

ROLE OF WAREHOUSE AUTOMATION ON SUPPLY CHAIN PERFORMANCE IN DISTRIBUTION FIRMS IN KENYA: A CASE OF ACCELER GLOBAL LOGISTICS LIMITED

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Abstract: This study focused on determining the role of warehouse automation on supply chain performance in distribution firms in Kenya. Several studies for instance Emmett, 2005 report that logistics solutions company, Siginon Global Logistics launched cloud software in its Nairobi warehouses. The system increased operational efficiency and reduced stock taking and stacking time by more than 23 hours. Warehouse automation reduces costs, maximizes on operational efficiency and ensures faster processing of orders thereby improving a business return on assets, return on investments, organizational profitability and in overall the competitive edge of the business. The objectives of the study were; To establish the influence of staff training on supply chain performance in distribution firms in Kenya.; To establish the effect of lead-time on supply chain performance in distribution firms in Kenya.; To determine the level of customer satisfaction on supply chain performance in distribution firms in Kenya and To determine the level of significance of ICT integration on supply chain performance in distribution firms in Kenya. This study adopted a descriptive research design. The unit of analysis which is the study population consisted of the employees of Accelor Global Logistics Limited located in Nairobi. The unit of observation which is the target population consisted of the 450 employees of Accelor Global Logistics who work within the Nairobi office and the sample size was 82 respondents. Proportionate stratified sampling technique was used to determine the specific sample size of each strata and the study. Questionnaires were used to obtain primary data. Secondary data was obtained through published materials such as journals, audited accounts and annual reports. Data analysis was done through SPSS Version 24 and the analysed data was presented in form of tables and charts. F test (ANOVA) was conducted to ascertain the difference between groups on study variables. The study provided recommendations and guidelines the stakeholders at large on need for implementing automated warehouses and the possible gains the technology contributes onboard.

Keywords: warehouse automation, performance and distribution.

1. INTRODUCTION

Background to the study:

Warehouses are important components of most supply chains. In terms of cost, they represent approximately 20 per cent of total logistics costs (European Logistics Association and A.T. Kearney Management Consultants, 2004; Establish Inc. and Herbert W. Davis & Co., 2005), whilst in terms of service they are critical to the achievement of customer service levels (Hackman, et. al., 2005), particularly as distribution centers are often the final point in the supply chain for order assembly, value added services and dispatch to the customer. Automation is reasonably commonplace in large warehouses, particularly with regard to conveyor/sortation, and automated storage and retrieval systems, with each of

these types of equipment being present in more than a third of large warehouses (Baker & Halim, 2007). However, in spite of this significance in supply chains, warehouse automation has received relatively little research attention and this paper sets out to review the literature in this area and to explore the level of significance staff training, lead-time, customer satisfaction and ICT integration as variables of warehouse integration have on supply chain performance in the distribution firms in Kenya.

In today's market, most companies have moved away from a 'push' supply chain to a 'pull' supply chain and are seeking state-of-the-art automated warehouse storage solutions in order to ensure maximum level of customer satisfaction (Chow et. al., 2006). Whether expanding an existing location, opening a new facility, adding more SKUs or products, offering new sales channels, or other major shifts in operations, all companies face the same challenge; implementing physical and operational changes without affecting the customer (Clark et. al., 2007). The role of the warehouse in the supply chain is to assist in delivering the perfect order to the customer every time thereby by providing maximum level of customer satisfaction. However, warehouse operators still face many challenges that ultimately drive the need for automated warehouse storage solutions. For instance, any warehouse management should always strive at improving efficiency and productivity while reducing costs, improving quality and accuracy, embracing technological advancements, continuously improving and nurturing workforce skills and talents, focusing on health and safety and ensuring operations that are environmental friendly (Golfarelli & Rizzi, 2009).

Local Perspective on Warehouse Automation:

Kenya has not been left behind as far as stores automation is concerned. Most organizations in Kenya are adopting modern, spacious and secure warehousing options that meet their unique needs (Ondiek & Samuel, 2014). The facilities include storage of cargo in cold rooms as well as in general, transit and bonded warehouses. In Mombasa the warehouses are fitted with railway sidings for storage of inward and outbound cargo that goes by rail. Most stores in the country are being fully equipped with forklifts (normal and clamp), hand jacks, ladders, weighing machines fitted with rollers for ease of loading and offloading and fitted scissor jacks. There is also a lot of software and systems development that is aimed towards ensuring effective stores automation. As part of the automation, various security measures are also being incorporated including the 24 hours CCTV surveillance, (Public Procurement Oversight Authority (Public procurement and oversight authority, 2009).

There are also shuttle-based systems, which are ultra-capacitor or battery powered, in the GTP mix. Shuttles traverse each level of each aisle, and each level has at least one shuttle to handle loads. Busch continues, "Another even more modern shuttle system is one that utilizes lifts at the ends of the storage aisles. The shuttles still traverse the length of the storage aisles, but this type of system allows for the shuttles to travel to other levels within a given aisle. This creates flexibility by allowing access to all inventory within a given aisle, as well as flexibility when determining investment costs for throughput versus the quantity of shuttles required."

Warehouse Automation in kenyan perspective has led to maximization on efficiency and reduction in costs since the operations continues for 24hours in terms of handling materials, loading and off-loading, arrangement and with easy of movement in the store (Bullmore & Sporns, 2009).

Kenya's mobile and e-commerce scene is an exciting space as witnessed by recent events. From meat to fruits, Kenyan tech companies are churning out apps that make it possible for customers to buy these goods through mobile and online platforms (Nonaka & Von Krogh, 2009). While data is scarce on the size of the mobile and e-commerce industry, recent events show that there is a lot of potential. While much attention is on how SMEs and start-ups are using technologies, especially mobile money platforms to drive retail, there is an important cog in the mobile and ecommerce wheel that budding entrepreneurs and their mature counterparts need to look at i.e. warehousing and whether it is time firms started outsourcing this function (Storhagen, 2003).

Furthermore stock levels often depend on seasonal changes and these apply for both the supply and demand side (Axsater, 2000). Companies may need to stock up more goods during the holiday season to meet customer demand. On the other hand fruits ripen at specific times of the year and warehouse demand should reflect this. It therefore makes sense for a company to only pay for space that they use and avoid maintaining idle facilities (Autio et. al., 2000). Third party logistics operators (3PL) also have expertise which cannot be taken for granted. Warehousing and transportation go hand in hand and often companies that specialize in warehousing also provide transportation services. An SME can leverage on these synergies and reduce their overall logistical costs. It is important to note that in Kenya transport, warehousing and other logistics functions account for up to 50 per cent of the cost of goods and therefore any savings made go a long way into freeing up cash for a SME (Ivanov, et al, 2010).

Apart from benefiting micro business and SMEs the Kenyan consumer also stands to benefit when these businesses invest in efficient warehousing by using third party logistics providers (Kitheka, 2012). The present inefficiencies especially for fresh food produce are paid for by consumers through higher food prices. The good news is that Kenyan firms are opening up to the idea that unless your core business is in transportation or logistics there is no need to heavily invest in facilities when a business can rent space on a need-be basis (Okinyi, , 2015). It is important to note that with agriculture accounting for one out of five shillings that the general economy generates and the gradual shift to value addition in this sector, there is even a greater need for warehousing than can handle farm produce. Kenyan SMEs firms are already outsourcing IT management, cleaning, catering and human resource management. It is time that warehousing management was treated the same (Muiruri & Mwangangi, 2017).

Acceler Global Logistics Limited:

Acceler Global Logistics Ltd is an international freight and logistics service company that plans, implements and operates complex supply chain solutions on a national, regional and global scale on behalf of medium to large scale corporate firms in Kenya .We specialize in offering freight and logistics services, Customs brokerage, warehousing, cargo transportation, distribution and Supply Chain management services in Kenya and in East and Central Africa. Offer a wide range of warehousing and specialized services which include cold storage and highly secured vault storage areas. These warehouses are located in Nairobi, Mombasa and other key points in Kenya and are used for storage of imported goods for clients while awaiting delivery call-offs as well as storage of goods destined for export. Whereas it provide warehouse facilities for general cargo, we also have bonded warehouse facilities for storing goods under custom bonds.

Our warehouse operations involve provision of secure facilities that meet client's standards in terms of equipment, security, and health/safety. We have electricity backup generators that enhance our 24 hour surveillance system and ensure that goods are stored under required temperatures. Acceler carry out continuous stock administration which includes receipt, tagging, pillarization, put-away, data update and issuing out to users and customers. Where necessary, we carry out assembly (kitting), bundling packaging and labeling of stocks. Our administrative processes include continuous stock verification, cycle counting and stock counting. They provide Customs bond processing services for goods under bond. They have a large fleet of light and heavy commercial vehicles that are fitted with state-of-the-art electronic cargo tracking systems and are used for local and transit cargo transportation as well as distribution services in Kenya and within the East and Central Africa region. Their fleet of commercial vehicles include pick-ups and mini-trucks for door-to-door deliveries, light and heavy lorries for cargo deliveries, car carriers, low loaders, wide. Warehouse automation solutions improve operational speed and productivity (Mantey, 2016).

Statement of the Problem:

Many organizations today have not taken the issue of warehousing into account, storage of goods and distributions from the same warehouses are done haphazardly that is without any order, theft cases have been on the rise giving a compromise on the general ethics of workers, due to the disorganization and inadequate incorporation of modern information technology which come with good warehouse management systems, it has resulted to inaccuracy order management techniques which has dealt a major blow to the organization as a whole (Ackerman, 2008; Cooper, 2002). Across the world, the demand for modern quality warehousing is growing. In Kenya, such services are in short supply, according to the 2017 Sub-Saharan Africa report by Broll Property Group. "Kenya's warehousing industry operates at a primary level; meaning that warehousing is standard and the provision of total warehousing solutions is barely practiced in the market. The market predominantly has B-grade and C-grade spaces, with A-grade warehousing remaining at its infancy stages," says the report.

(Emmett, 2005) Reports that logistics solutions company, Siginon Global Logistics launched cloud software in its Nairobi warehouses. The system increased operational efficiency and reduced stock taking and stacking time by more than 23 hours. Overall, the system has reduced stock taking and stacking time from a whole day to 30 minutes for a 70,000 sq-ft warehouse, with all shipments received now bar-coded and scanned.

(Emmett, 2005) Further argues that it created approximately Ksh. 2 billion savings per week and Ksh. 48 billion in the first half of a financial year. In a survey, 43 per cent of warehousing executives said the software technologies had lowered transport costs, 41 per cent said they had shortened delivery time, while 32 per cent reported that automation enabled them to expand businesses across new suppliers and locations. Warehouse automation reduces costs, maximizes

on operational efficiency and ensures faster processing of orders thereby improving a business return on assets, return on investments, organizational profitability and in overall the competitive edge of the business. The study aimed to help organizations operate on a zero defect warehousing platform, its main purpose was to determine the role of warehouse automation on supply chain performance in distribution firms in Kenya based on a case of Acceler Global Logistics Limited Kenya.

Scope of the study:

The study was limited to finding out the role of warehouse automation on supply chain performance in the distribution firms in Kenya with specific reference to Acceler Global Logistics Limited. The company was chosen as the preference of the study in the industry due the level of quality, efficiency and effectiveness in its supply chain pertains and service delivery. The target population was 450 respondents which comprised of the finance, supply chain management, the human resource, Customer service and ICT departments’.

2. LITERATURE REVIEW

The Knowledge-Based Theory:

Knowledge management involves introducing new ways of conducting and managing business processes both at individual and team levels. The process of creating new knowledge may be achieved through training, brainstorming sessions, or internal and external consultancy. Training can be enhanced through job rotations, participation of employees in committee assignments, outdoor training, process simulations, lecture courses, and seminars. The knowledge-based theory of the firm considers knowledge as the most strategically significant resource of the firm. (Ketchen et. al., 2007) Argue that because knowledge- based resources are usually difficult to imitate and socially complex, heterogeneous knowledge bases and capabilities among firms are the major determinants of sustained competitive advantage and superior corporate performance (Grant, 2007). This knowledge is embedded and carried through multiple entities including organizational culture and identity, policies, documents, systems and employee (Newbert, 2007).

Theory of constraints:

Theory of Constraints (TOC) is widely known as a management philosophy discovered by Goldratt (1990) this theory is based on the idea, that every company must have at least one constraint. Goldratt and Cox (1992) define a constraint as any element or factor that limits the system from doing more of what it was designed to accomplish, i.e. achieving its goal to make money now and also in the future (Robbins, 2001). TOC is method how to identify the limitation and how to solve it. Cox and Spencer (1998) define three separate areas of TOC method logistics, performance measurement and logical thinking. The TOC method in logistics includes the drum-buffer-rope scheduling method, buffer management and the VAT analysis. Rahman (1998) reviews the TOC application in manufacturing companies. Cox and Spencer (1998) deal with managing the supply chain, Umble et al. (2001) described how a manufacturing firm applied the TOC method to direct the implementation of enterprise resource planning (ERP). Application of TOC approach can optimize also logistics cost along supply chain Gupta (1997). Specific problems of distribution in supply chain are less discussed in literature. Stein (1997) deals with model of locating the time buffer at different positions of participating members to protect actual sales from demand and supply uncertainty. The TOC solutions in supply chain are discussed by Goldratt et al. (2000).

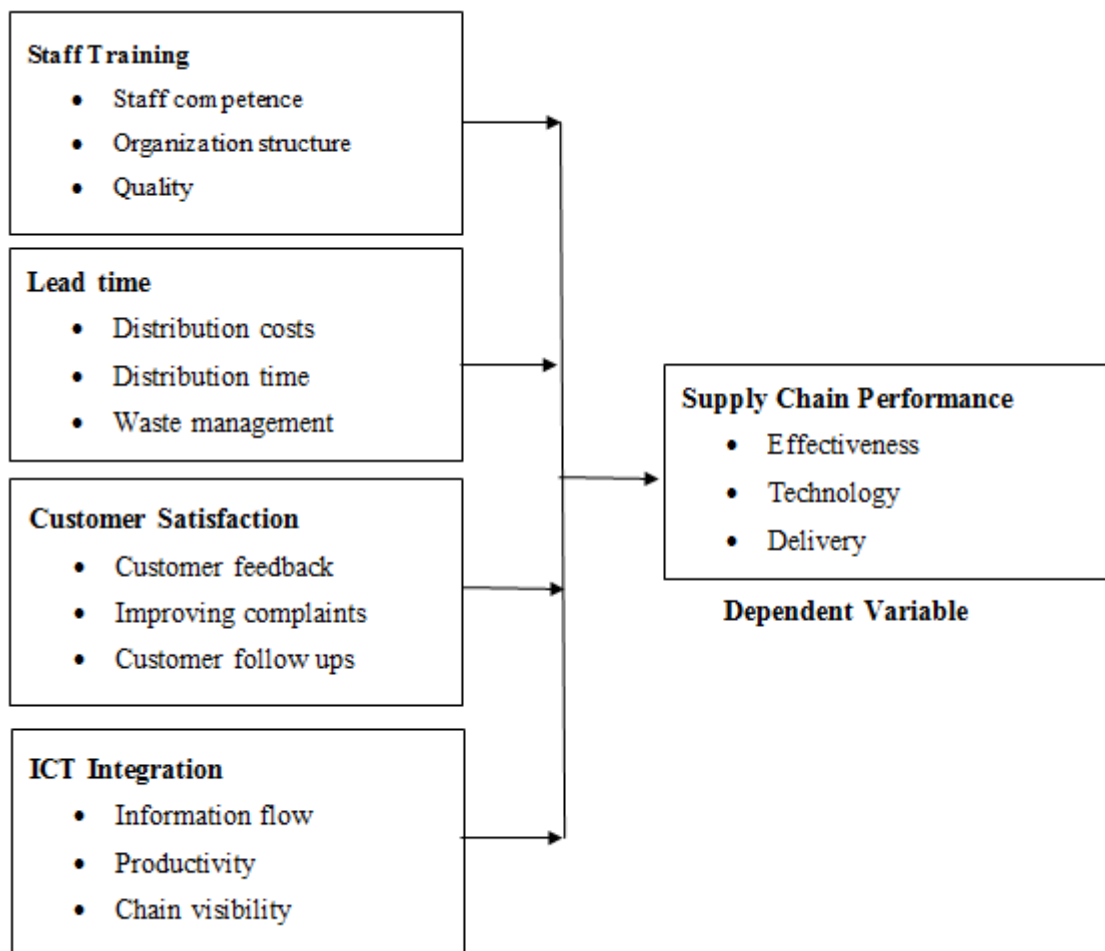
Systems Theory:

(Aoki, 2013) The systems thinking theory was used to support the influence of supply chain management practices on customer satisfaction. Systems thinking theory is a management approach which enables the leadership to see the company as a unified part. According to (Senge, 1990), system thinking theory calls for addressing various parts of a system from a holistic viewpoint and not in isolation of each other. In doing so, in tackling the problems in their entirety, the theory advocates for greater understanding of the problems or issues at hand through gauging patterns or the interrelationships that are at play among various entities of a system (Rubenstein-Montano et. al. , 2001). Such interrelationships or the evolving properties at work in the whole system, (Senge, 1990) argues, would, however, go missing, if and when the whole is broken into parts. This theory is thus tailored toward systematically explicating the dynamics that characterize the SCM practices. For instance, the strategic supplier partnership, postponement, customer relationship and information sharing that are in place within and across supply chain should be all taken into account for a sound understanding of these practices

Technology Acceptance Model:

According (Hutchful & Fayemi, 2005) to Technology Acceptance Model (TAM) is an information systems theory that models how users come to accept and use a technology. The model suggests that when users are presented with a new technology, a number of factors influence their decision about how and when they will use it. The degree to which a person believes that using a particular system would be free from effort (Teo, 2009). There is a rapid development in the use of information and communications technology (ICT) in logistics and supply chain management. ICT is today being applied in many organizations' in a wide range and operations areas. It has provided new ways to store, process, distribute and exchange information both within companies and with customers and suppliers in the supply chain. ICT used to exchange information in the supply chain is often named inter organizational ICT or interior organizational information systems (Gupta et. al., 2008).

Conceptual Framework:



Research Gap:

The distributors reduce information costs that a company might incur. Manufactures would invest a lot of infrastructure to obtain relevant market information if left alone. Distributors in different areas are therefore used to gain information and relay the same to the companies for appropriate strategy formulation. Further, logistics functions can prove overwhelming for a company that decides to do everything on its own. However, (Aoki, 2013) discussed that a big companies can dictate the terms of engagement and what margin it would offer the distributor simply because it already has the resources to go it alone if it so wishes. The margin may be about four per cent depending on how the agreement shapes out, and ask the distributor to bank on mass distribution to increase his/her proceeds. This study will cover on the nature of relationship between the distributor companies and the parent companies and therefore will not discuss on the extent to which benefits are extended to the other.

Statistics from Nairobi City County showed that out of the 2,303 planning permits approved last year, only 199 were warehouse class. Tilisi, in its research, argued that the most affected companies were those operating in manufacturing, Fast Moving Consumer Goods, pharmaceuticals, logistics, and import, export, retail and e-commerce sectors. Historically, the business practice in Kenya has been for businesses to own their own properties, a factor that has inhibited speculative industrial development. Industrial real estates are clustered around Nairobi, Mombasa and Kisumu with major industrial nodes located on Mombasa road and Baba Dogo. The nodes were originally established due to their proximity to transport infrastructure, stable water and electricity supply. “However, a shortage of development land in these nodes has forced developers to focus on emerging ones such as Ruiru, Syokimau, Athi River, Eastern Bypass/Embakasi, Thika Road and Kikuyu,” notes The Africa Prime Industrial Report. It said the areas have become popular due to completion of the Southern and Northern bypasses. This study will cover on the availability of space in Kenya to construct more warehouse.

Target Population:

Population refers to the larger group from which a sample is taken (Orodho, 2003). Target population includes the individuals to be studied (Mugenda & Mugenda, 2003). The unit of analysis which is the study population consisted of the employees’ of Acceler Global Logistic Ltd. According to the HR statistical records of Acceler Global Logistic Ltd, the organization had a total population of 1,500 employees. The unit of observation which is the target population consisted 450 employees within Nairobi. The target respondents were from the department of finance, the department of supply chain, the department of ICT, the department of human resource and the department of customer service. The target population therefore was 450 as shown in Table 3.1.

Target Population:

Population Category	Target Population	Sample size (15%)
Finance	85	15
HR	53	10
Supply Chain	100	18
Customer service	87	16
ICT	125	23
Total	450	82

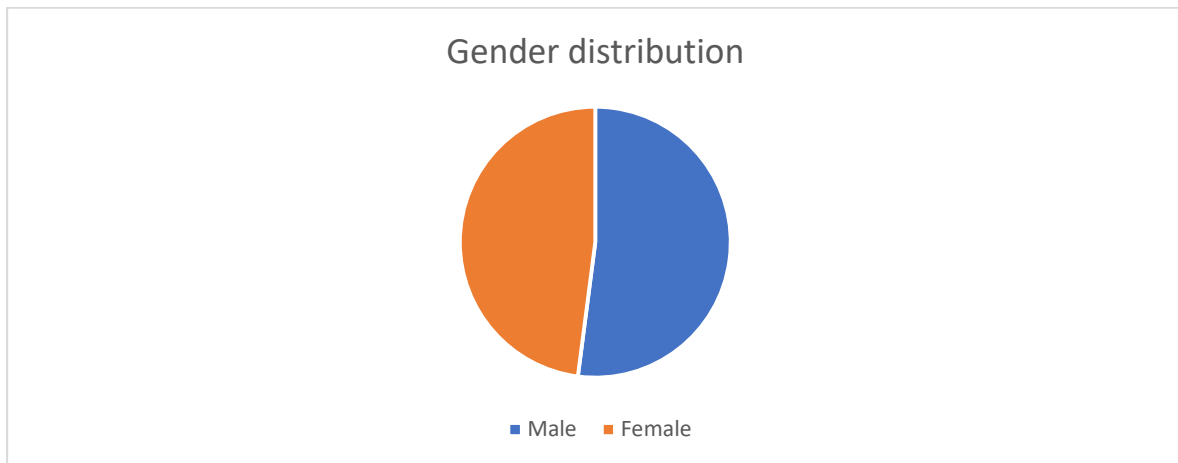
3. RESEARCH FINDINGS AND DISCUSSION

Introduction:

The study sought to find out the role of warehouse automation on supply chain performance in distribution firms in Kenya: a case of Acceler global logistics limited. Specifically the study looked at staff training, lead time, customer satisfaction and ICT integration. This chapter presents the data analysis and interpretation of study findings. The research data was collected using closed questionnaires that covered the different dimensions of warehouse automation. The questionnaires were distributed to Acceler global logistics limited employees according to their different departments and collected in the same manner and the analysis of the data was based on a general weight of 1 to 5 (1-Strongly disagree, 2-disagree, 3-neutral, 4-agree and 5- strongly agree)

Gender Distribution:

The gender of the respondent was sought. Majority of the respondents 52.055% were male while the rest 47.945% were female as shown in Figure 4.1, an indication that Acceler global logistics limited has more male staff than females. However, this is a good distribution which depicts a fair balance of gender. Since majority of the responses for this study relies on the perceptual measures of the respondents, this gender distribution is expected to accommodate the opinions and views from both sides of the gender divide. Nevertheless the balance in gender in private sector may also be an evidence of successful efforts of various gender mainstreaming campaigns.



Staff training:

The study sought the influence of staff training on supply chain performance in distribution firms in Kenya. Staff training is among the strongest pillars that drive supply chain performance. Continuous staff training helps to improve the knowledge and awareness of supply chain employees which in turn leads to improved decision making.

Table: percentages distribution of respondents' perception on process integration

Process integration	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Staff competence has an effect on supply chain performance	74.20%	21.00%	4.80%	0.00%	0.00%
Organization structure has an effect on supply chain performance	33.90%	61.30%	0%	4.80%	0%
Quality has an effect on supply chain performance	87.10%	8.10%	0%	3.20%	1.60%

From table above, majority of the respondents agreed to the fact that staff training affects supply chain performance in the distribution firms. This is evident from the table where 4.8% were not sure whether staff competence has an effect on supply chain performance followed by 21.0 who agreed to the fact while the another 74.20% strongly agreed that staff competence has an effect on supply chain performance. The findings are in agreement with (Berente, et al., 2009) who argues that human resource management regards training and development as a function concerned with organizational activity aimed at bettering the job performance of individuals and groups in organizational settings. The training will give the employee a greater understanding of their responsibilities within their role, and in turn build their confidence. ... Improved employee satisfaction and morale – the investment in training that a company makes shows employees that they are valued. The training creates a supportive workplace.

When asked whether organization structure has an effect on supply chain performance in distribution firms, 4.80% disagreed, 33.9% strongly agreed while the majority 61.3% agreed that organization structure has an effect on supply chain performance.

When asked whether quality has an effect on supply chain performance in distribution firms, 1.60% strongly disagreed, 3.20% disagreed, 8.10% agreed while the majority of 87.1% strongly agreed with the statement.

Lead time:

The study sought to establish the effect of lead time on supply chain performance in distribution firms in Kenya.

Table: Percentages distribution of respondents' perception on lead time

Lead time	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean
Distribution cost has an effect on supply chain performance	45.20%	54.80%	0	0	0	4.4516
Distribution time has an effect on supply chain performance	79.00%	14.5	1.6	3.20%	1.6	4.6613
Waste control has an effect on supply chain performance	48.40%	45.20%	1.60%	1.60%	3.20%	4.3387

From table above, majority of the respondents agreed to the fact that lead time affects supply chain performance in distribution firms in Kenya. This is evident from the table where 45.20% strongly agreed that distribution cost has an effect on supply chain performance and 54.80% agreed to that effect. The findings are in agreement with the theory of Swift, Even Flow, proposed by (Schmenner, 2001) contending that companies emphasizing flow which implies a focus on speed and on reduction of variability would have higher productivity than companies emphasizing productivity.

When asked whether distribution time has an effect on supply chain performance in distribution firms in Kenya, 1.6% strongly disagreed, 3.2% disagreed, and 1.6% were not sure. 14.5% of the respondents agreed while the remaining 79.0% strongly agreed. When asked whether waste control has an effect on supply chain performance in distribution firms in Kenya, 3.2% strongly disagreed, 1.6% disagreed, and 1.6% were not sure. 45.20% agreed with the statement while the majority of 48.40 strongly agreed.

Customer satisfaction:

The study sought to establish the significance of customer satisfaction on supply chain performance in distribution firms in Kenya

Table: Percentages distribution of respondents' perception on inventory policy

Inventory policy	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean
Customer feedback has an effect on supply chain performance	54.80%	33.90%	6.50%	1.6	3.2	4.3548
Customer complaints has an effect on supply chain management	58.10%	35.5	3.2	1.60%	1.6	4.4677
Customer follow up has an effect on supply chain performance	51.60%	48.4	0%	0%	0%	4.5161

From table, majority of the respondents agreed to the fact that customer satisfaction has an effect on supply chain performance. This is evident from the table where 3.2% strongly disagreed to the fact that customer feedback has an effect on supply chain performance, followed by a 1.6% who disagreed too but not strongly. A percentage of 6.5% were not sure while 33.9% and 54.8% agreed and strongly agreed respectively that customer feedback has an effect on supply chain performance. The findings are in agreement with (Friedman, 2006) who argues that customer feedback is a marketing term that describes the process of obtaining a customer's opinion about a business, product or service.

Customer feedback is so important because it provides marketers and business owners with insight that they can use to improve their business, products and/or overall customer experience.

When the respondents were asked whether the improving on customer complaints has an effect on supply chain performance, 1.6 % strongly disagreed while 1.6% disagreed. 3.2% were not sure. 35.5% agreed while 58.1% strongly agreed.

All the respondents were in agreement that performing customer follow up has an effect on supply chain performance with 51.6% strongly agreeing while 48.4% agreed.

When asked whether the length of lead- time has an effect on supply chain performance, 1.6% strongly disagreed with another 1.6% disagreeing, 51.6% agreed while 45.2% strongly agreed.

ICT integration

The study sought to find out the level of significance of ICT integration on supply chain performance in distribution firms in Kenya.

Table: Percentages distribution of respondents' perception on ICT integration

Inventory policy	5 Strongly agree	4 Agree	3 Neutral	2 Disagree	1 Strongly disagree	Mean
Information flow has an effect on supply chain performance	80.60%	19.40%	0%	0%	0%	4.8065
Level of productivity has an effect on supply chain performance	48.40%	50.00%	0%	1.60%	0%	4.4516
Level of visibility has an effect on supply chain performance	48.40%	51.60%	0%	0%	0%	4.4839

Respondents were asked to indicate the level ICT integration affect supply chain performance in distribution firms in Kenya. From the Table 4.9. When asked whether information flow has an effect on supply chain performance, all the respondents were in agreement with 19.4% agreeing while 80.6% strongly agreed. Majority of the respondents agreed that sharing of information with suppliers has an effect on supply chain performance with 50% being in agreement while 48.4% were in strong agreement. 1.6% disagreed though.

When asked whether the level of productivity has effect on supply chain performance, all the respondents were in agreement with 51.6% agreeing while 48.4% strongly agreed. When asked whether visibility has an effect on supply chain performance, all the respondents were in agreement with 51.60% agreeing while 48.40% strongly agreed.

Supply chain performance

Respondents were asked the extent to which the company has attained supply chain performance as a result of implementing automated warehouse systems. From the findings in the Table 4.10 below its evident that the company has realized a wide range of benefits resulting from automated warehouse systems.

Table: Percentages distribution of respondents' perception on supply chain performance

Supply chain performance	Very great extent	Great extent	Moderate	Small Extent	Not at all	Mean
Effectiveness	51.6%	48.4%	0.0%	0.0%	0.0%	4.52
Technology	77.4%	19.4%	0.0%	1.6%	1.6%	4.69
Delivery	79.0%	19.4%	0.0%	0.0%	1.6%	4.74

Majority of the respondents agreed to the fact that warehouse automation has brought about effectiveness in supply chain performance. All the respondents were of this opinion where 48.4% agreed to a great extent while 51.6% agreed to a very great extent. 77.4% of the respondents agreed to the fact that warehouse automation has brought about technology while 19.4% agreed to a great extent. 1.6% agreed to a small extent while the other 1.6% represented not at all. The respondent further accepted that warehouse automation has as well has ensured optimum delivery with elimination of waste in the distribution process. The majority of the respondents representing 79.0% agreed to a very great extent while 19.4% only agreed to a great extent. The remaining 1.6% were of a dissenting opinion.

Correlations of the Study Variables:

Table below illustrates the correlation matrix among the independent variables. Correlation is often used to explore the relationship among a group of variables (Pallant, 2010), in turn helping in testing for Multicollinearity. If the correlation values are not close to 1 or -1, this is an indication that the factors are sufficiently different measures of separate variables (Farndale, Hope-Hailey & Kelliher, 2010). It is also an indication that the variables are not multicollinear. Absence of Multicollinearity allows the study to utilize all the independent variables.

Table: Correlations of the Study Variables

Correlations

		Staff training	Lead Time	Customer satisfaction	ICT integration	Supply chain performance
Staff_training	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	62				
Lead_time	Pearson Correlation	.608	1			
	Sig. (2-tailed)	.040				
	N	62	62			
Customer_satisfaction	Pearson Correlation	-.143	.406	1		
	Sig. (2-tailed)	.266	.024			
	N	62	62	62		
ICT_integration	Pearson Correlation	.262*	.220	.596*	1	
	Sig. (2-tailed)	.040	.085	.019		
	N	62	62	62	62	
Supply_chain_performance	Pearson Correlation	.604	-.703	-.825*	.730	1
	Sig. (2-tailed)	.032	.022	.020	.023	
	N	62	62	62	62	62

*. Correlation is significant at the 0.05 level (2-tailed).

Table below indicated that customer satisfaction and ICT integration have significant weak positive relationship as attributed by the correlation coefficient of 0.596 and p-value of 0.019. The results show presence of a positive and significant weak relationship between customer satisfaction and lead time as proved by the p-value and the correlation coefficient ($r=0.406$, $p=0.024$).

The correlation matrix table shows presence of strong and significant positive relationship between staff training and lead time ($r=0.608$, $p=0.040$).

There is an evidence of significant weak positive relationship between process staff training and ICT integration as attributed by the p-value and correlation coefficient ($r=0.262$, $p=0.040$). Furthermore, the results of the table show presence of a significant moderate positive relationship between ICT integration and customer satisfaction as proved by the Pearson correlation coefficient of 0.596 and a p-value of 0.019.

From the table, all the independent variables are positively related to supply chain performance as attested by the respective correlation coefficients: staff training ($r=0.604$), lead time ($r= -0.703$), customer satisfaction ($r=0.825$) and ICT integration ($r= -0.730$). All the relationships are rendered significant since their p-values are less than 0.05. Accordingly, the ranking of the independent variables with their contribution to supply chain performance was: customer satisfaction contributed more to supply chain performance in in distribution firms in Kenya (82.5%), followed by ICT integration (73.0%), followed by lead time (70.3%) and finally staff training (60.4%).

4. SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary of Findings:

This study sought to find out role of warehouse automation on supply chain performance in distribution firms in Kenya: a case of Acceler Global Logistics Limited. The specific objectives that guided the study included; To establish the influence of staff training on supply chain performance in distribution firms in Kenya; To establish the effect of lead-time on supply chain performance in distribution firms in Kenya; To determine the level of customer satisfaction on supply chain performance in distribution firms in Kenya and To find out the level of significance of ICT integration on supply chain performance in distribution firms in Kenya. This study employed a case study research design to achieve these study objectives.

The study population comprised of 450 staffs at Acceler Global Logistic Limited and specifically the target respondents were from the department of finance, the department of supply chain, the department of ICT, the department of human resource and the department of customer service. This study used stratified random sampling technique. The sample size was 82 respondents. Structured questionnaire containing close-ended questions was used to collect primary data for this study. The questionnaires were distributed using drop-and-pick later method to the respondents. A pilot study was carried out among Acceler Global Logistic Limited staff who did not take part in the main study. Data collected was analyzed using descriptive and inferential analysis methods. A multiple linear regression analysis was used to analyze the effects of staff training, lead time, customer satisfaction and ICT integration on supply chain performance. SPSS version 24 was used to perform data analysis. Data analysis results were presented using tables. Multiple linear regression results have shown that four predictors can explain 79.1% of change in supply chain performance namely: staff training, lead time, customer satisfaction and ICT integration.

Conclusions:

It is worthwhile to conclude that there is a positive relationship between warehouse automation and supply chain performance. Through staff training, lead time, customer satisfaction and ICT integration, Acceler Global Logistic Limited has been able to achieve optimum supply chain performance. It is therefore clearer that the application of warehouse automation in distribution firms can be used to achieve more benefits than the operating the traditional warehouse systems. It provides means for achieving coordinated process and reduced costs. Distribution firms use warehouse automation with 3PLs to achieve benefits such as reduced distribution costs and distribution time in the purchase and transportation of raw materials and finished goods through its production processes. This has ensured achievement of improved efficiency and effectiveness and quality outputs both at reduced operational costs.

Introduction of robotics into the supply chain have for a long time been waited for. We have predicted the potential of such technology to help businesses keep pace with distribution challenges and consumer demand for convenience and variety. However, while robotics technology has now arrived in many sectors of life, it is yet to truly revolutionize the

logistics environment. There have been a number of technological barriers which have resulted in the slow uptake of automation in the supply chain. Until recently, robots had been stationary, blind, and relatively unintelligent, lacking the complexity and agility that the logistics industry requires. However, next-generation robots are very different they are lighter, more flexible, easier to program, and more affordable due to swift progress in grip and sensor technologies. Combined with the advent of micro-technology and the ability to create compact and collaborative robots, we are finally starting to see automation becoming a reality in the supply chain. Despite the previously slow uptake, the benefits of robotics and automation technologies are well understood, with their ability to support zero-defect logistics processes and enable new levels of productivity. The new generation of collaborative robots and automated solutions with significantly improved performance and enhanced sensing capabilities, offers a genuine alternative to manual handling.

Recommendations:

Given the role automated warehouse systems have on supply chain performance, it is imperative that distribution firms start to view warehouse automation as a strategy to ensure efficiency and effectiveness of their operations : that they will have a strong capability to increase the inventory turnover through properly established and right-sized safety stock buffers across the entire supply chain, taking into account the complex interdependencies between stages, as well as variables that cause chronic excess inventory, such as long lead times, demand uncertainty, and supply volatility.

Since most respondents agreed that warehouse automation have led to increasing the level of supply chain performance, distribution firms should be encouraged to adopt warehouse automation since it will assist them achieve their business goals.

The application of warehouse automation play a critical role in ensuring there is training and development, lead time management, customer satisfaction and ICT integration as observed in the study.

Areas for Further Research:

According to (Babbie, 2002) looking ahead, supply chain leaders should prepare their processes and infrastructure to embrace new technology and its ability to harness more data than ever before. While we have seen great progress in this area, the development of regulatory framework around robotics in the workplace and in 'public' spaces, rather than behind the scenes, will be the main factor to determine how quickly and to what degree robots and automation are incorporated into logistics. The successful businesses of the future will be those which are able to adapt to the accelerated change in sourcing, production and distribution that we are seeing today, and are agile and flexible enough to take advantage of new technologies (Best & Kahn, 2006).

It appears from industry figures that the adoption of warehouse automation is continuing to grow and, from this research, the main reasons are associated with growth, cost and service (Best & Kahn, 2006). There are however real concerns about disruption to the ongoing operation in the short term and the degree of future flexibility in the longer term. Further research is required in these areas to explore the key characteristics of successful implementations and to understand how (and to what extent) warehouse automation can be designed to provide responsiveness to rapidly changing market conditions (Berente, et al., 2009).

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