risk factors associated with the use of digital technology (Chernyakov & Chernyakova, 2018). It is regrettable to note that emerging economies accounts for only 28% of the world's digital technology usage. This is as a result of the presence of low technological infrastructure. The deployment of digital technology requires the use of the internet, computers, and other smart devices. There is a low level of internet coverage and penetration in some regions of Ghana, and this impacts negatively on timely information sharing for decision-making (Whitelaw *et al.*, 2020).

Cyber-attacks are a range of illegal activities in relation to the use of smart devices and networking systems (United Nation 2015). The healthcare delivery industry has been recognized as an industry with high cyber risks because of inherent weaknesses in its security structure. According to Martin et al., (2017) healthcare delivery systems along the supply chain is one of the highly targeted infrastructures by cyber-attacks in the world.

3. Technology and Healthcare Supply Chain

Technology risk has the potential of causing disruption to the supply chain. Disruptions within the supply chain of the healthcare system influences the delivery of health services. There is growing awareness of how the performance of institutions can improve through better management of the supply chain (Choong, 2017). The healthcare system of developing economics spends a large proportion of its expenditure on acquiring medicine and related medical commodities. The constant need to improve the healthcare supply chain within the public healthcare system has seen the deployment of digital technology to increase visibility within the healthcare supply chain network. Digital technology is an enabler for strengthening demand forecasting, reducing stockouts, and also developing an agile and effective public healthcare supply chain system (Bvuchete and Grobbelaar, 2021).

From a healthcare point of view, supply chain management is the flow of information, finance, and supplies related to acquiring and moving products and services from the supplier to the end-user, administering clinical care to the customer (patient). With the healthcare delivery system, supply chain management goes beyond the flow of physical products like pharmaceuticals, medical devices, and health aids but also to processes associated with the flow of patients. In doing so, supply chain management places strong emphasis on the integration of processes. Within the healthcare delivery system, the supply chain processes refer to both material and patient information flow, and the basic rationale of a supply chain management approach is founded on the belief that intensive co-ordination and integration between operational processes might lead to a better healthcare supply chain performance (de Vries and Huijsman, 2011)**.** The supply chain of the health system has been organized into two tiers - the supply tier and the demand tier. The supply tier is made up of primary healthcare, investigation diagnostic, specialty care, behavioral health, emergency care, interventional services, telehealth, and independent physician providers. The supply tier provides various services to the demand tier. The demand tier is made up of the patients who receive services from the supply tier.

Traditionally, the supply chain coordinates the movement of products and services from the origin of production to the destination where the product or service is consumed. The healthcare delivery system is fragmented with the various component that is essential to the effective delivery of care to the patient, from the information desk through to medical consultation to laboratory investigation to drug administration unit. Coordinating the chain of service delivery to efficiently manage the healthcare delivery system is paramount (Raijada *et al.*, 2021). As a field of study, the discipline of SCM can provide high-level insights and guidance about strategic issues like how an industry can be best organized to improve value for everyone in the system. The modern supply chain deals with the effective linkage of all units within the healthcare system. The healthcare supply chain deals with the effective management of logistical resources with the healthcare systems. The efficiency of healthcare delivery is dependent on the availability of logistical resources. The SCM field has contributed much towards linking issues of strategy to these essential supply chain processes, thereby enhancing system-wide performance (Ellram & Cooper, 2014; Phares, Dobrzykowski and Prohofsky, 2021)**.** Digital Technology involves the conversion of information from the physical state to digital for easy access (Segal, 2016; Kimura, 2015; Ranger *et al.*, 2015). Supply chain innovation has been identified as one of the solutions to the operational healthcare delivery challenges affecting emerging economies (Engel *et al.*, 2016). To reduce inventory carrying costs and improve supply chain efficiencies, the "visibility" of the supply chain is needed. Visibility of the supply chain is defined as the openness of specific information related to product orders and physical shipments, including transport and logistics activities. Visibility makes reducing costs and improving operational performance via multi-tiered global supply-demand networks (Nakasumi, 2017).

4. Supply Chains and Technological Risks

A supply chain is the network of flow or distribution of goods or services between demand and supply. It represents the step a good or service moves through to its final usage or consumption. The traditional supply chain lacked specific attributes that are needed in today's growing technological economy. Graduating the current supply chain into the technological economy improves the chain of networks and allow for system integration (Büyüközkan and Göçer, 2018). Supply chains are strongly influenced by technology. The digital economy is based on digital computing technologies where the business is conducted through online and smart devices. In today's economy, value is created through the technology-enabled links between people, machines, channels, and organizations. The digital supply chain empowers the distribution of goods and services from their origin to the final point of usage (Attaran, 2020)

Supply chain integration is becoming increasingly dynamic because of technological growth in today's economy. Access to consumers' needs to be shared effectively, and product and service deliveries must be tracked to provide visibility in the supply chain. Business process integration is based on standards and reference architectures, which should offer end-to-end integration of product or service data. Companies operating in supply chains establish process and data integration through the specialized intermediate companies, whose role is to establish interoperability by mapping and integrating company-specific data for various organizations and systems. The growth in technological investments is always associated with uncertainties. Practitioners and academics have recognized technological initiatives as risky. The deployment and usage of technology in supply chain systems are riskier. The deployment of technology supply chain systems allows an organization or institution to digitize the processes of transacting and collaborating with their supply chain partners.

5. Theoretical Basis

5.1 The Technology Acceptance Theory (TAM)

Understanding the reason of accepting or rejecting any new technology by users has become one of the most important areas in the information technology field. For organizations, it means continuing to increase their investment in IT infrastructure (Hong *et al.,* 2006). Davis *et al.* (1989) defined technology adoption as the implementation of the software and hardware technology in an organization to increase productivity, competitive advantage, improve processing speed, and make information readily available. Technology acceptance theories and models aim to convey the concept of how users may understand and accept the new technology and how they may use it. For any new technology, there are many variables that affect the individual's decision-making process about how and when they will use it (Fishbein & Ajzen, 1975). The TAM was developed after the introduction of information systems into organizations. It is developed in the information technology field while theory of reasoned action and theory of planned behavior developed in the psychology field (Fishbein & Ajzen,1975). The development for TAM comes through three phases: adoption, validation, and extension. In the adoption phase, it was tested and adopted through a huge number of information system applications. In the validation phase, researchers noted that TAM uses accurate measurement of users' acceptance behavior in different technologies. The third phase, the extension, where there are much research introducing some new variables and relationships between the TAM's constructs.

6. Conceptual Model

The technology adoption model propounded by David (1986) posits that three elements contribute to the actual usage of a technology-based system. These elements are captured as; perceived usefulness, perceived ease of use, and attitude towards usage. Perceived usefulness in this context examines how users of a specific technological system perceive that using a specific system would enhance healthcare supply chain performance. Perceived ease of use relates to the degree to which users of healthcare delivery technology systems suggests that using a specific system is free and flexible. Attitude towards usage reflects the extent to which perceived usefulness and perceived ease of use contribute to attitudinal differences toward healthcare supply chain technologies. The conceptual model in Figure 1 details the effect of these factors underpinning the technology acceptance model (TAM) on healthcare supply chain performance.

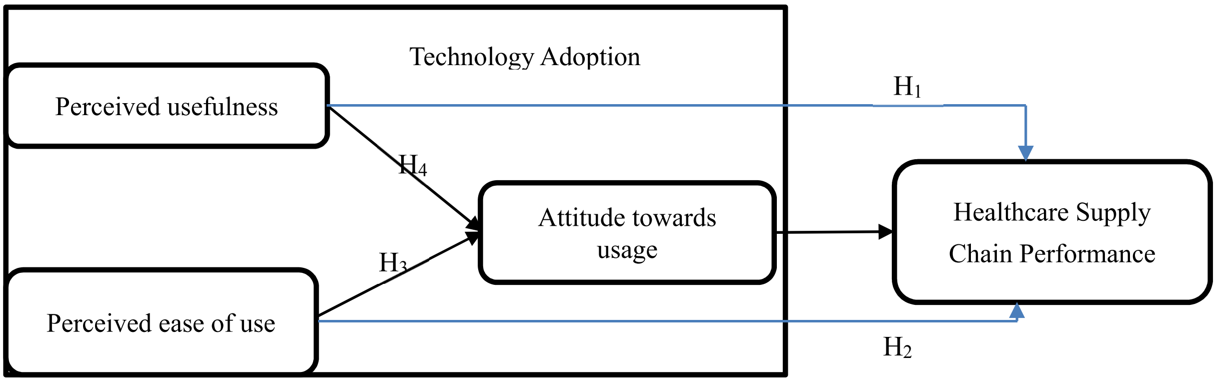

Figure 1. Conceptual model

7. Method

7.1 Study Population, Sample and Participants

A cross-sectional survey was carried out to draw sample of respondents from registered private health service facilities classified into hospitals, clinics and maternity homes within the Greater Accra Region of Ghana. The study population is made up 782 health facilities distributed as 141 hospitals, 423 clinics and 213 maternity homes (Ghana Health Service Report, 2021). Using the stratified sampling technique, 212 health facilities were selected for the study. The study basically relied on primary data collected using questionnaires administered with the help of field assistants. In collecting data, it was confirmed that, the sampled health facilities adopt some form of technology in their supply chain management information systems. During the data collection exercise, it was also confirmed that, questionnaires were completed by supply chain officers or officers-in-charge at these health facilities who are considered as key informants for the study. The demographic characteristics of the respondents suggested that 88.2% were male. The respondents had an average job experience in their current position of 7.32 years (SD = 2.88) with the facility. Also, on the average, the respondents were 32.53 years old (SD = 5.18) with 87.3% having at least bachelor degrees, and 78.3% having some form of knowledge or training in information technology.

During the data collection phase, a self-report measures were applied and as such, the possibility of occurrence of common method variance (CMV) in our constructs were anticipated. In controlling for CMV, the recommendations by Podsakoff *et al.* (2003) were strictly followed. First, respondents were assured of their anonymity and confidentiality and thus were encouraged to be as objective as possible. Secondly, covered rubrics were applied to serve as psychological separation for the different constructs on the questionnaire. Finally, the Harman single-factor test was conducted and was noticed that CMV did not exist in our measures.

7.2 Research Instrument and Measurement of Variables

In analysing the linkage between adopting technology in healthcare delivery and supply chain performance, the study adopts constructs under the TAM, namely, perceived usefulness, perceived ease-of-use and attitude towards usage. In this study, it is argued that the user perspective of usefulness and ease-of-use can be translated into performance in the supply chain management through the attitude of the user, hence, the constructs *'perceived usefulness'* and *'ease-of-use*[1]*'* are considered as exogenous variables which are all anchored on a five-point Likert scale ranging from 1=strongly disagree to 5=strongly agree following Maholtra *et al.* (2017) whereas '*attitude towards usage*[2]*'* is considered as a mediating variable also obtained on a five-point Likert scale. *Healthcare supply chain performance*[3] is considered as the endogenous variable which sought to measure the performance of the supply chain management system of the health care facility. Measurement of this variable follows the indicators suggested by Nebelsi (2011) with data collected on a five-point Likert scale.

8. Results and Discussion

This section presents and discusses the results obtained from the analysis of data collected from the field. It covers validation analysis where validity and reliability assessment of the measurement construct is carried out through

[1] See Lee (2016) and Flavián et al. (2006) for detail scale of measurement of the endogenous variables.

[2] See Lee (2016) for detail scale of measurement of the moderating variables.

[3] See Nebelsi (2011) for detail scale of measurement of the endogenous variable.

confirmatory factor analysis. This is followed by descriptive statistics of the responses for the study variables, inter-correlations analysis among the study variables and testing of the hypothesized model (Fig. 1) using the bootstrapping approach. Analysis of the data collected was carried out using the SmartPLS version 3.2.6 (Ringle *et al*., 2015).

8.1 Confirmatory Factor Analysis (CFA)

In assessing the internal consistency of the constructs, the Cronbach alpha[4] and Composite reliability (CR) index[5] was used. Results of these indexes are shown in Table I. It can be observed from these indexes that, all the constructs in the specification model met both the Cronbach criterion specified by Nunnally (1978) and composite reliability index, a more robust internal consistency test as specified by Dijkstra and Henseler (2015). In assessing the validity of the measurement model, two aspects of validity were tested, that is, convergent validity and discriminant validity. Convergent validity, a measure of the extent to which an indicator correlates positively with alternative indicator of the same construct, was assessed using the standard factor loading with bootstrapping. As shown in Table 1, all the indicators load significantly on their respective construct with a loading coefficient ranging 0.735 to 0.923 for all constructs in the hypothesized model after performing four iterations resulting from step-wise deletion of indicators with lower loadings. As all the loading exceed the recommended level of 0.7 (Bagozzi & Yi, 2012; Hair *et al*., 2014), it is an indication of acceptable item convergence on the intended constructs. The bootstrapping result indicate that, the loading obtained are significant at 5% in the final iteration. In addition, the reported Average Variance Extracted (AVE) of at least 0.50 is an indication that, all the constructs in the hypothesized model are able to account for more than half of the variance in their underlying indicator items. This shows that, the measurement items in the hypothesized model converges. Based on the recommendation by Dijkstra and Henseler (2015), a more robust measure, Rho_A[6], was applied and all the construct achieve a value above the cut of 0.75. The results indicate a satisfactory convergent validity for all constructs in the measurement model.

[4] Acceptable threshold ≥ 0.70 (Nunnally, 1978).

[5] Acceptable threshold ≥ 0.70 (Dijkstra & Henseler, 2015).

[6] Acceptable threshold ≥ 0.75 (Dijkstra & Henseler, 2015)

Table 1. Consistency, validity and reliability diagnostics

Constructs and their indicators	Standard factor loadings with bootstrapping (≥ 0.70)		Composite reliability (CR) (≥ 0.70)		Average variance extracted (AVE) (≥ 0.50)		α (≥ 0.70)	Rho_A (≥ 0.75)
	Initial iteration	Final iteration	Initial iteration	Final iteration	Initial iteration	Final iteration	Final iteration	Final iteration
Perceived usefulness (PUS)			0.941	0.866	0.761	0.619	0.795	0.807
PU1_	0.776**	0.772***						
PU2	0.807***	0.834***						
PU3	0.720**	0.735***						
PU4	0.786**	0.802***						
PU5	0.693*	Omitted						
Perceived ease-of-use (PEU)			0.905	0.909	0.658	0.833	0.801	0.808
PEU1	0.471	Omitted						
PEU2	0.594	Omitted						
PEU3	0.606*	Omitted						
PEU4	0.893**	0.902***						
PEU5	0.845**	0.923***						
Attitude towards usage (ATU)			0.820	0.941	0.490	0.761	0.922	0.929
ATU1	0.852**	0.854***						
ATU2	0.900***	0.901***						
ATU3	0.886***	0.885***						
ATU4	0.893***	0.892***						
ATU5	0.830**	0.829***						
Healthcare supply chain performance (HSCP)			0.870	0.896	0.574	0.658	0.801	0.869
HCSP1	0.755*	0.757**						
HCSP2	0.870**	0.871***						
HCSP3	0.852**	0.852***						
HCSP4	0.798**	0.798**						
HCSP5	0.773*	0.772**						

Discriminant validity was carried out following the recommendation of Hair *et al.* (2014). Hence, the Heterotrait-Monotrait Ratio of correlations (HTMT), the Fornnel-Larcker test of discriminant validity, and the cross loadings criterion were applied. Result of the discriminant validity test is shown in Table 2.

Table 2. Heterotrait-Monotrait Ratio of correlations and Fornnel-Larcker test of discriminant validity

	Heterotrait-Monotrait Ratio of correlations				Fornnel-Larcker criteria			
	PUS	PEU	ATU	HSCP	PUS	PEU	ATU	HSCP
PUS					***0.787***			
PEU	0.258				0.205	***0.913***		
ATU	0.064	0.274			-0.014	0.238	***0.872***	
HSCP	0.358	0.533	0.640	-	0.306	0.450	0.578	***0.811***

Based on the HTMT, the correlation between the constructs satisfies the threshold requirement of below 0.80 (Gold *et al*., 2001) and are all significant at 5% after conducting the bootstrapping of 500 sub-samples from selected sample demonstrating that, the indicators that are not supposed to relate are actually not relating. Again, the diagonal elements of the Fornell-Larker matrix (shown in Table 2) are greater than the off-diagonal elements in the corresponding rows and columns demonstrating that, the discriminant validity assumption is satisfied. These values indicate that, the latent constructs share more variance with its respective underlying indicators than with any other construct in the hypothesised model (Henseller, *et al.*, 2009; Hair *et al*., 2014). Again, the indicator loading on the associated construct is greater than all of its cross-loadings (Chin, 1998; Hair *et al*., 2014) with other indicators as shown in Table 3 which is an indication that, the constructs are discriminantly valid.

Table 3. Cross loading on construct indicators

	ATU	HSCP	PEU	PUS
ATU1	**0.854**	0.504	0.200	-0.032
ATU2	**0.901**	0.581	0.210	-0.012
ATU3	**0.885**	0.496	0.247	0.019
ATU4	**0.892**	0.513	0.213	0.003
ATU5	**0.829**	0.407	0.162	-0.049
HCSP1	0.496	**0.757**	0.252	0.113
HCSP2	0.507	**0.871**	0.383	0.228
HCSP3	0.470	**0.852**	0.412	0.345
HCSP4	0.376	**0.798**	0.359	0.289
HCSP5	0.491	**0.772**	0.399	0.248
PEU4	0.186	0.396	**0.902**	0.209
PEU5	0.246	0.424	**0.923**	0.167
PU1	0.019	0.239	0.092	**0.772**
PU2	0.026	0.288	0.192	**0.834**
PU3	-0.030	0.213	0.157	**0.735**
PU4	-0.077	0.211	0.203	**0.802**

In assessing the reliability of the indicators, the standard factor loading of the indicators for each construct was used which should be at least 0.708 (Bagozzi, Yi, & Philipps, 1991; Hair et al., 2011) to be considered reliable. Initial iteration shows a lower loading on some indicators which were deleted in a stepwise manner. After four iterations, the reliability threshold was achieved as shown in Table 3. In conclusion, it has been demonstrated that, the measurement model used in this study has good internal consistency, reliability, convergent validity and discriminant validity. In other words, these results on validity and reliability provide evidence for the instruments used in this study. We therefore go ahead to test the relevant hypotheses of the study.

8.2 Inter-correlations and Descriptive Statistics

On the basis of from their skewness coefficient and their kurtosis, the study constructs can be considered to be approximately normal. Questionnaire items seem to be fairly answered by respondents with most of the responses agreeing to the statement posed to them as the average score for each contract tend to exceed the average score for each question item. On their relationship, user perceived usefulness of information technology and its ease-of-use relate positively with the dependent variable, Healthcare supply chain performance. Even though attitude towards usage of technology relate positively with Healthcare supply chain performance, it relates negatively with perceived usefulness of technology indicating that, poor attitude towards usage of technology is likely to influence a user's attitude toward the use of technology. Again, attitude towards usage of technology relates positively with perceived usefulness which is an indication that, all other things being equal, when users of an information technology perceive the technology to be useful, their attitude towards such technology change positively and that have positive influence on the supply chain performance.

Assessing the inner model for multi-collinearity, we followed the two approaches recommended by Hair *et al.* (2014). First, the reported highest correlation coefficient among the predictor variables to be 0.224 indicating absence of collinearity. Secondary, to deal with collinearity arising from the combined effect of two or more predictors, the variance inflation factor (VIF) of the predictor variables was applied. Using the threshold of VIF values of 10 as recommended by Gaur and Gaur (2009) and Hair *et al*. (2014), the VIF values (ranging from 1.044 to 1.111), as shown in parentheses on the leading diagonal in Table 4 indicates that, there is no problem of multi-collinearity among the predictor variables. Consequently, the hypothesis of the study can now be tested.

Table 4. Descriptive statistics and inter-correlation coefficients

	Descriptive statistics				Inter-correlation coefficients			
	Mean	SD	Skew.	Excess Kurt.	PUS	PEU	ATU	HSCP
PUS	3.847	0.752	0.068	-0.440	(1.111)			
PEU	3.778	0.761	1.486	-0.925	0.076	(1.049)		
ATU	3.889	0.909	1.157	-1.165	-0.03	0.224	(1.044)	
HSCP	3.992	0.808	1.914	-1.180	0.523*	0.663**	0.562*	(1.065)

Note: n = 212. PUS, Perceived usefulness; PEU, Perceived ease-of-use; ATU, Attitude towards usage; HSCP, Healthcare supply chain performance; Figures on the leading diagonal of the correlation matrix put in parenthesis are the Variance Inflated Factors (VIF).

**$p < 0.05$.

8.3 Hypotheses Testing

The hypothesized model was empirically tested using the structural equation modelling (SEM) as it allows all paths to be evaluated concurrently. The result of the path analysis is presented Table 5. All hypotheses were tested using bootstrap analysis with bias-corrected 95% confidence interval, where 5000 sub-samples were created with observations randomly drawn (with replacement) from the original set of data. As the number of respondents (212 officers in charge of procurement activities) is ten times more than the exogenous constructs, the problem of bias estimates of path coefficients and indicator loading is not expected (Chin, 1998) and besides, a bias-corrected 95% confidence interval was constructed, which have the tendency of subsiding the propensity of bias estimate of path coefficient. The results of the bootstrap analysis are shown in the path diagram in Figure 2 and Table 5.

Two set of hypotheses were set to be tested. The first seeks to test the relationship between the exogenous variables (that is, *Perceived Usefulness* and *Perceived ease-of-use*) and endogenous variable (*Healthcare Supply Chain Performance*). The second seeks to assess the mediating role of *Attitude* toward usage on the relationship between the drivers of the exogenous and endogenous variable.

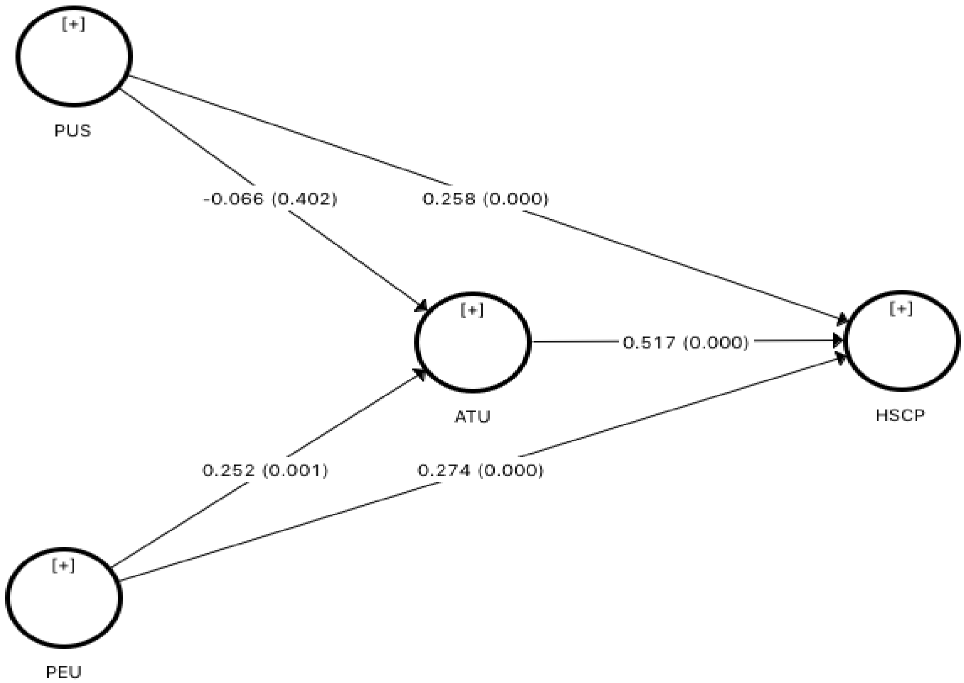

Figure 2. Path diagram of the hypothesised model with result of bootstrap analysis. PUS, Perceived usefulness; PEU, Perceived ease-of-use; ATU, Attitude towards usage; HSCP, Healthcare supply chain performance. Values on the path are path coefficients and those in the bracket are p-values.

Table 5. Direct, indirect and total effect of the hypothesised model

	Std Estimate	Std Error	Bias Corrected 95% CI		Decision on hypothesised model
			LLCI	ULCI	
Standardised direct effects					
ATU → HSCP	0.517***	0.061	0.394	0.634	Supported
PEU → ATU	0.252***	0.078	0.096	0.406	Supported
PEU → HSCP	0.274***	0.069	0.141	0.402	Supported
PUS → ATU	-0.066	0.079	-0.225	0.085	Unsupported
PUS → HSCP	0.258***	0.063	0.142	0.389	Supported
Standardised indirect effects					
PEU → ATU → HSCP	0.130***	0.045	0.048	0.223	Supported
PUS → ATU → HSCP	-0.034	0.041	-0.108	0.044	Unsupported
Total effect					
ATU → HSCP	0.517***	0.061	0.394	0.634	Supported
PEU → ATU	0.252***	0.078	0.096	0.406	Supported
PEU → HSCP	0.404***	0.08	0.242	0.56	Supported
PUS → ATU	-0.066	0.079	-0.225	0.085	Unsupported
PUS → HSCP	0.223***	0.08	0.061	0.383	Supported

Note: n = 212. PUS, Perceived usefulness; PEU, Perceived ease-of-use; ATU, Attitude towards usage; HSCP, Healthcare supply chain performance; Standardised estimate was obtained from 5,000 sub-samples generated from the sample size. *p<0.1; **p<0.05; ***p<0.01

8.4 Effect of Perceived Usefulness of Technology on Healthcare Supply Chain Performance

The hypothesized model in Figure 1 predicts a positive significant relationship between perceived usefulness (PUS) and Healthcare supply chain performance (HSCP). Perceived usefulness is positively related to Healthcare supply chain performance ($r = 0.523$, $p > 0.05$). From Table 5, the direct effect of PUS on HSCP is positive and significant at 1% ($\beta = 0.258$, Se = 0.063, $p < 0.01$). Hence, the null hypothesis of no effect is rejected at 1% significance level and conclude that, as users perceive technology as useful in the delivery of their services, there would be an improvement in the performance of healthcare supply chain which provides support to the hypothesized model. Again, the study predicts in the second hypothesis, a positive significant relationship between perceived ease-of-use (PEU) and Healthcare supply chain performance (HSCP). From Table 4, perceived ease-of-use showed a strong positive correlation with Healthcare supply chain performance ($r = 0.663$, $p > 0.05$). Again, there is a direct significant positive effect of perceived ease-of-use on Healthcare supply chain performance ($\beta = 0.274$, Se = 0.141, $p < 0.01$) indicating that, all other things being equal, as users perceive a supply chain management system to be easy to use, there would be an improvement in the performance of the system. This therefore provide support for the hypothesis model which predicts a positive linkage between the ease-of-use and healthcare supply chain performance. These results are in line with the findings of Taboada and Shee (2021) and Khezr *et al.* (2019) who found that user perception of how useful a system is and how it is perceived to be user-freiendly have impact of the performance of the system. The findings is also consistent with the technological dimension of the TAM framework which posited that, the decision to adopt a new technology is influenced by user-friendlyness and usefulness of the system.

8.5 The Mediating Role of User-Attitude

Again, the hypothesised model predict in hypothesis 3 (H_3) that, attitude of the user serves as a transmission mechanism between usefulness and supply chain performance of the healthcare information system. From Table 4, *attitude towards usage* is negatively related to *perceived usefulness* of the healthcare information system ($r = -0.03$, $p > 0.05$) but positively relate to healthcare supply chain performance ($r = 0.562$, $p < 0.05$). Nevertheless, *perceived usefulness* impact negatively on *attitude towards usage* even though, the level of impact is not significant ($\beta = -0.066$, Se = 0.079, $p > 0.05$). Also, *attitude towards usage* significantly impact positively on *healthcare supply chain performance* ($\beta = 0.517$, Se = 0.061, $p < 0.05$). Giving the fact that there is a significant direct significant relationship between perceived usefulness and supply chain healthcare performance ($\beta = 0.258$, Se = 0.063, $p < 0.01$), but insignificant indirect path between perceived usefulness, attitude towards usage and healthcare supply chain performance ($\beta = -0.034$, Se = 0.042, $p > 0.01$), attitude towards usage does not mediate the relationship between usefulness and healthcare supply chain performance. The findings therefore do not provide support for the hypothesised model. The implication of this finding is that, once user of a supply chain information system perceives the system to be useful, irrespective of the attitude of the user, the performance of the system is very likely to improve. This finding is consistent with the finding of Segal (2016) and Engel *et al.*(2016) who are of the view that, attitude have little to do with determining the performance of a supply chain management systems so far as management is able to put in proper internal and system controls to check the efficiency of the system.

The study, in addition sought to find out whether attitude towards usage plays a mediating role between perceived ease-of-use and performance of the supply chain information system. This was captured in the fourth hypothesis of the study. From Table 4, *attitude towards usage* is positively related to *perceived ease-of-use* of the healthcare information system ($r = 0.224$, $p > 0.05$) and then positively relate to healthcare supply chain performance ($r = 0.663$, $p < 0.05$). *Perceived ease-of-use* have significant positive impact on *attitude towards usage* ($\beta = 0.252$, Se = 0.078, $p < 0.05$). Also, *attitude towards usage* significantly impact positively on *healthcare supply chain performance* ($\beta = 0.517$, Se = 0.061, $p < 0.05$). Giving the fact that there is a significant direct significant relationship between perceived ease-of-use and supply chain healthcare performance ($\beta = 0.274$, Se = 0.141, $p > 0.01$), and that there is a significant indirect path between perceived ease-of-use, attitude towards usage and healthcare supply chain performance ($\beta = -0.130$, Se = 0.045, $p < 0.01$), attitude towards usage partially mediate the relationship between perceive ease-of-use and healthcare supply chain performance which provides support for the claims made by the hypothesised model in Figure 1. This implies that, once user of a supply chain information system perceives the system to be user friendly, the attitude of the user towards the system is likely to be improved which will positively affect the performance of the system. This finding is in consonance with that of Büyüközkan and Göçer (2018) and Attaran (2020) who arserted that, ueserfriendliness is an impaortant element in determining the performance of a supply chain management information systems.

9. Conclusion

Theoretically, this study's evidence indicates that technology significantly positively influences the healthcare supply chain. This suggests that technology cannot be overlooked or downplayed as part of the factors that contribute to effective healthcare supply chain activities. Technology plays a role that seeks to improve healthcare supply chain performance. It therefore imperative for emerging economies to integrate technology into their healthcare delivery systems for effective and efficient service delivery. Additionally, attitudes towards the adoption of technology to enhance performance should be embraced by practitioners to facilitate and improve operational performance. In summary, the study has shown that whiles attitude towards usage of healthcare supply chain information system mediate the relationship between ease-of-usage and performance of the system, it does not provide any mediation effect between perceived usefulness and performance of the system.

Further Research

Further research could look at this subject matter using a qualitative approach or consider a more saturated setting with different geographical destinations. Also, a comparative analysis could be conducted between the private and public health services providers.

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