

**E-TRANSPORT MANAGEMENT PRACTICES AND SUPPLY CHAIN PERFORMANCE
IN PUBLIC HEALTH FACILITIES IN NAIROBI COUNTY, KENYA**

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Corresponding Author email: kabanja2@gmail.com**ABSTRACT**

Logistics plays a crucial role in the Kenyan economy. Despite its significance, logistics operations in firms still grapple with challenges, primarily due to their labor-intensive nature. As a result, procurement managers dedicate a substantial amount of time to activities that do not directly add value. The level of automation in logistic practices within firms, mainly public health facilities in Kenya remains relatively low and hence this study sought to establish the effect of e-transport management practices on the supply chain performance of the public health facilities in Nairobi City County. Drawing from the Institutional Theory and Technology-Organization-Environment (TOE) Framework, this study adopted a descriptive research design that involved the use of primary data collected from a sample of 97 administrative staff members of the 97 public health facilities in the county. Through descriptive and inferential analysis, it was established that public health institutions in the county have implemented e-transport practices to a moderate extent. Regression analysis demonstrated that adoption of e-transport management practices ($\beta = 0.328$; P-Value > 0.05) has a positive and statistically significant effect on the supply chain performance of public health facilities in Nairobi County. These findings led to recommendations to enhance adoption of e-transport management practices, such as radio-frequency communication systems to guide drivers during transportation and implementing vehicle management systems for accountability and global positioning system for driver tracking so as to realize significant improvement in supply chain in the health sector.

Key Words: *E-Transport Management Practices, Supply Chain Performance, Public Health Facilities, Public Health Sector, Nairobi City County.*

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1. BACKGROUND OF THE STUDY

Businesses are being forced to look for novel ways to meet consumer expectations and change operational practices due to the quickly shifting market dynamics and increased competition in the service and product providing (Harrison et al., 2019). Contemporary technology has played a pivotal role in reshaping operations and service delivery. Firms are increasingly recognizing the imperative of integrating new technologies into their transaction management (Tien et al., 2019). Within the realm of supply chain, technology adoption has also been instrumental in the implementation of diverse systems. In the present era, there is a notable focus on leveraging technology for effective logistics management. This is attributed to its potential to yield advantages such as heightened agility, shortened cycle times, enhanced efficiency, and the timely delivery of high-quality products (Zhang, 2022). This, in turn, contributes to an overall enhancement of supply chain performance. Nevertheless, it is important to recognize that subpar information management practices can exert a detrimental impact on the performance of the supply chain (Zhang, 2022). Information technology (IT) also holds the promise of streamlining the supply chain process by minimizing wastage and inefficiencies.

In the contemporary globalized economy, businesses frequently grapple with intricate and widely dispersed supply chains. E-logistics offers the essential instruments for effective coordination and communication among diverse stakeholders engaged in the logistics process (Tien et al., 2019). With the surge in online shopping, customers now anticipate swifter delivery times, increased transparency regarding the status of their orders, and convenient options for returns. E-logistics assumes a pivotal role in meeting these expectations (Cichosz et al., 2020). By enabling companies to implement sophisticated tracking and monitoring systems, conduct real-time inventory management, and optimize dynamic routing, it not only heightens customer satisfaction but also translates into cost reductions and operational efficiencies for the businesses themselves (Rejeb et al., 2020). E-logistics also plays a significant role in advancing sustainability initiatives within the logistics sector. Through e-logistics, there are tools and technologies available for optimizing routes, consolidating loads, and enhancing inventory management (Rejeb et al., 2020). This translates to decreased fuel usage, reduced emissions, and a more environmentally-friendly approach to logistics operations overall. In an era where sustainability is an increasingly pressing concern for both consumers and regulatory authorities, adopting e-logistics practices positions businesses in alignment with eco-conscious trends and has the potential for enduring cost savings through enhanced environmental stewardship (Cichosz et al., 2020).

Globally, Al Majzoub and Davidaviciene (2019), argued that e-logistics is being embraced by manufacturing firms through implementation of automated and interconnected logistics management systems, enhancing operational efficiency and consequently reducing overall company expenditures (Erceg & Damoska-Sekulowska, 2019). Furthermore, Georgise et al. (2020) provided evidence that adoption of e-transport management among Germany firms has allowed firms to significantly cut down on delivery lead time. In Africa, most Nigerian manufacturing firms make use of transportation management systems where information regarding the whereabouts of usually, essential supply chain assets like goods or cars are stored (David-West, 2022). In Ghana, these technologies play a pivotal role in coordinating activities for effective supply chain management (Memon et al., 2023). Additionally, many South African firms have adopted logistics management systems to deliver efficient services to their clientele.

In Kenya, the initial resistance to the mandatory installation of the Electronic Cargo Tracking System (ECTS) for all truckers has gradually subsided. The ECTS aims to replace the security bond while simultaneously overseeing cargo in transit and providing real-time updates on the location, security, and condition of both cargo and assets (Dumanska & Matviets, 2021). Nairobi County accommodates numerous public healthcare facilities providing preventative services such as immunization initiatives, family planning, and antenatal care, contributing to endeavors aimed at alleviating the burden of avoidable illnesses within the locality. Despite their importance, the 2016 Kenya Demographics and HealthCare Survey indicated a myriad of challenges ranging from but not limited to subpar quality of care, diminished service accessibility and availability. Another report by the Ethics and Anti-Corruption Commission (2022) highlighted that patients in public healthcare facilities have resorted to offering bribes to access health services, seeking better quality care, reducing waiting times, and obtaining necessary drugs and meals. The survey also unveiled a deficiency in medical supplies in pub-

lic healthcare facilities, with 38.6% of patients being instructed to procure their own medications and equipment for treatment. Despite being recipients of public funding, it is imperative to reevaluate how e-logistics management practices contribute to this predicament in public healthcare facilities. Effectively tackling these issues mandates continual investments in infrastructure, human capital, and technology, alongside astute strategic planning to guarantee impartial access to high-caliber healthcare services for every inhabitant of Nairobi County (RoK, 2022).

2. STATEMENT OF THE PROBLEM

Logistics plays a crucial role in the Kenyan economy. Despite its significance, the logistics function encounters several challenges, primarily because it relies heavily on labor. Consequently, procurement managers expend considerable time on activities that do not directly contribute value (Korir et al., 2023). The supply chain operations of the public health sector in Kenya have come under scrutiny due to recurring issues like delayed deliveries and drug shortages. These challenges have led scholars to question the efficacy of its logistical management practices (Amboko et al., 2022). The performance of the supply chain in public health facilities, particularly in terms of punctual delivery, quality of supplies, and cost-effectiveness, has been subject to examination. According to Tama et al. (2022), the public health sector sometimes experiences significant delays in delivery, ranging from 30 days to as long as 6 to 15 months in some cases. Additionally, concerns have been raised regarding the presence of counterfeit drugs in the inventory, casting doubt on the overall quality of supplies. Basel (2016) contends that one effective approach to enhancing speed, quality, and cost reduction in procurement, by as much as 40%, is the adoption of technology. Conversely, Okoroafor et al. (2022) argue that technology can lead to an improvement in supply chain performance by up to 48%. Given the reported subpar performance of the supply chain in public health facilities, it becomes imperative to investigate how the integration of technology in logistics can impact overall supply chain efficiency.

This research was prompted by identified gaps in prior studies related to logistics. As an illustration of a particular contextual knowledge gap, Miralam (2017) focused on the impact of deploying a warehouse management system (WMS) on the operations of auto spare part warehouses in the Saudi Arabian market. Although it focused more on logistics management techniques than e-logistics management, Mungu's (2013) study examined how the use of logistics management strategies affects the stock levels of essential medications in public health facilities. Similarly, a contextual knowledge gap unique to this industry was created by Gitonga's research (2017), which investigated the relationship between logistics management methods and the operational performance of Fast-Moving Consumer Goods Manufacturers in Kenya. Furthermore, by concentrating on green supply chain management rather than e-logistics management, Chege's study (2012) introduced a conceptual knowledge gap by attempting to analyze the impact of green supply chain management techniques on the supply chain performance of private hospitals in Nairobi, Kenya. Therefore, this study endeavored to address these identified knowledge gaps.

3. RESEARCH OBJECTIVE

The study sought to determine the effect of e-transportation management practices on supply chain performance in public health facilities in Nairobi County

4. THEORETICAL LITERATURE REVIEW

The study was anchored on the Institutional Theory and the Technology-Organization Environment (TOE) Framework.

4.1. Institutional Theory

Institutional Theory, initially proposed by Powell and DiMaggio (1991), emphasizes how organizations adopt structures, routines, and norms to align with regulatory and societal expectations. Organizations often respond to external pressures—regulatory, normative, or mimetic—to gain legitimacy and sustain competitiveness (Cox, 2010; Barua et al., 2009). These pressures create a framework where environmental responsibility and conformity to industry standards become es-

essential for long-term survival. Carter et al. (2000) assert that such institutional influences drive firms to institutionalize sustainable practices not only to comply with environmental laws but also to protect their market positions.

Despite its limitations, Institutional Theory remains highly applicable in explaining how firms adopt e-logistics systems to enhance supply chain performance. The adoption of e-logistics—such as digital tracking, automated inventory systems, and real-time data analytics—can be seen as a response to institutional pressures for greater efficiency, transparency, and environmental compliance. Dacin et al. (2007) emphasize that actions taken by firms must be justifiable within institutional norms to gain legitimacy. Therefore, the decision to integrate e-logistics is not only a strategic move to improve supply chain responsiveness but also a legitimizing step driven by both formal regulations and informal societal expectations. This alignment with Institutional Theory helps explain why firms invest in IT-based logistics innovations to meet evolving stakeholder demands while enhancing their operational performance.

4.2. Technology-Organization Environment (TOE) Framework

The Technology-Organization-Environment (TOE) framework, developed by Tornatzky et al. (1990), presents a comprehensive model for understanding how organizations adopt new technologies. It comprises three primary contexts: technological, which relates to existing and emerging technologies; organizational, which encompasses the firm's size, structure, and internal processes; and environmental, which includes external forces such as government regulations and market competition (Chen et al., 2006). The framework emphasizes that these interconnected domains influence whether and how a firm adopts innovations, particularly in e-business. Within the organizational context, factors such as managerial attitudes, resource availability, and internal communication systems play a pivotal role in determining the success of technological integration (Mohamad & Ismail, 2009). In the environmental context, the TOE framework considers pressures from key external actors like suppliers, customers, and government agencies as crucial motivators for technology adoption (Lippert & Govindarajulu, 2015).

This framework remains valuable in offering a structured approach to evaluating how internal capabilities and external forces interact to shape technological change within organizations. In the context of e-logistics, the TOE framework is instrumental in understanding how public health facilities and other organizations adopt digital logistics systems to enhance supply chain performance. The technological context supports the deployment of tools like inventory management systems, real-time tracking, and automated order processing. The organizational context provides insight into whether an institution has the leadership support, skills, and infrastructure to adopt such systems. Meanwhile, the environmental context highlights regulatory requirements and customer expectations driving digital transformation. E-logistics adoption under this framework enables smoother interactions with suppliers, improved transparency, and faster decision-making—factors critical to achieving an efficient, resilient, and responsive supply chain in health service delivery and beyond.

5. EMPIRICAL LITERATURE REVIEW

Using a descriptive research approach, Bwari et al. (2016) studied the East African Breweries Limited supply chain. With a sample size of 165 respondents, the study concentrated on 1653 EABL employees. The results showed that supply chain performance was highly impacted by distribution, transportation, and inventory management. It is important to note that the current study on public health facilities is conducted in a different environment than this one, which concentrated on industrial enterprises. Given the variations in the institutional, legal, and economic environments, the results of a study conducted in a different setting cannot be justified for use in Kenya. This study was therefore recommended for comparison purposes. The study also presented a conceptual research gap since the focus was only on one variable. This study goes a long way to ensure a focus on not only this e-logistics factor, but also three more so as to fill this conceptual research gap.

Similar goals were pursued by Musau, Namusonge, Makokha, and Ngeno (2017) in their evaluation of the influence of

transport management systems on organizational performance in Kenyan textile production companies. A convergent parallel mixed methods design was used in the investigation. It was directed at fifteen Nairobi County-based textile manufacturing companies. 139 respondents, chosen by stratified and straightforward random selection techniques, were drawn from procurement departments and department heads to make up the sample size. The study collected data using a combination of qualitative and quantitative methods, including questionnaires and interview schedules. The findings showed that textile companies' supply chain performance was positively impacted by their adoption of transport management systems. The study suggested that in order to be competitive in the market and improve the overall performance of textile manufacturing enterprises, textile firms should take steps to solve transportation difficulties, such as fleet management, vehicle tracking, scheduling, and route planning. The current study is focused on public health facilities, whereas this study is more concerned with manufacturing enterprises. Due to its singular focus, the study also revealed a conceptual research gap. In order to close this conceptual research gap, our work does a great deal to guarantee that attention is paid to not just this e-logistics factor but also three others.

The goal of Gitahi and Ogollah's (2014) study was to evaluate how a fleet management system affected the UNHCR Kenya program's ability to provide services to refugees. With a sample size of 117 participants, the study used a descriptive research approach to focus on 390 employees. The findings showed that the UNHCR program in Kenya's service delivery to refugees was greatly and favorably impacted by the implementation of a fleet management system. In particular, the system was helpful in tracking and monitoring fuel allocation, sourcing, and use on a daily basis. Due to its singular focus, the study also revealed a conceptual research gap. This study makes great efforts to guarantee that attention is paid to three additional e-logistics factors in addition to this one. Similar to this, Vijayaraghavan and Raju (2011) investigated the impact of logistics and transportation on performance with an emphasis on Indian-based businesses. Over a ten-year period, this study sought to identify any significant differences between the pre- and post-implementation of transport and logistics procedures. The findings unveiled a positive correlation between logistics capabilities and firm performance. It is worth noting that while this study primarily centered on transport management systems, the present study encompasses a broader scope, considering additional elements such as inventory management systems, e-warehousing, and e-order management. The findings of a study carried out in a different context cannot be justified for a Kenyan context given the differences in the legal, economic and institutional environment. This study was therefore recommended for comparison purposes.

6. CONCEPTUAL FRAMEWORK

The conceptual relationship between the study variables has also been presented as shown in Figure 2.1. The e-logistics practices being focused on have been operationalized as four and linked to the dependent variable as hypothetically shown.

Independent Variable

Dependent Variable

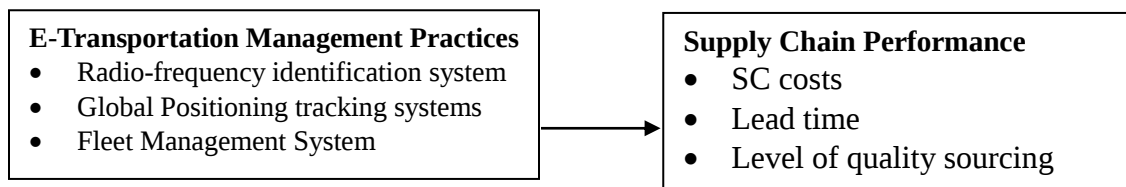


Figure 1: Conceptual Framework

7. RESEARCH METHODOLOGY

The study adopted a descriptive research design. The target population encompassed all 97 public health facilities in Nairobi County, as indicated in the Nairobi County Integrated Strategic Plan (2022) where a census was conducted. Primary data was gathered through structured questionnaires, utilizing a 5-point Likert scale. And analysed through the Statistical Package for Social Sciences (SPSS) software, version 21. Measures such as the mean and standard deviation formed the descriptive statistics to describe the properties of the variables under consideration. Furthermore, bivariate regression was used to examine the relationship between the independent and dependent variables. A linear regression model of the form below was adopted;

$$Y = \beta_0 + \beta_1 X_1 + \epsilon$$

Where; Y = Supply Chain Performance; X_1 = e-Transportation Management Practices; ϵ =Error term; β_0 = the constant term while $\beta_i = 1$ was the Beta coefficient. Before running the regression model, the study meticulously performed diagnostic tests namely, normality, autocorrelation and homoscedasticity to ensure adherence to the assumptions of classical linear regression. Kolmogorov-Smirnov (K-S) Test was employed for normality test, Durbin Watson test was employed for autocorrelation while Breusch Pagan method employed for heteroscedasticity.

8. RESEARCH FINDINGS

8.1. Response Rate

The study targeted 97 administrative staff from the 97 public health facilities in Nairobi County. A total of 97 questionnaires were administered. Out of the number, the study obtained a total of 79 questionnaires from the filled properly filled. This gave a response rate of 81% which is acceptable according to Singh (2022) who argued that a response above 50% is appropriate and acceptable.

8.2. Validity and Reliability Results

The study conducted reliability and validity tests to ensure that the questionnaire was both valid and reliable before being used in the main survey. For validity, content validity was used whereby the questionnaire was subjected to critique and examination by the supervisor who recommended changes. For reliability, internal consistency was adopted whereby; the data from 5 public health facilities was entered and used to establish the Cronbach Alpha coefficient. The results shown in Table 1 show that all five variables were deemed reliable for this study because they all above the Cronbach Alpha level of 0.7 (Cronbach, 1951).

Table 1 Reliability Test Results

Variable	Number of Items	Cronbach Alpha	Decision
E-transportation Management	8	0.812	Reliable
Supply Chain Performance	5	0.785	Reliable

8.3. Respondent's Demographic Characteristics

The respondent's highest level of education and work experience was established in order to understand whether they had institutional knowledge as well as the intellectual ability to understand the concept of e-logistics management in the public health facilities.

8.4. Respondent's Level of Education

The study findings (Figure 2) indicated that majority of the study respondents, 71%, had university level of education while 29% had college level of education. Generally, it can be concluded that the respondents were literate and the information they provided was reliable since the questionnaire was self-administered.

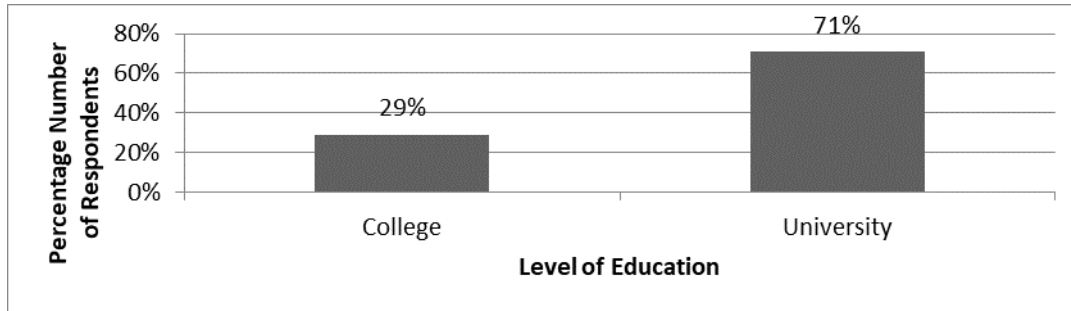


Figure 2 Respondents Level of Education

8.5. Respondent's Work Experience

The findings (Figure 3) showed that 48% of the respondents had a work experience of between 4 and 6 years which means that they had more institutional knowledge. On the other hand, 23% had a work experience between 2 and 4 years, 12% had less than 2 years of work experience while 17% had a work experience above 6 years. Generally, it can be argued that majority of the respondents had institutional knowledge and were in a better position to explain the e-logistics practices of their organizations.

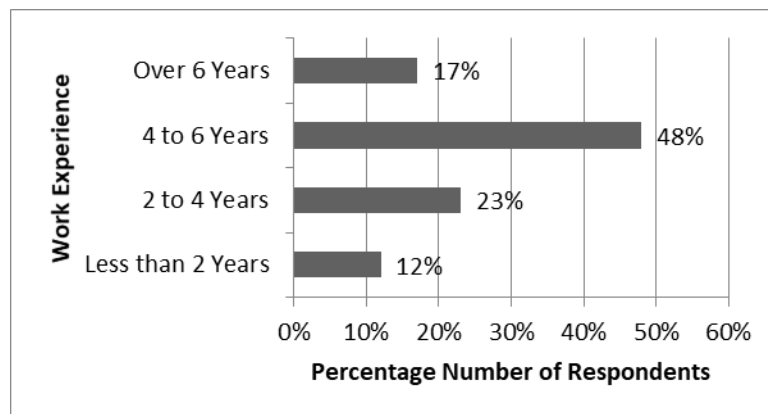


Figure 3 Respondents Work Experience

8.5. Descriptive Statistics of E-Transportation Management Practices

The results in Table 2 found that, among Nairobi County's public health facilities, the transportation information system greatly assists logistics managers in planning transportation-related issues (Mean = 3.56); they heavily rely on radio-frequency communication systems to direct drivers while transporting products (Mean = 4.80); they use transportation data recorder information to optimize operations (Mean = 4.62) and heavily rely on vehicle management systems to establish accountability for every vehicle (Mean = 3.59).

Additional research revealed that, of the public health facilities in Nairobi County, logistics managers use the global positioning system to track drivers during the transportation of products to a moderate extent (Mean = 3.16), control transportation issues to a moderate extent (Mean = 3.00), and manage transportation issues to a moderate extent (Mean = 2.68).

They also use the global positioning system to guide drivers during the transportation of products to a moderate extent (Mean = 2.95). The average adoption rate of e-transportation techniques by Nairobi County's public health facilities was found to be 3.55 (Average Mean). The results suggest that the public health institutions have implemented e-transportation strategies in an effort to improve the efficiency of their supply chain.

Table 2 Descriptive Statistics of E-Transportation Management Practices

Statement	Mean	Std Dev
The transportation information system helps logistics managers in planning transportation issues	3.56	1.38
The transportation information system helps logistics managers in managing transportation issues	2.68	1.32
The transportation information system helps logistics managers in managing controlling transportation issues	3.00	0.83
The institution uses global positioning system to track drivers during the transportation of products	3.16	0.82
The institution uses global positioning system to guide drivers during the transportation of products	2.95	0.83
The institution uses radio-frequency communication system to guide drivers during the transportation of products	4.80	0.40
The institution uses the information from the transportation data recorder to optimize its operations	4.62	0.79
The institution uses Vehicle management system to establish accountability for all vehicle use	3.59	1.25
Average	3.55	0.95

8.6. Descriptive Statistics of Supply Chain Performance

The findings in Table 3 indicate that majority of the public health facilities in Nairobi county indicated that they had recorded a reduction in logistic operation costs to a high extent (Mean = 4.01) with adoption of e-logistics management, there has been timeliness in the delivery of goods and services to a high extent (Mean = 4.22) with adoption of e-logistics management, there is faster response to the clients demands to a moderate extent with adoption of e-logistics management (Mean = 3.03) and that there has been an increase in the reliability of supply chain to a high extent (Mean = 4.15) with adoption of e-logistics management. On average, the respondents indicated that there has been an improvement in supply chain performance to a high extent since adoption of various e-logistics management practices (Mean = 3.90). The findings imply that as a result of implementing e-procurement practices, the public health facilities have enhanced their supply chain performance.

Table 3 Descriptive Statistics of Supply Chain Performance

Statement	Mean	Std Dev
There has been a reduction in logistic operation costs	4.01	0.93
There is timeliness in the delivery of goods and services	4.22	0.94
There is faster response to the clients demands in terms	3.03	0.82
There has been an increase in the reliability of supply chain	4.15	0.85
Average	3.90	0.90

8.7. Regression Analysis

The findings in Table 7 indicate that the R-square (coefficient of determination) was 0.443. This implies that e-Transport Management account for up to 44.3% of the changes in supply chain performance of public health facilities in Nairobi County, Kenya. It means that other factors not studied in this study account for up to 55.7% of the variation in supply chain performance of public health facilities in Nairobi County, Kenya.

Table 7 Coefficient of Determination

R	R Square	Adjusted R Square	Std. Error of the Estimate
.665	0.443	0.413	0.3282
Predictors: (Constant), e-Transport Management,			

Analysis of variance (ANOVA) is used to indicate whether the regression model was significant of fit the line of best fit. The findings presented below indicate that the model linking e-Transport Management to supply chain performance was fit/significant as shown by a significant F value at sig = 0.000 < 0.05.

Table 8 ANOVA (Model Fitness)

	Sum of Squares	df	Mean Square	F	Sig.
Regression	6.336	1	6.336	61.19052	0.000
Residual	7.973	77	0.10355		
Total	14.309	78			
Dependent Variable: Supply Chain Performance					
Predictors: (Constant), e-Transport Management					

The model coefficients findings established e-transport management has a positive and significant effect on supply chain performance of public health facilities in Nairobi County, Kenya (Beta = 0.328, Sig < 0.05). These findings imply that an increase in adoption of e-transport management leads to a significant improvement in supply chain performance of public health facilities in Nairobi County, Kenya. The findings are consistent with the findings of a study by Bwari *et al.* (2016) which indicated that better transportation management practices led to an improvement in supply chain performance to a great extent.

Table 9 Model Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	1.434	0.409		3.508	0.001
e-Transport Management	0.328	0.066	0.486	4.942	0.000
Dependent Variable: Supply Chain Performance					

9. CONCLUSION

Adoption of e-transport management practices such as the use of radio-frequency communication system to guide drivers during the transportation of products, using the information from the transportation data recorder to optimize its operations, using Vehicle management system to establish accountability for all vehicles and using global positioning system to track drivers during the transportation of products as well as using global positioning system to guide drivers during the transportation of products leads to an insignificant improvement in supply chain performance of public health facilities in Nairobi County.

10. RECOMMENDATION

Since the study findings indicated a positive effect of e-transport management practices on supply chain performance, the study recommends that public health facilities should enhance adoption of e-transport management practices. Some of the practices include the use of radio-frequency communication system to guide drivers during the transportation of products, using the information from the transportation data recorder to optimize its operations, using Vehicle management system to establish accountability for all vehicles and using global positioning system to track drivers during the transportation of products as well as using global positioning system to guide drivers during the transportation of products.

11. ACKNOWLEDGMENTS

This study and manuscript would not have been possible without the availability of the study respondents from the public health facilities in Nairobi County who voluntarily participated in the study.

12. ETHICAL APPROVAL AND CONSENT

All procedures performed in this study were in accordance with the required ethical standards and research protocol / proposal by National Commission for Science and Technology, Kenya.

13. DECLARATION OF CONFLICT OF INTEREST

The author declares that he no conflict of interest.

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