The Relationship Between Localization Technology and Performance of Shipping Lines in Kenya: The Moderating Effect of International Maritime Regulations

[*1]Njeri M. Nancy, [1]Musau Enock, [2]Nyaoga B. Richard and [1]Ngacho Christopher
[1]School of Business and Economics, Kisii University P.O. Box 408 – 40200, Kisii, Kenya

[2]Faculty of Commerce, Egerton University P.O. Box 13357 – 20100, Nakuru, Kenya

***Corresponding author's email address:** muthoninjeri582@gmail.com

Abstract

Technology has been highly rated as a key enabler of improving organizational performance. Kenya's shipping industry experiences low logistics efficiency characterised by high transportation cost, delayed delivery, poor track and trace as well as customs clearance. Shipping lines' performance just like any other organisation's performance is highly pegged on proper implementation and use of the right technology. The localization technologies if well utilised can help to solve these problems. The objective of this study therefore, was to examine the relationship between localization technology and performance of shipping lines in Kenya, the moderating effect of international maritime regulations. The study was anchored on technology acceptance model as well as the task technology fit theory, institutional theory and theory of firm. The study made use of positivist research philosophy as it sought to come up a practical solution to the existing problem of poor performance among the shipping lines. The explanatory survey research design was utilized in this study. The target population was all the 2835 respondents who are logistics, IT, sales and marketing and finance staff of the 53 shipping lines listed in Kenya business directory 2021. The sample size of 438 respondents who are staff from different departments of these firms namely; logistics 109 staff, IT 96 staff, finance 103 staff, sales and marketing 130 staff were determined using the Yamane formula. Random stratified sampling design was utilized to arrive at specific respondents. Quantitative data was collected using structured questionnaires administered to the respondents. A pilot study was conducted in in 6 shipping lines from Mombasa using the 10% of the sample size; 50 questionnaires but only 44 were filled and returned. The questionnaire was tested for both validity and reliability. Reliability was tested using Cronbach alpha index at 0.7 while validity was ascertained through factor analysis. Quantitative data was appropriately coded and entered into SPSS version 20 for analysis in order to generate descriptive statistics (minimum, maximum, mean, standard deviation and frequency percentage) and inferential statistics (Pearson correlation coefficient, multiple linear regression and hierarchical regression model) which was then be presented in frequency tables and graphs. Results showed that there was a significant and positive relationship between localization technology and performance of shipping lines in Kenya. Also, international maritime regulations had no statistically significant moderating effect on the relationship between localization technology and performance of shipping lines in Kenya. It was concluded that shipping lines in Kenya utilized localization technology to help the in locating cargo during transportation, forecasting lead time accurately, mapping the route, eliminating delay, checking route deviation and tracking vessels. The study recommends that in order to enhance shipping lines performance through efficient operations, the managers of these companies need to adopt and make use of the localization technology.

Keywords: Localization technology, shipping lines companies, reliability, Factor analysis, Performance, international maritime regulations.

INTRODUCTION

Shipping lines form a key component of maritime logistics and it contributes significantly towards the economy of a country given that it promotes international trade by enabling transportation of goods from one country to the other by water transport (Rodrigue and Notteboom, 2017). According to UNCTAD (2020) review of maritime transport, maritime transport (shipping) contributes 90% of international trade volume.

Shipping is part of blue economy that advocates for use of water resources for economic development of a country. Kenya in 2018 hosted global conference on sustainable blue economy and one of the resolutions passed was to identify appropriate technologies that can accelerate sustainable development of blue economy (Data collection survey on blue economy in the republic of Kenya, 2018). The volumes of trade involved in shipping lines deem it necessary to device ways of improving their performance. One way that shipping lines can improve their performance is by use of supply chain management technologies. Harris, Wang and Wang (2015), argue that the integration of technology in a firm's operations can lead to better performance. Atieno (2014); Cheptora, Osoro & Musau (2018) too argue that use of technology has a positive effect on organizational performance. Barros *et al* (2015), also opines that the vast application of technology is due to the resulting benefits of improving performance.

Shipping lines' performance just like any other organizational performance is a multi-dimensional construct measured through different indicators but the sole purpose of this is to evaluate whether the organizational goals have been achieved. Researchers use different performance measures based on the context. Aramyan *et al* (2007), for instance suggests that performance can be viewed from dimensions of efficiency, responsiveness, flexibility and quality. Toyli *et al* (2008), on the other hand argue that shipping lines' performance is multi-dimensional involving logistics cost, operational metrics and service level. Fugate *et al* (2010), allude to shipping lines performance being viewed from three dimensions: efficiency, effectiveness and differentiation.

Firm's performance relates to extent to which an organisation achieves its goals and objectives. Key performance indicators of shipping lines' are cost, delivery time, customer service, market share, profitability and customer satisfaction (Ndonye, 2014; Macharia, Iravo, Tirimba & Ombui 2015). Globally, Karia & Wong (2013), argue that technology if well implemented and used can lead to better performance of logistics firms in terms of aspects such as cost reduction. However, there is need to carry out further research to determine how various logistics resources can be combined and used together to improve the performance of logistics firms. Proper implementation and used of this model positively impacted on shipping companies security, business resilience and customer performance (Sadovaya & Thai, 2015).

Regionally studies have been carried on indicators of shipping lines performance. There is a significant correlation between logistics performance and competitiveness of international trade. Logistics performance index and global competitive index upon which global logistic performance is based on the research finding was that the two indices have a correlation of 65% (Onyemejor, 2015). Further Zikomo (2016) opine that cargo handling factors such as bureaucracy, lack of handling equipment and delay

in cargo clearance had a significant negative effect on port performance. There is a significant positive correlation between logistics management and a firm's performance in terms of on time delivery (0.982) and increased sales (0.964) (Karibo, 2019).

Locally researches on indicators of shipping lines performance have been conducted. Ruto (2015) argue that logistical factors such as poor ICT network, infrastructure and restriction of navigational channel led to poor marine logistics performance. Njagi, Namusonge and Mugambi (2016) contend that there is a significant relationship between determinants of strategic management and performance of shipping industry firms in terms of profitability.

Innovations made in the logistical sector on road mode of transport provided benefits such as efficient operation, reduced cost, satisfaction of customer and helps the firm in gaining a cutting edge (Gwaro, 2011). Maina (2017) opine that bunker cost, charter hiring cost, insurance cost and container management cost have an impact on the performance of shipping lines. The research fails to show whether these costs can be reduced through the use of technology and hence the need for further studies in this area.

Ndonye (2014), argue that there is a strong relationship between a firm's performance in terms of efficiency and effectiveness and the use of information technology and that logistics firms dealing with cargo transportation. There is a relationship between quay crane, dwell time and clearance procedure and the performance of the port efficiency Nyema (2014). According to Gacuru & Kabare (2015) contend that proper use of technology by logistics firms enhances cost and time reduction, quality and competitiveness in their operations.

According to Kenya Shippers Association report (2016) Kenya's shipping industry experiences low logistics efficiency characterised by high transportation cost, delayed delivery, poor track and trace as well as customs clearance. In addition, according to Kenya competition authority final report 2019 shipping lines operations are characterised by low efficiency resulting from high port charges and delays as compared to developed countries efficiency. This low logistics efficiency discourages international trade as it poses a business risk to maritime logistics service providers, importers and exporters.

The localization technologies include Geographical position systems, tracking and tracing systems as well as Global systems for mobile communication. They are meant to show the position/ location of a shipment in the course of transportation, forecasting lead time accurately, mapping the route, eliminating delays, checking route deviation and tracking vessels. When cargo is being transported it is subjected to a number of risks such as delays, theft or being misplaced. The development of localization technologies contributes to fulfil the growing demands of the logistics and/or transportation chain. The localization technologies if well utilised can help to solve these problems as evidenced in the following researches.

Shipping is an international activity and as such it is regulated by international maritime transport bodies such as the International maritime organization (IMO). The International Maritime Organization is a United Nations' specialized agency mandated with duty to draft measures to enhance international shipping safety and security and prevent pollution of marine by ships (Kenton, 2020). Mwashigadi (2014) contend that factors such as bureaucracy, political interference, poor integration of harmonized

regulations and poor information communication technology infrastructure have significant impact on implementation of maritime trade regulations which in turn negatively affects the operational efficiency of shipping lines. It is on this light the study will seek to evaluate the moderating effect of international maritime regulations on the relationship between localization technologies and performance of shipping lines. This will provide a solution to the ailing shipping lines logistics sub-sector.

THEORETICAL AND EMPIRICAL LITERATURE REVIEW

Theoretical review

Technology acceptance model

Technology acceptance model (TAM) was introduced by Fred Davis in 1986. This model is an adaptation of the theory of reasoned behaviour. According to Davis (1989) TAM is used to explain the determinants of technology acceptance among the user of any new technological innovations. TAM was developed to test two beliefs perceived usefulness and perceived ease of use. Perceived usefulness refers to the potential user's likelihood that the use of a certain technology will improve the performance of his/her action. Perceived ease of use refers to the extent to which users expect their target technology to be effortless (Davis 1989). Technology acceptance model has been widely used by researchers in the field of procurement and logistics (Aboelmaged, 2010; Anshadh & Mahesh (2014). Nyongesa (2018) in his research on the impacts of electronic cargo tracking systems on managing transit goods made use of TAM. Brandon (2018) made use of TAM in his study on assessing the TAM antecedents in e-procurement. The relevance of the theory to this study was to justify the reasons behind the use of localization technologies for performance of logistics firms.

Task Technology Fit Theory

The proponents of this theory Goodhue and Thompson (1995) argue that new technology has a positive impact on an employee's performance and can be used if its capabilities match the tasks that the user must perform (Goodhue & Thompson, 1995; Irick, 2008). In this study the theory was used to justify why logistics firms will make use of localization technologies and not others to improve the performance of the logistic firms should match the tasks performed by various people in order to eliminate inefficiencies and enhance performance.

Institutional Theory

Maritime shipping being inherently an international affair is regulated by the international maritime organization. The mandatory adherence of International maritime regulations was anchored on Institutional theory which attends to aspects of social structure. It considers the processes by which structures including schemas, rules, norms and routines become established as authoritative guidelines for social behaviour (Scott, 2004). Institutional theorists assert that institutional environment can strongly influence the development of formal structures in an organisation often more profoundly than market pressures. Innovative structures that improve technical efficiency in early –adopting organisations are legitimized in the environment. The criticism of the theory is according to Marx and Weber is that the theory is linked to power and interests. Zucker (1996) in his study on empirical study of organization criticized the theory arguing that it is better to develop direct measures of organizations other than institutionalized structures. Institutional theory which explains the rules and regulations pertaining to the logistics firms industry and the mandatory requirements of their day to day operations was used to support the reason why logistics firms adopt

technology. They do so in a bid to adhere to the set rules and regulation by the government and to avoid penalty and loss of customers.

Firm theory

The theory of the firm was founded by Ronald Coase in 1937. The theory comprises of three economic theories that seek to explain why a firm exists and the impact of market price on their performance. The theory argues that firms will seek to reduce cost and maximise profit. Given that Logistics companies in Kenya are privately owned profit maximisation will be one of their key objectives. This theory was used to support the dependent variable which is the performance of logistics firms. The theory of the firm which provides the reasons as to why a firm exists, given the fact that almost all logistics firms are private entities profit maximisation and cost reduction will be key among their objectives. This will necessitate the logistics firms to adopt localization technology in order for them to reap the resulting benefits of using these technologies.

Empirical Review

Michaelides, Michaelides & Nicolaou (2010) conducted a study that sought to assess the use of GPS technology in optimising operations of logistics. The variables of the study were GPS technology and shipping lines operation optimization. The study was conducted in the United Kingdom and its objective was to assess operations of shipping lines in the UK and provide a tracking solution by use of GPS. The research employed case study research method and data was collected using interviews and onsite observation. The respondents of the study included shipping line managers, container terminal managers, haulage company managers and port officials. The finding of the study was that there a significant relationship between GPS technology use and efficiency in logistics operations. The study shows GPS technology as the only enabler of achieving logistics operation and it also differs in term of methodology and data collection methods.

Musa, Azmi, Shibghatullah, Asmala and Abas (2017) investigated Global positioning implementation for providers of logistics services. The variables of the study were Global positioning system and benefits achieved by logistics services providers. The study was conducted in Malaysia and the objective that guided the study was to assess characteristics of logistics service providers such as security and safety, cost reduction and customer satisfaction that have an influence on the adoption of Geographical positioning system. The study employed descriptive research method. Non-probability random sampling was used and sample size was made up of 450 respondents who were logistics service providers. The research data was collected through the use of the questionnaires and analyzed using descriptive statistics and inferential statistics. The findings of the research study were that cost reduction was the key characteristic that led to adoption of GPS by logistics service providers with a SD of 0.575 followed by safety and security with SD of .652 and customer satisfaction with SD of .674. The conclusion of the study was that characteristics of logistics service providers greatly influence the adoption of GPS. The study recommends that logistics service providers should adopt GPS in order to gain the resulting benefits.

In a similar study Bolte & Goll (2020) conducted a research study on analyzing tracking and tracing systems of outbound logistics. The study variables were track and trace systems and their benefits to firms that use them. The study was conducted in Sweden and its objectives were as follows. One was to identify trends and techniques currently in use for track and trace for outbound logistics. Two was assessing factors required for the implementation of tracking and tracing technologies in Swedish retailer outbound logistics. Three was to determine how the tracking and tracing

technologies can be successfully implemented in Swedish retailer outbound logistics. The study made use of exploratory research design and followed a qualitative research approach. The sample size was made up of 8 respondents who were purposively selected. Both primary and secondary data collected for the study was analyzed using grounded analysis. The findings of the study were that track and trace technology if well implemented and used has the capability to improve logistical performance. The conclusion of the study was that there is a positive significant relationship between track and trace and outbound logistics. The study recommends further studies in this area to test how suitable these technologies are in other areas of logistics

In a similar study Lukhoba (2014), study investigated how a firm can gain competitive strategy through the use of cargo tracking. The variables of the research were tracking systems and their benefits to logistics service providers. The study was a case of study DHL Kenya and was guided by the following objectives: one was to determine the form of cargo tracking system used by DHL to achieve competitive strategy in service delivery. Two was to analyze the positive impact achieved by DHL for using cargo tracking. Three was to assess the difficulties encountered in using DHL as a competitive strategy for service delivery. Under theoretical framework the study was anchored on resource-based view theory which posits that firm operating environment is ever changing. The study made use of qualitative research design because the study was in depth as opposed to breadth. It also made use of primary and secondary data in order to gather the required information. The sample size of the case study was made up of get-way managers, supervisors, hub manager, regional operations officer and the CEO. The findings of the study were that tracking systems help to track the location of the goods or shipment in the course of transportation. The research data gathered through the use of interviews was analysed through the use of qualitative methods. The conclusion was that cargo tracking system used by DHL can give it a competitive strategy in service delivery to its customers. The study recommends that the company should implement insurance for liability in order to ensure that customer service delivery is well achieved. The study was based on a case study (DHL) and the findings may not be applicable for small logistics firms. The study is different from the current study in terms of theories and research methodology.

In line with the above studies Kabiru (2016), study investigated how performance of KRA and logistics companies is impacted by the electronic cargo tracking system. The variables of the study were cargo tracking systems and their impact on operational performance. The study was guided by three research objectives: one was to analyse the extent to which KRA and transporters have adopted these systems. Two was to determine the various factors influencing implementation of these systems by transporters and KRA. Three was to evaluate challenges faced in the implementation of these cargo tracking systems. The study was anchored institutional theory and the theory of constraints and employed exploratory research design. The study target population was 450 organization officials out of which a sample size of 150 respondents was calculated and used in data collection. The research data collected was analyzed using descriptive statistics which included percentages, standard deviation and the results presented in tables. The findings of the study were that the system had been implemented and that it had impacted positively on performance of both KRA and the logistics services providers who had adopted it. The conclusion of the study was that in order for the system to be well implemented the expectations of the system must be well defined and the benefits to be achieved by the stakeholders be well understood. The study recommends establishment of a communication channel and a working together formula. It also recommends incorporating operational performance principles. The study does not give other factors that are used in conjunction with

tracking systems to enhance performance. The study is different from the current study in terms of theories and research methodology.

This is in agreement with Mugambi (2017), who study sought to come up with a model for tracking vessels. The study variables were Radio frequency identification model and the benefits to the organizational performance. The objectives of the research were one to find out difficulties encounter by managers of transport in vessel tracking. Two was to evaluate models and architectures that can be used in tracking. Three was to come up with a model that can be used to track company vessel. Four was to test the developed mode for vehicle tracking. The study made use of both qualitative and quantitative research designs. The sample size of the study was made up of 341 respondents. The study found out that once the model is well implemented it provides the capabilities of accurately locating and tracking vehicles and driver behaviour instantaneously. The study concluded that the developed model was effective in tracking vehicles well as the behaviour of the driver. The study recommends that the model should be made to a transport regulatory such as NTSA. Aspect of tracking is a key requirement for the logistics firms to operate efficiently. The study differs from the current study in term of methodology and only considered one mode of transport.

Kilonzi and Kanai (2020), investigated how tracking technologies influence logistics service providers and improving revenue collection among the east Africa trade block members. Variables of the study were tracking systems and their benefits to the users. The research objectives were to determine the effect of: one operational performance realization of revenue; two cost of collecting revenue on realizing revenue and three tax losses on collection of revenue. The study was anchored on the theory of transaction cost in addition to institutional theory. The research employed explanatory research design in order to get the relation between the two variables. The sample size of the study was 278 respondents who comprised of senior management, middle level staff and junior staff. The research data was analysed using both descriptive and inferential statistics. The findings of the study were that there is a significant relationship of $r=0.143$, $p>0.05$ between use of tracking technologies and improved revenue collection and cost reduction for the logistics providers due to reduced time at border point. Conclusion of the study was that the use of electronic cargo tracking systems has not effectively reduced cargo clearance time, staffing cost and goods are still being lost while on transit. The research study recommends that states members of East Africa community should have a common ICT policy at border points. The study is different from the current study in terms of some theories and research methodology.

Conceptual Framework

The independent variable was localization technologies and dependent variable is shipping lines performance being moderated by the International maritime regulations. International maritime regulations such as SOLAS, ISM, MARPOL, COLREG, LOADLINES and ISPS have for a long time been for a long time observed by shipping lines in order to adhere to the International maritime Organization (IMO) conventions. International maritime regulations in this study were used as a moderator in the relationship between supply chain management technologies and the performance of shipping lines.

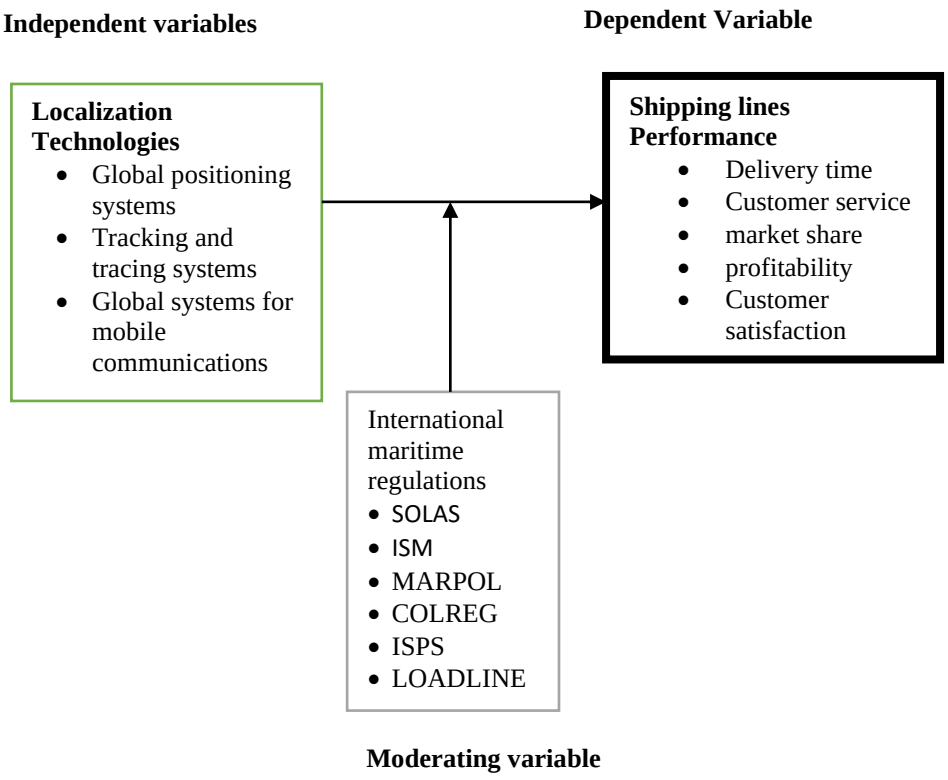

Figure 1: Conceptual framework
Source: Researcher (2021)

METHODOLOGY

The research philosophy which underpinned this study was positivism. Positivism research philosophy holds that the goal of knowledge was simply by describing the phenomenon that people experience (William, 2006). Maxwell (2013) define research design as the roadmap that directs data gathering, collecting and analysing and is a map of the manner in which a study is carried out as per the data needed so as to assess the research questions in an orderly manner, therefore, this study utilized explanatory survey research design. The study was conducted in Nairobi and Mombasa regions of Kenya. The study sites were chosen because they are where all the 53 shipping lines that call at the port of Mombasa are located. These shipping lines are located in Nairobi and Mombasa. Shipping lines which are part and parcel of marine logistics contributes 90% of the international trade (UNCTAD, 2020). The target population for this study was all the 2835 respondents who are logistics, IT, sales and marketing and finance staff of the 53 shipping lines listed in Kenya business directory 2021. The size of the sample was determined using the Yamane (1976) formula which yielded 438 respondents who are staff from different departments. The sample size of 438 respondents was selected using stratified and simple random sampling from the four departments' employees which was grouped into four strata. IT department, Finance department, Finance department and sales and marketing department of these shipping lines that form the target population were used in the gathering of the research data. This sampling technique ensures equal chances of every item in the population being selected in the target population (Mugenda & Mugenda, 2013).

Table 1: Sample size

Department	No. of staff	n.Xi/N	sample size
Logistics	706	706 ÷ 2835 × 438	109
Finance	666	666 ÷ 2835 × 438	103
Information technology	623	623 ÷ 2835 × 438	96
Sales and marketing	840	840 ÷ 2835 × 438	130
Total	2835		438

Source: Kenya Business List Directory 2021

The study used random stratified sampling design to arrive at specific respondents. Quantitative data was collected using structured questionnaires. A pilot study was conducted in in 6 shipping lines from Mombasa using the 10% of the sample size; 50 questionnaires but only 44 were filled and returned. The questionnaire was tested for both validity and reliability. Reliability was tested using Cronbach alpha index at 0.7 while validity was ascertained through factor analysis as indicated in table 2 below.

Table 2: Kaiser-Meyer-Olkin and Bartlett's Test for Localization Technology

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.726
Bartlett's Test of Sphericity	Approx. Chi-Square	121.340
	Df	15
	Sig.	.000

Source: Field Data 2022

The Kaiser- Meyer – Olkin (KMO) measure for sampling adequacy was 0.726 that showed that the sample was adequate for factor analysis. The Bartlett's test of Sphericity was 0.000 which was less than 0.05. It can therefore be concluded that the variables are related and suitable for analysis.

Quantitative data was appropriately coded and entered into SPSS version 20 for analysis in order to generate descriptive statistics (minimum, maximum, mean, standard deviation and frequency percentage) and inferential statistics (Pearson correlation coefficient, multiple linear regression and hierarchical regression model) which was then be presented in frequency tables and graphs.

Model Specification 1

To examine the relationship between Localization technology and performance of shipping lines in Kenya

$Y = \beta_o + \beta_1 X_1 + \varepsilon$……(1)

Where Y= performance of shipping lines

X_1= localization technology is the independent variable

B_o= Constant (Y intercepts)

β_1= coefficient of the regression

ε= error term

Model Specification 2

In the second step, the moderating factor was introduced to the equation 1 above to have

$Y = \beta_o + \beta_1 X_1 M + e$……(2)

Where;

Y = Firm's performance

β_o = Constant (Y intercepts)
β_{1-4} =Regression coefficient
X_1 = Independent variables (Localization)
M = International maritime regulations
e = margin of error

RESULTS AND DISCUSSIONS

Performance of shipping lines

Shipping lines performance entails measurement of the extent to which a firm achieves its goals and objectives. The sampled responses in relation to Performance of shipping lines have been assessed and presented in table 3

Table 3: Descriptive statistics for Shipping lines performance

Statement	N	Min.	Max.	Mean	Std. Dev	Skewness	Kurtosis
The utilization of technology has led to reduced delivery time of the firm	360	1	5	4.05	.750	-.803	.922
The use of supply chain management technologies has made your Firm to increase market share	360	1	5	4.29	.625	-.513	.402
The use of supply chain management technologies has made your Firm to increase market share	360	1	5	4.31	.707	-.675	-.213
The profitability of the firm has increased since your firm started using these technologies	360	2	5	4.27	.679	-.720	.660
Customer satisfaction has been improved with the use of these technologies by your firm	360	3	5	4.45	.571	-.424	-.760
Overall score	**360**			**4.274**	**0.6664**	**-0.627**	**0.2004**

Source: field Data 2022

Table 3 indicated that the overall score for shipping lines performance was a mean of 4.274. The variation of responses was low with a standard deviation of 0.6664, whereby the individual statements recording a standard deviation of around 1.000. The highest variation of 0.750 was recorded for the statement 'The utilization of technology has led to reduced delivery time of the firm,' which had a mean of 4.05. The lowest variation of 0.571 was recorded for the statement' customer satisfaction has been improved with the use of these technologies by your firm,' which had a mean of 4.45 this means the research respondents agreed to the statement on improving shipping lines performance through the use of supply chain management technologies. This resonates with the study carried out by Karibo (2019) who argued that use of supply chain management technologies had a positive significant effect of 0.982 and 0.964 on the shipping performance in terms of timely delivery and increased sales respectively.

The statement on 'The use of supply chain management technologies has made your Firm to increase market share,' the research respondents agreed at a mean of 4.31 and a variation at a standard deviation of 0.707 that shipping lines performance has improved in terms of increased market share. This is in agreement with the studies that were conducted by Ndonye (2014), Macharia, Iravo, Tirimba & Ombui (2015) and Maina (2017) who contended that there is positive relationship between use of technology and shipping lines performance in terms of cost reduction, time reduction, quality service and competitiveness in their operations.

The statement on' Customers service of the firm has improved with the use of supply chain management technologies,' the respondents agreed with a mean of 4.29 and a variation showing a standard deviation of 0.625. This is in line with the study by Ojwang who posited that use of technology improved shipping lines efficiency by reducing lead time, quality services and timely feedback.

On the statement 'The profitability of the firm has increased since your firm started using these technologies,' the respondents agreed at a mean of 4.27 and a variation showing a standard deviation of 0.679. This is in agreement with the study carried out by Njagi, Namusonge, & Mugambi (2016) who posited that there is a positive relationship between use of technology and performance if shipping firms in terms of profitability.

Localization technologies

Localization technologies include geographical position systems, tracking and tracing systems and global systems for mobile Communication. The answers provided by the respondents on various aspects was analyzed and presented in table 4.

Table 4: Descriptive statistics for Localization technology

Statement	N	Min	Max	Mean	Std. dev	Skewness	Kurtosis
There is high utilization of GPS as a localization technology in your firm	360	1	5	2.92	1.224	-.069	-.920
The GPS are adequate for indicating position of shipment and forecasting lead time	360	1	5	3.11	1.061	-.494	-.418
The tracking and tracing systems are widely utilized asa localization technology in your firm operations	360	1	5	3.01	1.310	-.170	-1.134
The use of TTS has proved adequate for vessel tracking and checking route deviation	360	1	5	3.02	1.436	-.172	-1.358
There is use of GSM as a localization technology in your firm in operation	360	1	5	3.07	1.394	-.216	-1.304
The GSM are adequate localization technology for route mapping	360	1	5	3.23	1.560	-.237	-1.492
Overall Score	**360**			**3.06**	**1.331**	**-0.2263**	**-1.1043**

Source: field Data 2022

Table 4 showed the results of the respondents on their level of agreement to the statements on Localization technology uses in the organizations. In these ratings strongly disagree was depicted by 1, disagree by 2, undecided by 3, agree by 4 and strongly agree by 5. The number of respondents in all cases was 360 with a minimum score of 1 and a maximum score of 5. The overall score for localization technology was a mean of 3.06 with a standard deviation of 1.331. The variations in the individual statement score were equally low with the highest standard deviation being that of the statement," The GSM are adequate localization technology for your firm's operations" at a standard deviation of 1.560 and a mean of 3.23. The lowest deviation for individual statements was that of the statement," The GPS are adequate localization technology for use your firm" at a standard deviation of 1.061, and a mean 3.11; this therefore showed that the respondents were in agreement on the existence and importance of localization technology.

On the respondent's view concerning the statement' there is high utilization of GPS as a localization technology in your firm' the variations in the responses were low with a standard deviation of 1.224 and a mean of 2.92. This concurs with (Bolte & Goll, 2020) who argue that these global position systems are effective in location position of cargo on transit and map the route.

On the statement 'there is utilization of TTS as a localization technology in your firm operation' the respondents agreed with a mean of 3.01 and a standard deviation of 1.310 that there is high utilization of tracking systems by the organization. The respondents too agreed at a mean of 3.02 and a standard deviation of 1.436 that the tracing and tracking systems have proved to be adequate in vessel tracking and checking route deviation. This study results are in agreement with Jonker (2016) and Njeru (2017) who posit the tracking systems can accurately track vessels in the cause of transportation, thus eliminating unnecessary delay leading to improved performance.

On the statement 'there is use of GSM as a localization technology in your firm in operation' the respondents agreed on at a mean of 3.07 and standard deviation of 1.394 the results are supported by Oyebamiji (2018) and Shamsuzzoha, Ehrs, Addo-Tenkorang & Helo (2021) who argued that use of GSM technology for assist in route mapping which ensure safe delivery of goods leading to shipping lines performance improvement.

International Maritime Regulations

International maritime regulations are presented by conventions such as SOLAS, ISM, MARPOL, COLREG, LOADLINES and ISPS each serving a distinct purpose. These regulations are meant to guard the lives of seafarers, marine pollution, and cargo weight limit. The international maritime regulations have an impact on the relationship between supply chain management technologies and performance of shipping lines. The researcher sought to find out the moderating effect of these international maritime regulations on the relationship between supply chain management technologies and shipping line performance. The sampled responses in relation to international maritime regulations have been assessed and presented in table 5.

Table 5 showed that the overall score for international maritime regulations was a mean of 4.2983. The variation of responses was low with a standard deviation of 0.810, whereby the individual statements recording a standard deviation of around 1.000. The highest variation of 0.938 was recorded for the statement 'Your organization strictly observes SOLAS convention during its operations,' which had a mean of 4.15. The lowest variation of 0.705 was recorded for the statement' ISM adherence affects your

operations and consequently affects performance,' which had a mean of 4.23 this means the research respondents agreed to the statement on international maritime regulations affects shipping lines performance gained after using supply chain manage ment technologies.

Table 5: Descriptive statistics for International Maritime Regulations

Statement	N	Min	Max	Mean	Std. Dev	Skewness	Kurtosis
Your organization strictly observes SOLAS convention during its operations	360	1	5	4.15	.938	-1.380	1.743
ISM adherence affects your operations and consequently affects performance	360	1	5	4.23	.705	-.987	2.227
Observing MARPOL convention has an effect on your firm's operation	360	1	5	4.29	.837	-1.697	4.024
Your organization strictly observes COLGEG convention	360	1	5	4.38	.812	-1.805	4.478
Your organization adheres to LOADLINES convention during its operations	360	1	5	4.34	.815	-1.310	1.737
Your organization strictly observes ISPS convention during its operations and this affects its performance	360	1	5	4.40	.753	-1.810	5.101
Overall score	**360**			**4.298**	**0.810**	**-1.4981**	**3.2183**

Source: field Data 2022

This is in agreement with the studies carried out by Kombo (2018) and Oraith (2020) who posited that international maritime regulation has a significant moderating effect on the relationship between the two.

The statement on 'observing MARPOL convention has an effect on your firm's operations,' the research respondents agreed at a mean of 4.29 and a variation at a standard deviation of 0.837 that observing MARPOL convention has an effect on your firm. The statement on 'your organization strictly adheres to LOADLINES convention,' the respondents agreed with a mean of 4.34 and a variation showing a standard deviation of 0.815. This is in agreement with the study carried out by and Oraith (2020) who posited that international maritime regulation has a significant moderating effect on the relationship between the two On the statement 'your organization strictly observes ISPS convention during its operations and this affects its performance,' the respondents agreed at a mean of 4.40 and a variation showing a standard deviation of 0.753. On the statement 'your organization strictly observes COLREG convention during its operations,' the respondents agreed at a mean of 4.38 and a variation showing a standard deviation of 0.812This is in agreement with the

study carried out by Kombo (2018) and who posited that international maritime regulation has a significant moderating effect on the relationship between the two.

Correlation Analysis

The Pearson product moment correlation coefficient was used to determine the strength of a linear relationship between the independent variable (supply chain management technologies) and the dependent Variable (Shipping lines performance). The Pearson correlation coefficient assumes values between +1 and -1; where +1 indicates a strong positive correlation, -1 indicates a strong negative correlation and a value of 0 meant there was no relationship between the independent and dependent variable. Values closer to 0 indicated a weak relationship either positive or negative. The results of the correlation analysis of the research are presented in table 6.

Table 6: Correlation Analysis

		LT	SLP
LT	Pearson Correlation	1	.
	Sig. (2-tailed)		
	N	360	
	N	360	
SLP	Pearson Correlation	.186**	1
	Sig. (2-tailed)	.000	
	N	360	360

Source: field Data 2022

Table 6 shows that there was a positive correlation between localization and performance of shipping lines with correlation coefficient of (r=0.186; N=360 p-value=.000 of significance). The p-value = 000, implies that the correlation is significant since the p-value < 0.05. These results showed that a significant change in performance of shipping lines was explained by use of localization technology. Given that the relationship was positive it implied that an increase in use of localization technology led to increase in performance of shipping lines. These results are in agreement with studies of Bolte & Goll (2020) and Shamsuzzoha et al (2021) which showed that there a positive correlation between use of localization technology and performance of shipping lines.

Localization Technology and shipping lines performance

The research study sought to examine relationship between Localization Technology and performance of shipping lines in Kenya. To achieve objective the following hypothesis was tested: Ho_1 there is no statistically significant relationship between Localization technology and performance of shipping lines in Kenya. The model formulated was $Y = \beta_o + \beta_1 X_1 + \varepsilon$, where Y if the performance of shipping lines, βo is a constant, β_1 coefficient of regression, X_1 is the Localization technology the independent variable and ε is the error term. To achieve objective one and test the hypothesis, the researcher carried out a regression analysis of the variables whereby the R and R^2 was obtained the results are shown on the table that follow,

Model Summary on Localization Technology and Shipping lines performance

The model summary in table 7 Showed the values of R, R2 and the adjusted R2 as well as the standard error of the estimates, which were used to determine how well a regression model, fitted the data. The model summary showed the extent of variation in the outcome variable to the predicator variables in the model. The results are presented in table 7.

Table 7: Model summary of Localization Technology and Shipping lines performance

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change S R Change
1	.174[a]	.030	.028	.32624	.030

a. Predictors: (Constant), Composite Effect of LT
b. Dependent Variable: shipping lines' Performance
Source: field Data 2022

The results shown in table 7 above showed that the value of R^2 was 0.030 0r 3.0 % that implied that 3.0% of the variations in shipping lines performance were explained by localization technology, whereas 97% of the variations in performance is explained by other factors.

ANOVA on Localization Technology and Shipping lines performance
The Analysis of Variance (ANOVA) was used to check the fitness of the model in predicting the relationship between the dependent and independent variable, In this case the relationship between Localization technology and shipping lines performance. The results of analysis were presented in table 8.

Table 8: ANOVA on Localization Technology and Shipping lines performance

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1.193	1	1.193	11.210	.001[b]
	Residual	38.102	358	.106		
	Total	39.295	359			

a. Dependent Variable: shipping lines' Performance
b. Predictors: (Constant), Composite Effect of LT
Source: field Data 2022

Table 8 showed the computed values and the p-value. The calculated value of F (1, 358) = 11.210 and a p value of 0.000. Using the p-value to check the model's fitness, showed that the model was fit to explain the relationship between the predicator variable Localization Technology and the dependent variable shipping lines performance since the p-value obtained 0.000 is less than 0.05. Further this is confirmed by the use of the F values. The calculated value of F at (1,358), where 1 was the numerator and 358was the denominator showed that the calculated F value was 11.210 while the critical F value at 5% significance level was 3.8676.

The results are in agreement with those that were reported by Bolte and Goll (2020) and Shamsuzzoha, Ehrs, Addo-Tenkorang & Helo (2021) who found that use of significant relationship between use of Localization technology and performance of shipping lines and logistics industry in general.

Coefficient on Localization Technology and Shipping lines performance
From the results and discussion, the study conducted a regression coefficient to establish the mean change in shipping lines performance for a unit variation in Localization technology among the shipping lines in Kenya. The regression

coefficients were thus established to show the mean change in dependent variable as a result of the change in the independent variable. The model allowed the prediction of a dependent variable given an independent variable. The findings are presented in table 9.

Table 9: Regression coefficients on Localization Technology and shipping lines performance

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.261	.092		35.565	.000
	B	.099	.029	.174	3.348	.001

a.Dependent Variable: Shipping lines' performance

Source: Field Data 2022

Table 9 showed the constant coefficient, that is, the point where the regression line touched the y axis in the graph was positive since most of the shipping lines had reported positive return after use of Localization technology based on the findings. The slope of the line was also positive showing change in performance with the continued use localization technology. The table indicated that the constant coefficient β_o is 3.261 while the standardized β_1 is 0.099 this shows unit change in Localization technology brought about a change in performance of 0.099.

To test the hypothesis using t-test, the t-value obtained of 3.348 at 95% level of significance was higher than the critical t- value of 1.645 for the sample size used in this study. This therefore led to the rejection of the null hypothesis $Ho_{1.}$

Based on the above results the study derived the following simple linear regression equation for localization technology on shipping lines performance.
$Y = 3.261 + 0.099X_1 + \varepsilon$

The first objective of the research study was to examine the relationship between Localization technology and performance of shipping lines in Kenya. From the findings it was established that there was a significant positive relationship between localization technology and performance of shipping lines in Kenya. . Based on the results the null hypothesis $Ho_{1,}$ There is no statistically significant relationship between Localization technology and performance of shipping lines in Kenya was rejected since the calculated t-value 3.261 is greater than 1.645.

The study findings concur with Jonker (2016) Oyebamiji (2018) and who showed that there is a significant positive relationship between Localization technology and performance of shipping lines. The findings further agreed with Kabiru (2016) and Njeru (2017) who showed that there is significant and positive relationship between localization technology and shipping lines performance.

Coefficients of International maritime regulations, Localization technology and performance of shipping lines

The study conducted a regression coefficient to establish the mean change in shipping lines performance for a unit variation in international maritime regulations among the shipping lines in Kenya. The regression coefficients were thus developed to show the

moderating effect of international maritime regulation on the relationship between dependent variable and independent variable. The model allowed the prediction of the moderating effect of international maritime regulations on the relationship between Localization technology and shipping lines performance.

Table 10: Regression Coefficients of International maritime regulations, Localization technology and performance of shipping lines

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.261	.092		35.565	.000
	B	.099	.029	.174	3.348	.001
2	(Constant)	2.801	.151		18.537	.000
	B	.080	.029	.141	2.730	.007
	G	.120	.032	.197	3.794	.000

a. Dependent Variable: Shipping lines Performance
Source: Field data 2022

Table 10 showed the coefficients in a straight-line equation on the moderating effect of international maritime regulations on the relationship between Localization technology and shipping lines performance. These were the coefficients that were used to predict the moderating effect of international maritime regulations on the relationship between Localization technology and shipping lines performance. The constant βo as shown in table 4.34 was positive implying that the regression line started on a positive point on the Y-axis. This was because most shipping lines have an improvement in performance due to use of this technology. The slope of the line was also positive implying that international maritime regulations have a positive moderating effect on the relationship between localization technology and shipping lines performance. Table 4.34 showed the unstandardized constant coefficient β_0 3.261 while unstandardized coefficient β_1 = 0.080 while β_5 =0.120

To test the H_o 5a hypothesis using the t-test, the calculated t-value 3.794 at 95% level of significance was found to be higher than the critical t-value of 1.6496. Hence the null hypothesis H_o 5a, international maritime regulations have no statistically significant moderating effect on the relationship between Localization technology and performance of shipping lines in Kenya was rejected on the basis that 3.794 is greater than 1.6496.

Based on the above results the study derived the following linear regression equation for the moderating effect of international maritime regulations have no statistically significant moderating effect on the relationship between Localization technology and performance of shipping lines.
$Y = 3.261 + 0.080X_1 + 0.120M + \varepsilon$

CONCLUSION AND RECOMMENDATIONS

It was concluded that there was a significant and positive relationship between Localization technology and performance of shipping lines in Kenya. It was also concluded that shipping lines in Kenya utilized localization technology to help the in locating cargo during transportation, forecasting lead time accurately, mapping the route, eliminating delay, checking route deviation and tracking vessels. The study

findings corroborated with findings of Musa *et al* (2017), Bolte & Goll (2020) and Oyebamiji (2018) which further reinforced the conclusion that use of localization technology by shipping lines (logistic firms) improved their performance. The results of the study showed that use of this technology had positive effect on performance. This showed that the use of localization technology positively affects shipping lines performance. This showed that the use of Technology Acceptance Model and Task Technology Fit Theory keep watch over cargo locating and tracking areas will improve shipping lines performance. The study recommends that in order to enhance shipping lines performance through efficient operations, the managers of these companies need to adopt and make use of the right technology. The study further brought to the fore the importance of international maritime regulations in the relationship between localization technologies and performance of shipping lines. The study acts as a catalyst for the implementation of policies that will spur performance and growth of these companies.

REFERENCES

Aboelmaged, M. (2010) Predicting e-procurement adoption in a developing country: An empirical integration on TAM and theory of reasoned behaviour *Industrial management and data systems* 110 (3) 392-414

Anshadh, A& Mahesh, S. (2014) PSU employees acceptance of e-procurement based on revised TAM *International journal of scientific and engineering research* 5 (7)

Aramyan, L. H., Oude Lansink, A. G., Van Der Vorst, J. G., & Van Kooten, O. (2007). Performance measurement in agri-food supply chains: a case study. *Supply chain management: an international Journal*, *12*(4), 304-315.

Atieno, E. O. (2014) Information and communication technology and supply chain performance among logistics firms in Nairobi unpublished thesis

Barros, P. A., Ishikiriyama, C. S., Peres, C. R. & Gomes, S. F.(2015) Processes and benefits of the application of information technology in supply chain management: an analysis of literature. *Science direct procedia computer science* 55,698-705.

Bolte, N. O & Goll, D. C. (2020) Potential analysis of the track and trace systems in the outbound logistics of a Swedish retailer. Unpublished thesis Jonkoping University

Brandon, J. S. & Kauppi, K. (2018) Examining the antecedents of TAM within e-procurement *international journal of operation and production management* 38 (1) 22-42.

Cheptora, N. C., Osoro, A.,& Musau, E. (2018). The impact of information communication technology on procurement performance in manufacturing firms in Kenya. *International journal of academic research in business and social science*, 8(9)605-616

Davis, F. D. (1989), ''perceived usefulness, perceived ease of use, and user acceptance of information technology", MIS Quarterly, 13 (3): 319-340.

Fugate, B. S. Mentzer, J. T. & Stank, T. P. (2010) Logistics performance: efficiency effectiveness and differentiation. *Journal of business logistics* 31: 43-61

Gacuru, W., & Kabare, K. (2015). Factors affecting efficiency in logistics performance of trading and distribution firms based in Jomo Kenyatta International Airport area. *International Academic Journal of Procurement and Supply Chain Management*, *1*(5), 50-71.

Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. *MIS quarterly*, 213-236.

Gwaro, T. M. (2011). *Logistics innovations in the road transport sector in Kenya* (Doctoral dissertation).

Harris, I., Wang, Y., & Wang, H. (2015). ICT in multimodal transport and technological trends: Unleashing potential for the future. *International Journal of Production Economics*, *159*, 88-103.

Irick, M. L. (2008). Task-technology fit and information systems effectiveness. *Journal of Knowledge Management Practice*, *9*(3), 1-5.

Jonker, W. (2016). *The Impact of Implementing a Vehicle Tracking System within a South African Ferrochrome Smelter Supply Chain*. University of Johannesburg (South Africa).

Kabiru, V. N.(2016) Electronic Cargo Tracking Systems and Operational performance at Kenya Revenue Authority and on transporters erepository.uonbi.ac.ke

Karia, N. & Wong, C. Y. (2013) The impact of logistics resources on the performance of Malaysian logistics service providers. *Production, planning and control* 24(7) 589-606.

Karibo, B. B. (2019). Logistics management from firm's performance perspective. *European journal of logistics, purchasing and supply chain management*,7(1) 12-28

Kento, W(2020) international maritime organization. Investopedia. Economy> Government and policy

Kenya Shippers Association report 2016 on Logistics efficiency

Kilonzi, F., & Kanai, C. K. (2020). Electronic Cargo Tracking System and Its Effects On Revenue Realization in East Africa Member Countries. *International Journal of Scientific and Research Publications*, *10*(1).

Kombo, M. K. (2018). *Advancing Security in East Africa Coastal Region Through Maritime Strategy: Case of Kenya* (Doctoral dissertation, University of Nairobi).

Lukhoba, M. J. (2014). *Cargo Tracking System as a Competitive Strategy in Service Delivery* (Doctoral dissertation, University Of Nairobi).

Macharia, N. M., Iravo, M., Tirimba, I. O. & Ombui, K. (2015). Effects of information technology on performance of logistics firms in Nairobi County. *International Journal of Scientific and Research Publications*, *5*(4).

Maina, J. W. (2017). Factors affecting the financial performance of shipping lines in Kenya *strategic journal of business and change management* 4 (4)

Maxwell, J. A. (2013). *Qualitative research design: An interactive approach (applied social research methods)* (p. 232). Thousand Oaks, CA: Sage.

Michaelides, R., Michaelides, Z., & Nicolaou, D. I. M. I. T. R. I. O. S. (2010). Optimisation of logistics operations using GPS technology solutions: a case study. In *of the twenty first annual POMS conference, Paper* (No. 015-0822).

Mugambi, N. (2017). *Effect of cargo tracking system on cross-border trade between Kenya and Uganda* (Doctoral dissertation, University of Nairobi).

Mugenda, O., & Mugenda, P. (2013). Qualitative and quantitative research methods. *ACTS, Kenya*.

Musa, H., Azmi, F. R., Shibghatullah, A. S., Asmala, A., & Abas, Z. A. (2017). The implementation of global positioning system (GPS) towards logistic service provider (LSP). *Proceedings of Mechanical Engineering Research Day*, *2017*, 250-251.

Mwashigadi, D. M. (2014). *Factors influencing effectiveness in the execution of mandate of state regulatory and enforcement agencies within maritime trade in Kenya* (Doctoral dissertation, University of Nairobi).

Ndonye, S. K. (2014). Influence of information technology on logistics performance in Kenya with reference to cargo transportation. *Journal of Supply Chain Management*, *1*(2), 1-18.

Njagi, L. K., Namusonge, G. S & Mugambi, F. (2016) Effects of strategic management determinants on firm performance in the shipping industry in Kenya *Global journal of commerce and management perspective* 5 (5): 14-26

Njagi, L. K., Namusonge, G. S & Mugambi, F. (2016) Effects of strategic management determinants on firm performance in the shipping industry in Kenya *Global journal of commerce and management perspective* 5 (5): 14-26

Nyema, S. M. (2014). Factors influencing container terminals efficiency: A case study of Mombasa entry port. *European Journal of Logistics Purchasing and Supply Chain Management*, *2*(3), 39-78.

Nyongesa, E. (2018). *Influence Of Regional Electronic Cargo Tracking System On Management Of Transit Goods In Kenya: A Case Of Kenya Revenue Authority Customs Department* (Doctoral dissertation, University of Nairobi).

Onyemejor, V. I. (2015). Relationship between maritime logistics performance and international trade competitiveness: A case of Nigeria in central western African cluster of countries, unpublished thesis from world maritime university.

Oraith, H. M. (2020). *Human Factor Risk Management for Maritime Pilotage Operations*. Liverpool John Moores University (United Kingdom).

Oyebamiji F. (2018). Information technology and its effect on performance of logistics firms in Nigeria. *Asian Research Journal of Arts & Social Sciences*, *6*(1), 1-11.

Rodrigue, J. P., & Notteboom, T. (2017). Inland Ports/Dry Ports. *Rodrigue, JP., Comtois, C., Slack, B. The Geography of Transport Systems. Fourth edition, New York: Routledge*.

Ruto, W. K. (2014). Logistical Factors Influencing Port Performance A Case of Kenya Ports Authority. *International Journal of Advanced Research*, *2*(10), 558-562.

Sadovaya, E. & Thai, V. (2015). Impacts of implementation of the Effective Maritime Security Management Model (EMSMM) on organizational performance of shipping companies. *The Asian journal of shipping and logistics*,31 (2) 195-215

Scott, W. R. (2004). Institutional theory. *Encyclopedia of social theory*, *11*, 408-414.

Shamsuzzoha, A.., Ehrs, M., Addo-Tenkorang, R. & Helo, P (2021) Tracking and tracing of global supply chain Network: A case study from Finnish company. *Proceedings of the 23rd international conference on enterprise information systems* 1: 118-125

Toyli, J., Hakkinen, L., Ojala, L. & Naula, T. (2008) logistics and financial performance: An analysis of 424 Finnish Small and medium enterprises. *International journal of physical distribution and logistics management* 38:57-80

UNCTAD review on maritime transport (2020)

William, I. (2006). Against the Skeptical Argument and the Absence Thesis: African Jurisprudence and the Challenge of Positivist Historiography. *The Journal of Philosophy, Science & Law*, *6*(2), 9-24.

Yamane, T.(1967) Statistics; An introductory Analysis, 2nd Edition, New York Harper and Raw.

Zikomo, M. (2016). Analysis on the effects of cargo handling factors to port

Zucker,L 91996) the institutionalization of institutional theory. www semantic scholar.org