Influence of Logistics Network Optimization on Performance of Distribution Firms in Kenya

Author's Details:
Jattani Abdirahman[1] Dr. Noor Ismail Shale[2]
[1,2] Department Of Procurement And Logistics Management, Jomo Kenyatta University of Agriculture and Technology's, Kenya

Abstract
The main aim of the paper was to determine the influence of logistics network optimization on performance of distribution firms in Kenya. This study used descriptive cross sectional survey design the descriptive survey is a method of collecting information by interviewing or administering a questionnaire to a sample of individual. The target population composed all transport and logistics department, the study frame involved: logistics and warehouse. Data presentation is method by which people summarize, organize and communicate information using a variety of tools, such as diagrams, distribution charts, histograms and graphs.Qualitative reports were presented in form of essay, which was discussed as per the study objectives aligned with the theories and empirical study.The collected research data was checked for any errors and omissions, coded, defined and then entered into Statistical Package for Social Science (SPSS Version 24). The study established that logistic scheduling and mult-modal logistics positively and significantly influences the performance of distribution firms. The study recommended for firms to have planners and dispatchers to cater for the entire planning and optimization process.
Keywords: Mult-Modal Logistics , Logistic Scheduling , Logistics Network Optimization, Distribution Firms

1.0   Introduction

logistics network optimization plays a critical role in logistics planning and supply chain network designs ,With a well-designed transportation and logistics network, logistics operators significantly improve the entire freight system efficiency, and customers' needs are better accommodated in a timely manner(Meidute & Litvinenko,2014).Under this circumstance, logistics operators and customers will achieve a win–win situation: logistics operators gain more revenues and customers are better served with a lower price due to the reduced operational and transportation costs (Wang, 2013). Therefore, properly optimizing the logistics network has become a vital objective for logistics operators. The typical logistics network optimization includes distribution center location selection, customer clustering and vehicle routing problem (VRP) (Hu, & Found, 2015).

The aim of logistics network optimization is to design and allocate a set of logistics facilities for better satisfying the demands of customers .the number of customers increases, the logistics network optimization problem become very challenging, and thus, customer clustering should be undertaken before conducting the vehicular dispatching Customer clustering approach groups the customers with similar characteristics into the same category (Anzanello & Fogliatto, 2011).It not only improves the logistics system efficiency, but also reduces the operational costs. For instance, by categories these customers who require cold chain services, logistics companies can dispatch several refrigerated trucks to store and deliver temperature-sensitive goods with the same area. With the proper customer clustering strategy, a large logistics zone can be decomposed into smaller zones where customers share certain common features (Azizi &Tarhandeh, 2014).

According to Canan Bilen, (2011) states that the end objective of logistics network optimization is to find an optimal combination of various warehouses best suited to the client's needs. With The foremost goal of logistics are satisfying customers' demands with effective cost. Kudla Klaas-Wissing, (2012),describes that customer value is a ratio between perceived benefits and total cost of ownership of each customer Inputs used to calculate customer value should be defined circumspectly because some costs such as opportunity

cost and hardly tangible costs can be ignored easily with a company responding more rapidly to customer requirements at lower costs becomes a leader in the market.

The logistics operations for the distribution firms in Kenya is hampered by low rates of technology adoption and poor skill lack of serious attention with use of RFID, vehicle tracking technologies, warehouse management system with Automation in processes still its infancy.Transit times for cargo are long and uncertain This results in a freight train taking as much as 6-8 days for a journey of 155 kms. Less flexibility in carrying different types of products- Special wagons are not easily available for carrying specialized products. Special types of steel required for automobile production have to be carried by trucks as the existing wagons do not offer the kind of protection that these high value products require.State of warehousing is poor Various estimates put warehousing costs to be around 10% of the total logistics costs.

Supply chain and logistics network optimization is neither easy nor cheap due to poor logistics management by the distribution firms in import and local distribution in kenya has experienced a decline in net profit on sales is 5%, increase in in supply chain costs from 4% to 9%. With Distributors (Import) operating cost average to 10.3% cost ,distributor of raw materials to Manufacturers average to 11% and Retail distributors industry average to 8.6% with 3.48% in operating cost a year in the (Njambi & Katuse, 2013). At the same time, inventory levels are often significantly higher than they have to be leading to high holding cost of between 1,500,000.00 and 5,000,000.00. it was indemnified that the performance of the distribution firms would be presenting transportation represented 8.8%, average savings of 6 to 22% on freight costs, 99.8% on-time delivery, reductions in out-of-stocks from 2 to 14% and lead-time reductions of 3 to 7 days . Additional, Ziukov (2016) alludes that across all categories, logistic optimization continues to be a major challenge for organizations. With 50% of all chains unable to provide a single view of their in-stock position, sales decline can be as high as 8.2% (Anene, 2014).

According to Mongare & Nasidai (2014) Regarding cost contribution, raw material is a major part of the total transport cost.Logistics service providers need to improve their competencies by investing in infrastructure and technology, gaining skill sets, and adopting best practices from developed logistics markets. Lack of this skills may lead to poor logistics management, lack of logistics optimization and poor supply chain performance. As such, in order to lower suppliers cost, logistics opitimization is, thus, a very important aspect to consider. However, From the foregoing, scanty research has been carried out on the role of logistics network optimization on performance of distribution firms hence the research gap. Therefore, this study carried out a study on determine the Influence of logistics network optimization on performance of distribution firms in Kenya. The specific objectives of the study are:

  i.   To determine the influence of logistics scheduling on performance of distribution firms in Kenya.
  ii. To establish the influence of mult-modal logistics on performance of distribution firms in Kenya.

1.1   Theoretical Review

The Network theory assisted the study in determining the effect of Mult-modal logistics on performance of distribution firms in Kenya.Network theory provides a useful framework for analysis of a business situation, and it adds a new level of complexity to understanding the relationship perspective (Madenas & Woodward, 2014) Mult-modal logistics Network relations create information sharing that enables buyers and sellers to establish distribution points, transportation costs and customer service targets. In a graphical sense, the point at which these three entities merge is the optimum balance of facility and transportation costs to develop a low-cost, high service distribution channel management .This approach is a structure formed by the main dimensions (e.g. activities, resources and actors) that products are stocked in the warehouse of the producer, without distribution centers. Orders are issued on an information system and the producer directly packs and delivers to customers through Mult-modal logistics (Marin-Garcia & Bonavia 2015).

Actors is an essential function within relationships that are required to form meaningful network structures, in which the network must have activities and the resources required to carry out those activities, Cao & Zhang, (2011). In the export business, actors connect with each other socially to bring various beneficial types of producers, retailers and consumers together within regional fruit and vegetable networks Priem and Swank, (2012) and establish a network position .The configuration increases both the performances of the Mult-modal logistics network, in terms of responsiveness, reliability and costs

These functions are meaningful in the conceptualization of the marketing network, which is an important value in analyzing a business Moller and Halinen, (2010). However, actors control activities that are built by relationships with other parties in the Mult-modal logistics network and are influenced by resources, which are exchanged to coordinate chain activities. Daugherty (2011) state that the cost-benefit analysis, considering the priorities clarified by the decision support system, resulted in a final configuration of distributed nodes as the best solutions are customer pick-up and last mile delivery.

Most of the previous studies state that relationship functions such as activities, resources and processes must be managed in a Mult-modal logistics network in order to establish interactions for better benefits and distribution services This is where networks are a set of relationships among constellations of and these relationships make connections with each other to provide the functions of benefits and exchange processes of their business and others' for better performance. This theory instigates the construct of distance, which is in the second research question. This therefore stimulated the researcher to try to find out how the Mult-modal logistics a logistic scheduling on performance of distribution firms in Kenya.

2.   Empirical Review

The empirical review gives an insight of the present situation of the cases which include fleet automation ,mult-modal logistics ,logistics outsourcing and logistics scheduling Empirical literature review offer an efficient method of building a professional knowledge base, understanding performance issues, identifying potential interventions and measurement methods, providing a foundation for asking the right questions in a project and defining common practices in organizations (Kothari ,2011).

2.1   Logistics Scheduling

 According to studies by Gitahi & Ogollah (2014) on the Influence of Fleet Management practices on service delivery to refugees in United Nations High Commissioner for Refugees Kenya programme There are research results on logistics scheduling that deals with all the three stages of supply, production and delivery. Multiple production-stages scheduling with batch delivery in an arbore scent supply chain. The studies they analysed the complexity of the problems and developed some dynamic programming algorithms. Considered a machine scheduling problem with supply and delivery of materials and products, where the warehouse, the factory and the customer are located at three different sites. The objective is to minimize the make span (Lysons & Farrington, 2012).

The studies identified that in mass customization logistics service, reasonable scheduling of the logistics service supply chain especially time scheduling, is benefit to increase its competitiveness. Therefore, the effect of a customer order decoupling point (CODP) on the time scheduling performance should be considered. To minimize the total order operation cost of the LSSC, minimize the difference between the expected and actual time of completing the service orders, and maximize the satisfaction of functional logistics service providers, this study establishes an LSSC time scheduling model based on the CODP(Mataara, 2011).

The study concluded that obtaining the optimal comprehensive performance could be effective if the expected order completion time is appropriately delayed. The increase in supply chain comprehensive performance caused by the increase in the relationship coefficient of logistics service integrator (LSI) is

limited. The relative concern degree of LSI on cost and service delivery punctuality leads to not only changes in CODP but also to those in the scheduling performance of the LSSC. At present, with the growing demand for customized logistics services, many logistics enterprises not only provide customers with mass service but also meet the demand for customized service as well as consider changes in the logistics service mode. Specially, these enterprises attempt to provide mass customization logistics services (MCLS) instead of mass logistics services (Pieters, 2012).

2.2   Mult-Modal Logistics

 According to Sezhiyan & Nambirajan (2010) .Empirically investigating the impact of supply effort management, logistics capabilities and supply chain management strategies on firm performance identified that Logistics has become a major economic activity comprising the process of planning, implementing and controlling the efficient, effective flow and storage of goods, services and related information from point of origin to point of consumption for the purpose of conforming to customer requirements. Multimodal logistics has become an important component of logistics worldwide. Hence, in modern deepsea and short-sea ports, access to other modes of transportation including road, rail, pipeline and air is available. The use of multimodal logistics has been encouraged by government directives and initiatives aiming at making operations more efficient and environmentally friendly (Saban, 2012).

The study established that International logistics requires ICT systems that satisfy a diversity of needs as it has been agreed that international logistics is practically mostly multimodal and involves a number of different players that underline the challenge of implementing information services that work to serve the needs of the whole logistics chain.ICT has become an essential part of the rapid and accurate transfer and processing of enormous volumes of data by international transport firms and port organisations Indeed, logistics and transportation are totally dependent on ICT as indicates that the flow of information is essential for carrying out an effective and efficient movement of consignments and using more advanced technology and data sharing it is possible to increase the resource utilisation and thus reduce costs. Despite the wide recognition of the importance of ICT in logistics and transportation, highlights that little empirical research has been conducted to study the use of information technology applications to support logistics operations. Furthermore, it is expected that emergent technologies may also have a significant impact on already complex multimodal logistics (Refas, &Thomas 2011).

This is particularly important as highlight that new technologies have affected the practice and significance of logistics management work on multimodal transportation involving the combined used of road transport and inland navigation recognise the need for a communications platform to make possible the integration and sharing of operational information in the supply chain and to mitigate problems such as low reliability and quality of mobile data connections. The solution envisaged by them comprised a real-time decision support system in which intelligent software agents handle communicative tasks, exchange desired amounts of information among different users using common exchange protocols, which act as translators between different systems (Sezhiyan & Nambirajan, 2010)

3.   Methodology

The study adopted the descriptive research design The target population compromised of 64 transport and logistics firms in Nairobi County the study frame involved: logistics and warehouse The unit of analysis comprised of Transport officers, logistics officers, The staffs in the transport sector sections those with the responsibility of distribution of customer goods from dispatch to the final deliver point. to calculate the sample size from 125 employees working in various distribution firms in Kenya county. Yamane (1967) formula was used. The primary data of the study was collected by the use of questionnaire. The Cronbach's Alpha Test of reliability was used to test the reliability of the constructs describing the variables of the study. For the quantitative reports, the tables consisted of mean and standard deviation values that were used to make interpretation of the analysis. Percentage, mean and standard deviation was used to show the

frequency of responses. Inferential statistics include both correlation, to show the strength of the relationship between strategy compliance and multivariate regression analysis to show the nature of the relationship between Influences of logistics network optimization on performance of distribution firms in Kenya

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$$

Where: Y = Performance of distribution firms in Kenya

β_0 = Constant Term;
$\beta_1, \beta_2, \beta_3$ and β_4 =
Beta coefficients;
X_1 = logistics scheduling
X_2 = mult-modal logistics
ε = Error term.

4.   Findings And Discussion

This section reviewed analysis of data basing on questions provided. The data was analyzed to indicate the level of agreement or significance of each structured question. Data was first discussed and later presented in tables.

4.1   Descriptive and Correlation analysis

As part of the study, the study sought to examine the role of logistics scheduling on the performance of distribution firms in Kenya. Overall, the findings on logistics scheduling summed up to a mean of 3.96 and standard deviation of 1.007 meaning that the respondents were generally in agreement with the items on logistics scheduling. Generally, the findings on mult-modal logistics summed up to a mean of 4.08 and standard deviation of 1.021 implying that the respondents were in agreement with the items on mult-modal logistics. Generally, results on firm performance summed up to a mean of 3.978 and standard deviation of 0.826. From the foregoing, it can be deduced that the firms have realized improved performance. There is also less variations on the responses as evidenced by the standard deviation. The findings revealed in Table 1 that logistics scheduling has a positive and significant relationship with performance of distribution firms, $\rho = 0.765$, $p < 0.001$. Further, mult-modal logistics has a positive and significant relationship with performance of distribution firms, $\rho = 0.668$, $p < 0.001$). These findings show that the various factors complement each other for the benefit of increasing performance of performance of distribution firms.

Table 1: Descriptive and Correlation analysis

	Mean	Std.D	Performance of distribution firms	Logistics scheduling	Mult-modal logistics
Performance of distribution firms	3.978	0.826	1		
Logistics scheduling	3.96	1.007	0.765**	1	
Mult-modal logistics	4.081	0.7701	0.668**	0.652**	1

** Correlation is significant at the 0.01 level (2-tailed).

4.2   Regression analysis

The regression analysis in this case is used in assess the effect of the independent factors on the dependent factor (performance of distribution firms) and answer the underlying research questions. Table 2 illustrates the model summary of multiple regression model, the results showed that all the four predictors (mult-modal logistics and logistics scheduling) explained 73.6% variation of performance of distribution firms. This showed that considering the four study independent variables, there is a probability of predicting performance of distribution firms by 73.6% (R-squared =0.736, $R = 0.858$). Study findings in table 1 for the

analysis of variance indicated that the above discussed coefficient of determination was significant as evidenced by F (4, 86) = 59.963 with $p < 0.001$. Thus, the model was fit to predict performance of distribution firms using mult-modal logistics and logistics scheduling.

The first specific objective of this study was to establish the role of logistics scheduling on the performance of distribution firms in Kenya. The findings in Table 2 show that logistics scheduling has a positive and significant effect on performance of performance of distribution firms, $\beta_1 = 0.207$, $p = 0.037$. This suggested that there was up to 0.207-unit increase in performance of distribution firms for each unit increase in logistics scheduling. The effect of logistics scheduling was more than 2 times the effect attributed to the error, $t = 2.123$. The findings tally with that of extant literature indicating that reasonable scheduling of the logistics service supply chain especially time scheduling increases firms' competitiveness (Gitahi & Ogollah (2014). Further support to the study findings is by Mataara, (2011) who concluded that obtaining the optimal comprehensive performance could be effective if the expected order completion time is appropriately delayed.

The second specific objective of this study was to determine the influence of mult-modal logistics on the performance of distribution firms in Kenya. The findings in Table 2 reveal that mult-modal logistics has a positive and significant effect on the performance of distribution firms in Kenya, $\beta_2 = 0.195$, $p = 0.011$ and this can be evidenced by the amount of effect accounted for by mult-modal logistics which is more than that accounted for by the residuals, $t = 2.596$ associated with the parameter. In this case, this means that for every unit increase in mult-modal logistics, performance of distribution firms increases by 0.195 units. The results conform with that of Saban, (2012) which affirmed that the use of multimodal logistics has been encouraged by government directives making operations more efficient.

Table 2   Regression model

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	0.441	0.227		1.944	0.055
Logistics scheduling	0.183	0.086	0.207	2.123	0.037
Mult-modal logistics	0.188	0.073	0.195	2.596	0.011
Model Summary					
R	0.858				
R Square	0.736				
Adjusted R Square	0.724				
F	59.963				
Sig.	0.000				

a Dependent Variable: Firm performance

4.3   Conclusion

The study concluded that logistics scheduling positively influences the performance of distribution firms in Kenya. Specifically, the distribution firms have ensured they have control over the entire planning and optimization process through the deployment of planners and dispatchers. Besides that, the fleet allocation process has been improved such a way that process errors have been reduced to a great extent. As well, there is utilization of real time KPI focused reporting tools coupled with improved visibility of maintenance requirements such that the firms have realized an improvement in their performance. Overall, logistic scheduling is instrumental in enhancing the performance of distribution firms in Kenya.

In addition, mult-modal logistics is instrumental in enhancing the performance of distribution firms in Kenya. This has been attributed to an efficient transporting infrastructure and minimized loss of time and risk of loss, pilferage and damage to the cargo at trans-shipment points. Other than that, transshipment only takes place in designated custom areas hence the firms save on time that would have been spent on custom checks. In addition, the safety of cargo is guaranteed since it is completely sheltered from the elements of the ship. In so doing, there is minimized loss of time and risks, pilferage and the safety of cargo which has contributed to improved performance of the distribution firms in Kenya.

Recommendation

In light of the study findings, logistics scheduling is instrumental in improving the performance of distribution firms in Kenya. As such, it is instrumental for firms to have planners and dispatchers to cater for the entire planning and optimization process. It is also recommended for firms to have real-time KPI focused reporting tools and state-of-the-art automated planning capabilities. Besides, the fleet allocation process should be in such a way that it reduces process errors. Finally, firms need to aim at improving visibility of maintenance requirements and next day duties.

Since mult-modal logistics positively influences the performance of distribution firms in Kenya, the firms should work towards ensuring that the transporting infrastructure are more efficient. Emphasis need to also be on ensuring that the burden of issuing multiple documentation for each segment of transport is minimized. Besides that, pilferage and damage to the cargo at trans-shipment points need to be minimized. In addition, there should be safe handling of cargo and minimized loss of time and risk of loss.. Further studies can also be carried using other measures of firm performance such as operational performance which would be more linked with logistics network optimization.

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