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Effect of New Technology Adoption by Customs on Logistics Performance in The Logistics Indus

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ABSTRACT

Purpose: This study sought to investigate the effect of new technology adopted by customs on logistics performance in Nairobi.

Design/ Methodology/Approach: It adopted a descriptive cross-sectional research design. The target population were 300 customs officers and managers of logistic companies within Nairobi. A sample of 171 customs officers and logistics managers were selected using stratified random sampling technique. Data was collected using structured questionnaire. The descriptive and inferential statistical analysis techniques were employed by the study. To investigate the relationship between the independent variables and dependent variable, correlation and multiple regression analysis was used. Correlation analysis established the strength of linear association between the variables. On the other hand, a multiple linear regression model tested the significance of the influence of the independent variables on the dependent variable.

Findings: The results of the descriptive statistics were summarised in form frequencies and percentages tables and figures. The findings show the relationship between the independent and the dependent variables. It was thus revealed that single window system and (β=0.346, p=0.000), electronic cargo tracking management systems (β=0.258, p=0.000) and cargo scanner management solution (β=0.330, p=0.000) have a significant and positive relationship on the logistics performance of transport operators at ICDE.

Contribution to policy and practice: The custom department under the KRA would also benefit from this research. It would be a useful research material for the customs departments since their consultants would find it as a helpful reference material in advising their investors as well as the government on some of the practical application of the new technology such as the electronic cargo tracking systems, single window system and cargo scanner management solution in other counties in the country. Moreover, those businesses that would have benefitted from the customs services would be able to understand the importance of the adoption of new technology in enhancing service delivery to them.

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Introduction

Background of the Study

The world of logistics is revolutionizing each day and every customs department has to cope with these advancements in technology required in simplifying their operations while at the same time achieving set objectives. New technology refers to the set of productive methods and techniques that provides significant improvements over established technology for a specific process in a specified historical context (Rotolo, Hicks & Martin, 2015). New technologies in the customs departments have helped in making the work easier and better in the process of improving service delivery.

The growth of international trade has gone high and customs departments play a very crucial link in the international supply chains. According to Christopher (2016), logistics involves the management of goods and carrying out information and services from the point of origin to the point of consumption. It aligns the complex patterns of traffic and shipping, transportation and storage, export and import operations. Due to the losses in time, customs need to make changes in their operations through the adoption of new technologies. Some of the key forms of technology adopted in customs departments include cargo scanner management solution, electronic cargo tracking system and the single window system. These new technologies have revolutionized logistics performance in the industry.

The world being a global village today has led to an increased need for customer satisfaction and expectations. These come with various logistics challenges facing most customs institutions. Gao, Chang, Fang and Luo (2018) asserts that some of these challenges include cutting operation costs due to increasing in operations complexities. The other problem includes the improvement of the business process which calls for new technology that has been increasingly challenging for the logistics industry especially in developing countries such as Kenya. Therefore, given these challenges, there is need to address the issue of the effects of new technology adoption by customs on logistics performance.

In their study of the Kenya Ports Authority (KPA), Ruto and Datche (2015), found that logistics problems often bring businesses to a halt. They state that technological issues happen almost everywhere from a few times, to even every day of the week. They reported that the frequency of the technical problems is increasing every day. However, they noted that despite these problems, new technology has revolutionized the logistics operations in the country since the past decade. With this said, it is clear that in Kenya, there are challenges that come with the adoption of new technology as much as it improves performance and customer satisfaction.

Logistics Performance

The growth and evolution in international trade has been quite intensive in the past two decades. According to Arvis et al. (2016) many economies across the world have recognized that trade plays a crucial role in economic growth. International trade involves the movements of goods across borders involving numerous procedures. The competitiveness of a country's logistics depends on its customs clearance efficiency and effectiveness. Therefore, the effectiveness of customs clearance in regard to logistics performance of a country leads to trade facilitation which is quite

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pivotal to its development. Efficient logistics fosters a country's competitiveness as it allows it to trade services and goods on a timely basis and at lower costs of transaction (Martí, Martín & Puertas, 2017). On the other hand, inefficient logistics pose a significant obstacle to trade in the country since it makes it difficult for it to develop or tap new markets and to improve its overall competitiveness in the trading system. This means that the customs department has a crucial role to play in improving the logistics performance of a country to facilitate trade and to improve the economy of that country.

Logistics comprises a network of services that supports the physical movement of goods across and within borders. It is estimated to be a $4.3 trillion industry (Gani, 2017). The Logistics Performance Index (LPI) scores countries on how efficiently they move goods across and within borders. According to Mwangangi (2016), the developing country's capacity to move goods from one country or region to the other efficiently and connecting consumers and manufacturers with international markets is considered to have improved in the past few years –albeit slowly. However, more needs to be done in order to close the existing logistics "performance gap" between the low and high performers. Ojala and Celebi (2015) agree that supply chains are deemed only as good as their weakest link, and sustainable improvements need complex changes in a range of policy dimensions in areas that include trade facilitation, services, and infrastructure. These efforts need persistence and focus; a combination of few countries have achieved according to the survey conducted by World Bank on trade logistics.

In Kenya, logistics performance is quite impressive. According to the World Bank, Kenya's logistics performance is termed as the best in East Africa due to the continued removal of administrative controls as well as the continued improvement of infrastructure. Ojala and Celebi (2015) indicate that according to the LPI, Kenya ranks at position 42 globally with a score of 3.33 points in 2019. By comparison, the surveys conducted in 2019 placed Uganda and Tanzania at positions 58 and 61 with a score of 3.04 and 2.99 respectively. Mwangangi (2016) asserts that Kenya's logistics performance is second in the African continent after South Africa which is in the 20th position on the global survey with a score of 3.78. This LPI indicates that Kenya has greatly reduced the costs of doing business and it has improved its trade flow for exporters and importers. According to the World Bank report (2019), efficient logistics connect forms to international and domestic trade through reliable supply chain networks which is a major characteristic of the Kenyan trade. Also, the adoption of new technology is credited as a key aspect of the good performance of the customs departments in Kenya, making it a viable topic for research.

New Technology

In the past, lack of technology was a major problem in the logistics sector across the globe. In the 1990s, the logistics sector landscape as management systems did not have modern forms of technology to revolutionize the processes and performance. Pugliese et al. (2017) noted that during this period to early 2000, paper work, manual data entry task interleaving among other tasks in logistics was done manually by workers as automation was not yet in place to improve efficiency. However, in the late 2000s to date, things have changed in the logistics industry and customs departments across the world. Technological advances have allowed these players to accomplish

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a lot in a short time and effectively with high levels of accuracy and with effective financial sustainability (Kalinicheva et al., 2016). In the past, for instance, customers placed orders, booked shipments and received the estimated time of delivery and then they were left in the dark without knowing the state of their cargo in transit. Telephone calls were the only way in which they could track the status of their shipments. Today, however, things have changed as customer experiences have changed as software and the internet advances have allowed players to access their shipping and tracking systems anytime, as and when required. This clearly, proves that technology has made changes to the industry.

The economic advances in most countries across the world have improved trade between countries. The evolution of technology is pushing the boundaries and changing how companies do business (Goldsby & Zinn, 2016). Today, companies are accustomed to almost everything being done by computers and right at their fingertips for immediate access. There are numerous types of new technologies in place today used by customs departments across the world in improving their performance. In Kenya for instance, one of such technology is the Electronic Cargo Tracking Systems (ECTS) developed by KRA in conjunction with regional revenue authorities. According to Mugambi (2017), it enables real tracking of cargo in transit from one region to the other for the improvement of tax as well as security.

Single Window System which is a trade facilitation tool that enables international traders to submit regulatory documents such as customs declarations and applications for import/export permits at a single location (Nizeyimana & De Wulf, 2015) is another. This system allows parties involved in trade and transport to lodge standardized information and documents with a single-entry point to fulfill all import, export, and transit-related regulatory requirements. If information is electronic, then individual data elements should only be submitted once. Independently from its description as a platform, environment, or facility, single window system can best be understood by the service that it aims to provide to traders and government authorities. The third one is the Cargo Scanner Management Solution (CSMS). Nwankwo and Olayinka (2019) indicate that this solution plays a key role in ensuring that there is a non-intrusive inspection of export, import and security controls. This solution has helped the customs authorities in ensuring that cargo is effectively screened booth on sea and land.

Research Problem

Irrespective of the fact that logistics firms are making much profit, they still suffer from inefficiency and insecurity. Logistics companies have come of age, and as such, competition has alerted firms to look for innovations that will keep their customers and win more. The need for efficiency and effectiveness in the logistics sector hence prompts the need to integrate use of technology. This is to foster customer relationship, increase customer satisfaction, improve operational efficiency, reduce running costs, reduce transaction time, give logistics firms competitive edge, provide security to investor funds as well as movement of goods across the globe.

The government of Kenya through the customs agency has introduced policies that have played a key role in the supply chain. For example, requirement of truckers to install electronic cargo

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tracking systems was met with opposition. However, they have slowly embraced them which seek to replace the security bond while monitoring cargo in transit and providing real time information on location of cargo. Other technologies introduced are the single window system which reduces cargo dwell time, cargo scanning solutions, radio frequency identification devices for bar-coding, communication technologies like Electronic Data Interchange (EDI) and GPS. The need to implement these technologies by customs would be to lessen risks such as tax losses and cargo theft.

Previous studies (Ndonga, 2013; Miler & Bujak, 2014; Mugambi, 2017; Ahn & Han, 2017) have explored the effect of information technology on performance of logistics firms. However, there exist research gaps as none of the studies has focused on custom automation and performance of logistics firms in Nairobi. The current study therefore seeks to fill the research gap by investigating the effect of custom automation on logistics performance in Nairobi with reference to electronic cargo tracking system, single window system and cargo scanner management solution.

Objective of the study

The general objective of this research is to investigate the effect of new technology adoption by customs on logistics performance in Nairobi County.

Literature Review

Electronic Cargo Tracking System (ECTS), according to Kenya Revenue Authority is an initiative created by KRA together with the revenue administrations of Rwanda, Uganda, Kenya, and Tanzania. According to Kabiru et al. (2016), this system enables real-time tracking of transit cargo from the port of Mombasa to its final destination through an online digital platform. Mugambi (2017) who conducted a study on the effects of the Regional Electronic Cargo Tracking System found out that the reason for the development of this system was to implement cargo security and tracking system as a response to the interest of the governments of the four countries to improve tax collection. Additionally, Miler and Bujak (2014) indicate that the system was also aimed at enhancing enforcement of cargo handling regulations and maintaining Kenya as a preferred trade route for cargo in East Africa. This initiative is critical in supporting the national programs that are aimed at promoting trade among the countries in East Africa. Mugambi (2017) study also found that the other reason why this system was created was to replace the Electronic Cargo Tracking System (ECTS) that was being managed by the private sector that failed to achieve the objects it was created to deliver to the customs departments.

The Electronic Cargo Tracking System encompasses the use of satellites, special electronic seals fitted into cargo containers and a monitoring center (Kenya Revenue Authority, 2016). Mugambi (2017) points out that ECTS covers trade routes that extend from the port of Mombasa to the Free Zones within Kenya, and from the port via the country's main transportation trade routes to the neighbouring landlocked countries including Uganda and Rwanda. Ross (2017), on the other hand, asserts that the introduction of ECTS is timely and is in the backdrop of rampant illegal dumping. Dumping takes place when goods consigned to a destination in another customs jurisdiction are unprocedurally offloaded while in transit (Mugambi, 2017). He adds that not only does such action

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result in unfair trade practice, but also in major duty and tax losses. This system has brought major results to the customs departments in the region. Kithiia (2015) found out that the implementation of ECTS has led to the closing of prevalent loopholes of tax loss and it has increased the flow of cargo through the e-monitoring system. Juma (2016) also found out that ECTS has eliminated cargo diversions into the local market as well as creating alert and responses during the trailer stop-over that take more than the allowed time. Therefore, it is clear that its implementation has brought major trade boosts in Kenya and the entire East African region.

Theoretical Background

Instrumental Theory of Technology

This theory was developed by Andrew Feenberg at Oxford University in 2002. The theory looks into how people use technology to their benefit in an organization rather than the Technology itself. The instrumental theory offers the most widely accepted view of technology. It is based on the common-sense idea that technologies are "tools" standing ready to serve the purposes of their users. Technology is deemed "neutral," without evaluative content of its own. However, what does the notion of the "neutrality" of technology actually mean? The concept usually implies at least four points. The first technology, as a pure instrumentality, is indifferent to the variety of ends it can be employed to achieve (Feenberg, 2002). Secondly, technology also appears to be indifferent with respect to politics, at least in the modern world, and especially with respect to the capitalist and socialist societies (Feenberg, 2002). Thirdly, the socio-political neutrality of technology is usually attributed to its "rational" character and the universality of the truth it embodies. Technology, in other words, is based on verifiable causal propositions (Feenberg, 2002). Lastly, the universality of technology also means that the same standards of measurement can be applied in different settings (Røvik, 2016). Thus, technology is routinely said to increase the productivity of labor in different countries, different eras, and different civilizations. Technologies are neutral because they stand essentially under the very same norm of efficiency in any and every context.

Instrumental theory, therefore, helps in understanding how technology affects how people use it in an organization (Feenberg, 2002). This could be useful in understanding how technology used by customs departments impacts its users and consequently the logistics performance. In the customs departments, there have been issues between people and the use of technology. This theory is useful to this study because it explains some of the causes of resistance to technology to be an issue with individuals and not the technology itself. If this is understood and employees are given the required education, then it becomes easier for them to adopt the new technologies.

Methodology

It adopted a descriptive cross-sectional research design. The target population were 300 customs officers and managers of logistic companies within Nairobi. A sample of 171 customs officers and logistics managers were selected using stratified random sampling technique. Data was collected using structured questionnaire. The descriptive and inferential statistical analysis techniques were employed by the study. To investigate the relationship between the independent variables and dependent variable, correlation and multiple regression analysis was used. Correlation analysis

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established the strength of linear association between the variables. On the other hand, a multiple linear regression model tested the significance of the influence of the independent variables on the dependent variable.

Findings and Presentation

Response rate

This is the result as determined by the respondents' cooperation in giving their view on the asked question that were reflected under different themes.

Table 1: Response Rate

Response	Frequency	Percentage
Returned	139	81.29%
Unreturned	32	18.71%
Total	**171**	**100%**

Since the questionnaires given were 171, 139 were properly filled and returned. As it turned out the response rate saw 81.29% of the questionnaire properly filled, which was a high return percentage wise, which is adequate. This is so because according to Allen (2016) and also Rindfuss (2015), a response rate of above 50% is adequate for a descriptive study.

Regression Analysis

Table 2.: Model of Fitness

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.763a	0.582	0.573	0.3404

Table 4.13 above shows the results of the fitness of regression model which is used to explain the study phenomena. The results indicate that single window system, electronic cargo tracking management systems and cargo scanner management solution were significant explanatory variables of logistics performance of transport operators at ICDE, as supported by the coefficient of determination, R square of 0.582. This implies that the variables explained 58.2% of the variation logistics performance of transport operators at ICDE.

Table 3: Analysis of Variance (ANOVA)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.816	3	7.272	62.756	.000b
	Residual	15.644	135	0.116		
	Total	37.46	138			

The results in table 4.14 revealed that the regression model was statistically significant. This was supported by the F statistic of 62.756 and the reported p value of 0.000 which was less than the

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conventional probability of 0.05 significance level. Where, $F_{statistic} = 62.756 > F_{critical} = 2.680$ (3,135).

Table 4: Regression of Coefficients

Variables	β	Std. Error	Beta	t	Sig.
(Constant)	0.300	0.252		1.190	0.236
Single Window System	0.346	0.056	0.389	6.186	0.000
Electronic Cargo Tracking Management Systems	0.258	0.060	0.268	4.287	0.000
Cargo Scanner Management Solution	0.330	0.063	0.330	5.238	0.000

Regression of coefficient results in the table 4.15 revealed that single window system and logistics performance of transport operators at ICDE are positively and significantly related (β=0.346, p=0.000). The p value was measured at 0.05 significance level and thus single window system with a p value of less than 0.005 (0.001) was found to be significant. This implies that an increase in 1 unit of aspects related to single window system improves logistics performance of transport operators at ICDE by 34.6%. These findings are in agreement with Aman, et al. (2017) who showed that Single Window Systems have been adapted in many countries to improve customer satisfaction in logistics since cutting through customs procedures can take a long time, leading to delayed shipments and unhappy customers. Ndonga (2013) concludes that in a market characterized by low margins and high costs, using SW like ACE helps speed up cargo clearance so that shippers and carriers can deliver merchandise to customers quickly.

The table further indicates that electronic cargo tracking management systems and logistics performance of transport operators at ICDE are positively and significantly related (β=0.258, p=0.000). The p value was measured at 0.05 significance level and thus electronic cargo tracking management systems with a p value of less than 0.005 (0.000) was found to be significant. This implies that an increase in 1 unit of aspects related to electronic cargo tracking management systems improves logistics performance of transport operators at ICDE by 25.8%. These findings are consistent with Kithiia (2015) who found out that the implementation of ECTS has led to the closing of prevalent loopholes of tax loss and it has increased the flow of cargo through the e-monitoring system. Juma (2016) also found out that ECTS has eliminated cargo diversions into the local market as well as creating alert and responses during the trailer stop-over that take more than the allowed time. Therefore, it is clear that its implementation has brought major trade boosts in Kenya and the entire East African region.

Furthermore, cargo scanner management solution and logistics performance of transport operators at ICDE were found to be positive and statistically related (β=0.330, p=0.000). The p value was measured at 0.05 significance level and thus cargo scanner management solution with a p value of less than 0.005 (0.000) was found to be significant. This implies that an increase in 1 unit of aspects related to cargo scanner management solution improves logistics performance of transport operators at ICDE by 33.0%. These findings are consistent with Nwankwo, Olayinka, and Benson (2019) who indicated that the cargo scanner management solutions do not only scan containers, but provides container loading inspections services that guarantee control by the customs

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departments of the entire loading process. Cutmore, Liu, and Tickner (2013) found out that the inspection of a container's contents through scanning is conducted in order to provide Customs officials with the ability to verify the accuracy of information provided by shippers on a container's contents and the effectiveness of container integrity measures. Besides, Föcker, et al. (2015) indicated that scanning is important because it can help identify dangerous cargo when the originating shipper, or the party responsible for stuffing and sealing the container appears to be legitimate, but has actually been infiltrated by a criminal group.

$$Y= 0.3 + 0.346X_1. + 0.258X_2 + 0.330X_3$$

Where:

Y is *Logistics Performance*

X_1, X_2, X_3 = *Single Window System, Cargo Scanner Management Solution and Electronic Cargo Tracking Management Systems respectively*.

Summary of the Findings

The regression was performed to show the relationship between the independent and the dependent variables. It was thus revealed that single window system and (β=0.346, p=0.000), electronic cargo tracking management systems (β=0.258, p=0.000) and cargo scanner management solution (β=0.330, p=0.000) have a significant and positive relationship on the logistics performance of transport operators at ICDE. Thus, due to the high coefficient of single window system, the variable was found to have the highest effect on logistics performance. This was followed by cargo scanner management solution and lastly by electronic cargo tracking management systems.

Conclusion

Based on the findings above the study concluded that single window system, electronic cargo tracking management systems and cargo scanner management solution are positive and significant explanatory variables of logistics performance of transport operators at ICDE in Nairobi. The study thus concluded that routing of information to target recipients, goods release, submission of regulatory documents, gate departure procedures, cargo manifest as well as B/L manifest are positive contributors of single window system. Furthermore, application of real-time tracking of transit cargo, improvement of security, tax collection as well as enforcement of cargo handling regulations help in improving the electronic cargo tracking system. Besides, reduction of rampant illegal dumping of goods, improvement of transit time and real-time response to clients cannot be over-emphasized in facilitating the electronic cargo tracking system in the customs department. Likewise, cargo scanner management solution is concluded to be promoted by the verification of goods, monitoring of goods, strengthening of customs protection of consumers from harmful goods, detection of contraband, reduction of physical examination of good and the utilization of resources.

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Contribution of the study

Based on the study findings, the current study therefore, recommends the following:

The customs department needs to constantly update its ICT infrastructure to incorporate the latest AI software. This helps in speeding up the tracking systems and providing real time and reliable information. The study likewise recommends the adoption of e-government standards and in particular of standardized e-customs solutions as well as political and societal impact of e-customs policies. The customs department officials, logistics companies, and technological providers need to scale up their collaborative activities in advancing the application of single window system, electronic cargo tracking management systems and cargo scanner management solution in supply chains for better performance of logistics.

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