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ROLE OF ELECTRONIC DATA INTERCHANGE IMPLEMENTATION ON SUPPLY CHAIN PERFORMANCE IN THE MANUFACTURING SECTOR IN KENYA: A CASE OF BAMBURI CEMENT LIMITED.

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ABSTRACT

EDI is software that increased inter-organization a communications, co-ordination and integration between the different supply chain members. It has the capabilities of enabling a range of transactions including transfers of funds, demand forecast data, actual point of sale demand data, suppliers schedules and customer schedules in an organization. In this regard, it has been observed to profoundly provide the means through which organizations connect electronically by providing a technological infrastructure to support significant re-design of inter-company processes. The main objective of this study is to ascertain the role of EDI implementation on supply chain performance in the manufacturing sector with Bamburi Cement Limited as the case study. Both the management and the ordinary staff members of Bamburi Cement Limited will comprise of the target population. The study seeks to involve 450 employees but only 45of them will form the sample population. The study will employ a descriptive survey design to analyze the existing research gap. The main mode of data collection will be through use of questionnaires that will be self-administered. Multiple regression analysis will be the major technique of data analysis. Further, results will be presented by use of charts, tables and even graphs.

Keywords:*supply chain performance, EDI implementation, integration and technological infrastructure*

Background of the study

Globalization is coupled with development in Information and Communications Technology (ICT) that has resulted in emergence of various new information and communication applications. One of such applications is Electronic Data Interchange (EDI) which has revolutionized the business activities through electronic commerce (Magutu et.al, 2010). With the emergence of the ICT in the past two decades, electronic business has taken over the world of commerce. Everything is now done via the internet ranging from buying of the raw materials to selling of the finished products. With the increased efficiency in business operations, there has been emergence of inter-organizational systems amongst the different companies of the world which have further enhanced inter-organizational co-operation. EDI is one of such inter-organizational systems that have improved communication between the different organizations of the world. Further, emergence of World Wide Web has greatly impacted the development of the EDI system (Sanchez and Perez, 2003).

EDI has a natural effect of increasing inter organizational co-ordination of activities and the integration that occurs between the different supply chain members (Hill and Scudder, 2002). It also provides the technology to enable a range of transactions including transfers of funds, demand forecast data, actual point of sale demand data, supplier schedules and customer schedules (O'Callaghan and Turner, 1995). EDI has profoundly provided the means through

which organizations connect electronically by providing a technological infrastructure to support significant re-design of inter-company processes (Hill and Scudder, 2002). EDI also facilitates inter-organizational computer-to-computer exchange of structured information in a standard, machine-readable format.

History of Bamburi Cement Limited

Bamburi Cement Limited was founded in 1951 by Felix Mandl - a director of Cementia Holding A.G. Zurich. Cementia later went into partnership with Blue Circle PLC (UK). In 1989, Lafarge, the world's largest building materials group, acquired 50 percent of Cementia, and thus became an equal shareholder with Blue Circle. Lafarge bought Blue Circle in 2001 to become the largest building materials company in the world and Bamburi Cement Limited principle shareholder (Lafarge, n.d). Bamburi Cement Limited is therefore a subsidiary of Lafarge, the world leader in building materials and is listed on the Nairobi Securities Exchange (Lafarge, 2013). Lafarge Company mainly has three subsidiaries namely Hima Cement Limited, Bamburi Special Products Limited and Lafarge Eco Systems Limited.

Its first plant Mombasa started production in 1954 with annual capacity of 140,000 tons of cement. Today the Mombasa based plant has the capacity to produce of 1.1 million tons. In 1998, a new one million ton per annum clinker grinding plant was added just outside Nairobi, increasing the total production capacity to 2.1 million tons (Oparanya, 2009). With the new plant, Bamburi Cement Limited has been able to improve its service to Nairobi and upcountry markets, through speedier and more efficient packing turnaround time; the rail sliding at the Nairobi plant has also facilitated sales to Western Kenya and Uganda (Lafarge, n.d).
Bamburi Cement Limited is the largest cement manufacturing company in Kenya and in East Africa and its Mombasa plant is the second largest cement plant in sub-Saharan Africa. It is also one of the largest manufacturing export earners in Kenya, exporting 28 per cent of its production in 1998 (29 per cent) (Oparanya, 2009). Export markets include Reunion, Uganda and Mayotle. In the past, they have also included Mauritius, Sri Lanka, The Comoros, Madagascar, Seychelles and the Congo.

In the year 2013, Bamburi Cement Limited posted profits of 3,673 million while in the preceding year 2014; the profits went a note higher to 3,903 million (Lafarge, 2014).The sales are objected to further grow in the year 2015.

Statement of the problem

The manufacturing costs accounts for at least 60 percent of a manufacturing company's total production costs is plainly for materials in which10 percent is for labour and 30 percent for overheads (Kinney and Raiborn, 2012). According to Kurtz and Boone (2013), manufacturing firms that adequately rely on EDI and other internet-based tools to make purchases adequately reduce their total costs by 25 percent.Kurtz and Boone (2013) further argue that quick response

system and the JIT systems as a result of EDI implementation is what has made Wal-Mart Company a market leader in the retailing industry.

Previous researches conducted in relation to this area of study have observed key technological advancements in the Kenyan manufacturing sector and other sectors. For instance, Kinyanjui and McComick (2002) investigated the E-commerce integration in the garment manufacturing industry in Kenya and found out that about 60 percent of the manufacturing firms in Kenya were conversant with e-commerce. Consequently, Humphrey et.al (2003) sought to find out the truth behind e-commerce development in the developing nations such as Kenya, South Africa and Bangladesh. The study found out that most of the manufacturing firms in Kenya specifically the garment firms had adopted most of the internet based technologies. Magutu et al. (2010) sought to investigate the benefits and challenges of EDI in Kilindini Harbor and found out that companies that have implemented the EDI have improved operational efficiency, enhanced information quality, and have achieved reductions in processing time of critically important business information.

Fukunishi (2012) further observed that the supply chain in the Kenyan manufacturing sector had major challenges; presence of high number of middlemen, retailers, distributors and re-sellers High numbers of retailers, agents, re-sellers and distributors along the supply chain have been observed to contribute to delays in delivery of service as well as the transfer of the final products to their final consumer since the supply chain is practically elongated. Nevertheless, the different players in the sector have worked towards developing and implementing various tools to help eliminate these challenges and shorten the supply chain to achieve a seamless flow of activities. One of the key solutions to such challenges has been the implementation of the Electronic Data Interchange (EDI) along the supply chain in the Kenyan manufacturing sector. As to whether the integration of the EDI in the supply chain has played any role in improving the performance of the supply chain in the manufacturing sector, the justification lies with the management of the firms in this sector. Hence the need to undertake this study to investigate the role of EDI implementation on supply chain performance in the Kenyan manufacturing sector with Bamburi Cement Limited Company as the case study.

LITERATURE REVIEW

Auto-filing

Automatic filing occurs when the records being exchanged between two or more parties are automatically filed into the systems of the company. According to the National Archives (2010), Records in an organization are "'Information created, received and maintained as evidence and information by an organization or person, in pursuance of legal obligations or in the transaction of business." Filing records involves a range of activities and tasks. Many of them are already done by staff as part of their daily work and simply require common sense and adherence to standard operating procedures (Reitz, 2004). Filing in a company is a core part of record management. Record management does not in this case exist in isolation. It connects to functions such as management of personal information for compliance with the Data Protection Act, information security, and information assurance. Record management is most successful when these connections are recognized in internal arrangements (National Archives, 2010). According to the study conducted by ARMA (2008) more than 90% of the records are now being produced in the electronic environment. It is considered that the communication through electronic mail, EDI and other technologies have contributed to integration of electronic records and highly promoted the aspect of automatic filing for the companies of the world (ARMA, 2008).

Auto-response

The communication process cannot be complete without a feedback. Auto-response is the aspect of receiving feedback immediately after reaching out to a party or parties. Automatic response has adequately promoted communication management among the firms in the supply chain. Communication management entails a systematic process of planning, monitoring, implementing and revising of communication channels in an organization and among organizations (Spaho, 2011). It entails dissemination of the organizational directives within an organization or between organizations thorough a network or a communication platform (Spaho, 2011). Today, following the increased need for quality information, rising security threats and need for a quick response, communication technologies such the EDI have been integrated by organizations to help perform communication management. Further, organizations have come up with communication strategies to help streamline communication with their respective stakeholders. In this case, both internal and external directives have been designed by the organizations to manage the flow of information in and out of the organizations (Spaho, 2011). Automatic response has largely enhanced the performance of the different companies of the world and largely impacted on their trade relations with the outside world especially with their customers and suppliers (Spaho, 2011).

E-signature

An electronic signature (e-signature) is a way to show that a person does assent to the content provided in a particular document (Lorna, 2008). Today, in the different parts of the world, electronic signatures or the digital signatures have become increasingly useful in the e-commerce

(Dennis, 2005). More than ever companies have accepted use of the e-signatures when buying and selling goods or services. countries such as the United States, Brazil, India, Australia and the European Nations have already recognized e-signatures under their jurisdiction (Lorna, 2008). This is an evidence that the e-signatures have continued to be useful to the different individuals of the world for both personal and business use. Contracts, leases, loans and agreements are today created in paper-free world. This has further reduced the company's expenses specifically; printing, filing, mailing and faxing costs (Dennis, 2005). Further, the use of the electronic signatures has been observed to further reduce forgery in companies since the storage of the documents is electronic (Dennis, 2005).

Organizational policies

Organizational policies are simply a set of rules, guidelines, principles that are formulated by an organization and adopted so as to help the organization achieve its goals and objectives (Knight, 2014). It is often published as booklets or published on the company's website where it is adequately accessible to all the employees. The organizational policies and procedures in an organization are designed in a way that they influence and determine the decisions and actions of the company's management. Along the supply chain, organizational policies are important for they constrain the different players to act within the law and adversely act as a tool of quality improvement (Knight, 2014).

Supply chain performance

According to Algren and Kotzab (2011) Supply chain performance is the base for supply chain strategies which is difficult to measure as it includes the observation of economic components like sales volumes and costs as well as qualitative components such as flexibility or delivery ability. The major goal of SCM has been identified with the maximization of the effectiveness of a chain's outcome, providing superior service to the ultimate customer of the chain (Bowersox et al., 2010). Every supply chain manager therefore knows the dilemma of balancing costs; productivity, customer service and quality as well as financial benefits (Charanet al., 2008). Supply Chain Performance is recognized as important for managing supply chain behavior and orientation (Karrer, 2003). Its purpose is to establish supply chain goals, evaluate supply chain and determine future supply chain directions and activities (Algren and Kotzab, 2011).

Therefore, for the measurement of supply chain performance the efficiency or the effectiveness of an outcome of a supply chain activity is analyzed (Fugate et al., 2010). Efficiency describes an input/output relation while effectiveness shows how well supply chain goals have been achieved (Bowersox et al. 2010). In this sense, supply chain performance can be seen as a function of the utilization of supply chain resources or as a function of supply chain results as compared to supply chain targets. Generally, any supply chain manager has to ensure that a certain service level can be guaranteed to the customers and that this service level is achieved at minimal costs and at the highest quality level. The cost aspect includes the total costs for order management, storage and commissioning, inventory management and transport (Bowersox et al. 2010)

RESEARCH METHODOLOGY

This study adopted a descriptive survey design. This study targeted the employees of Bamburi Cement Limited where the target population included the senior managers, middle-level managers, operation managers and the general staff members in production, sales, human resource, finance, Engineering, IT, public relations and procurement departments. In total, the target population was limited to 450 employees. Forty five employees were included in this study as sample population from the target population of 450 employees. The main data collection instrument in this study was a questionnaire that contained both the closed-ended and open-ended questions. According to Mugenda and Mugenda (2003), data analysis is the process of bringing order and meaning to raw data collected. The data was edited and information categorized into topics based on the research questions. Qualitative data from open ended questions was organized into subtopics Responses were coded, processed and tabulated by using the Statistical Package for Social Science (SPSS).

RESULTS AND FINDINGS

Reliability test

According to Kim & Cha (2002), Cronbach alpha is the basic formula for determining the reliability based on internal consistency. Malhotra (2004) stipulated that a standard minimum value of alpha of 0.7 is recommended). However, theoretical and empirical literature accepts a Cronbach‟s alpha of 0.4 as minimum (Zheka, 2006). Beltratti (2005) & Abdulah (2004) in their studies adopted the use of 0.4 as the minimum level for item loadings. In this study, all the Cronbach Alpha were above 0.4 as indicated in Table C, E-signature was the most reliable with a Cronbach alpha of 0.655 while organizational policies bared the lowest Cronbach Alpha (0.407).

Table: Reliability statistics

Variable	Cronbach's Alpha
Auto-filing	.60
Auto-response	.545
E-signature	.655
Organizational policies	.707

Regression Analysis

To be able to predict the relationship existing between the independent variables and the dependent variable, the researcher ran a regression analysis using SPSS software Version 20 to compute for the measurements of the multiple regressions used in the study. In this case, the coefficient of determination was used to establish the amount of change on supply chain

performance in the Kenyan manufacturing sector impacted by the independent variables (Auto-filing, Auto-response, E-signature and organizational policies).

Table 4.11a: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.633[a]	.767	.6371	3.27110	.7887	6.615	4	28	.048

a. Predictors: (Constant), Organizational policies, Electronic Signature, Automatic filing, Automatic response

(Source, Author, 2015).

From the study findings made in Table 4.11, the Adjusted R square was .6371. this was an indication that the four independent variables (organizational policies, Electronic signature, Automatic filing and automatic response) resulted in variations of 63.71 percent of the supply chain performance in the manufacturing sector. In this regard, other factors not investigated in this study were responsible for the other 36.29 percent. Therefore, a future study should be undertaken to explore these factors. The significance level was established to stand at 0.048 lesser than 0.05 an indication that the model was statistically significant.

Table 4.11b: ANOVA[a]

Model		Sum of Squares	df	F	Sig.
1	Regression	29.125	4	6.615	.048[b]
	Residual	19.602	28		
	Total	48.727	32		

a. Dependent Variable: Supply chain performance

b. Predictors: (Constant), Organizational policies, Electronic signature, Automatic filing, Automatic response

(Source, Author, 2015).

F-critical at 5 percent level of significance stood at 2.438 while the F calculated as represented in Table 4.11b stood at 6.615. in this regard, the F calculated was greater than the F critical meaning that the independent variables (organizational policies, Electronic signature, Automatic filing and automatic response) did affect supply chain performance with reference to Bamburi Cement Company.

$\mathbf{Ys = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon}$ becomes:

$Y= 0.380 + 0.085X_1 + 0.053X_2 + 0.416X_3 + 0.598X_4$

Where, Y is the dependent variable (supply chain performance), X1 is Auto-filing, X2 is Auto-response, X3 is E-signature and X4 is the organizational policies. In this regard, assuming that all the independent variables are Zero then the supply chain performance would remain constant at 0.380. further, the findings indicated that holding all other independent variables constant, a unit increase in Automatic filing would results to 0.085 increase in supply chain performance, a unit increase in Automatic response would result to 0.153 increase in supply chain performance, a unit increase in Electronic signature would result to 0.416 increase in supply chain performance while a unit increase in organizational policies would result to 0.598 increase in supply chain performance. In this regard, Automatic filing was statistically significant at 0.31, Automatic response at 0.22, Electronic signature at 0.006 and organizational policies at 0.001.

Table: Multiple Regressions

Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	.380	.223		.024
	Automatic filing	.085	.145	.169	.031
	Automatic response	.153	.276	.102	.022
	Electronic signature	.416	.348	.011	.006
	Organizational policies	.598	.280	.004	.001

a. Dependent Variable: Supply chain performance

(Source, Author, 2015).

Discussion of the study findings

Automatic filing

Filing is one of the most crucial practices in record management in any given organization (Reitz, 2004). How the files or documents are filed determines the retrieval and security of the documents. Today, automatic filing has revolutionized how things are done especially in the manufacturing sector, improving on the company's operations especially enhancing the supply chain efficiency by cutting down costs such as communication costs and labor costs. This study sought to investigate if automatic filing had an effect on supply chain performance. Majority of the respondents (63.64 percent) agreed that Automatic filing did influence the supply chain management. An indication that for sure, automatic filing did influence supply chain performance in Bamburi Cement Company. This was in tandem with the study findings made

by Xie (2009) who established that EDI implementation resulted to reduced labor costs what further enhanced the supply chain efficiency for the system was automatically backing up the records from varied transactions.

Automatic Response

The crucial aspect of the communication process is always the feedback. When the feedback is received in real-time, the transaction or the business is undertaken in a faster pace. Automatic response has revolutionized communication in most companies of the world integrated in varied communication networks (Spaho, 2011). According to the study findings, majority of the respondents, 58.57 percent of the respondents agreed that Automatic response did affect the supply chain performance in Bamburi Cement Company. This study finding was in line with the findings made by Nurmilaakso (2008) who established that EDI implementation adequately enhanced the speed through which the different companies shared information and also adequately reduced errors. Also, Sanders (2013) established that EDI adoption by the US manufacturing firms resulted to JIT and quick response what has created new ways through which organizations are undertaking business activities. further, the study established that Automatic response was third most significant (0.22). In this case, the study results collaborated to the literature of Spaho (2011) who argued that Automatic response has become a part of today's business world where everybody wants to get a feedback instantly.

Electronic signature

Lorna (2008) articulated that most nations of the world have today recognized use of E-signatures under their jurisdiction. this has greatly enhanced the growth of e-commerce to practically all parts of the world (Dennis, 2005). From the study findings, majority of the respondents (81.82 percent) agreed to the fact that E-signature had an impact on the supply chain performance in Bamburi Cement Limited while 12.12 percent disagreed. A clear indication that E-signature does influence supply chain performance in the Kenyan manufacturing sector. These study findings collaborate to the study findings of Liu et al. (2013) who established that EDI is not just a single technique but a combination of integrated technologies what has electronized the entire business operations and significantly contributed to the growth of e-commerce. Further, Electronic signature was found to be second most significant variable (0.006). in this regard, these findings were in line with the literature by (Dennis, 2005) who stipulated that, slowly by slowly E-signature has found its way to the top and today contracts, leases, loans and agreements are t created in paper-free world. E-signature in the manufacturing sector has resulted to reduced expenses specifically; printing, filing, mailing and faxing costs (Dennis, 2005).

Organizational policies

International trade has continued to grow and expand between the different nations of the world. Despite being influenced by the cultural factors in an organization, organization

policies are developed by institutions to help it achieve its set goals and objectives as well as work towards its mission and vision (Knight, 2014). From the study findings majority of the respondents (84.85 percent) agreed that top-management support resulted to development and implementation of organizational policies. 6.06 percent disagreed with 9.09 indicating that they did not know. These findings were in line with the study findings made by Manthou et al. (2001) who established that implementation of EDI in any given organization largely depended on legal issues, institutional frameworks and management support. In this case, training policies and funding policies were seen as vital for a successful integration of EDI (Manthou et al., 2001). Also, Maunola (2009) observed that EDI implementation was driven forth by supportive policies set by finance and/or accounting department. Further, organizational policy was observed to be the most significant variables (0.001) affecting supply chain performance. In this regard, these findings collaborated to the literature of Maunola (2009) who argued that organizational policies are major driving forces to the process of EDI implementation in any given organization. They not only determine the pace of implementation and integration of EDI but also the success of the implementation and or integration (Maunola, 2009).

Conclusion

Firstly, the study concluded that Automatic filing, Automatic response, E-signature and organizational policies all did influence the supply chain performance in the Manufacturing sector in Kenya. Secondly, the study made a conclusion that it is essential for the manufacturing firms in the Kenyan manufacturing sector to invest in ICT for it can positively impact their performance as single entities. Also, it can positively contribute to supply chain efficiency through cost reduction along the supply chain boosting the profit margins of these firms what can have a positive impact to the economy of Kenya as a country. Lastly, manufacturing firm's need to come up with smart policies to support adoption of the ICT tools such as the EDI that have proved very important to the manufacturing firms.

Recommendations

The study recommended the following:

1. Improvement in use of EDI by the manufacturing companies in record management. In this regard, more use of EDI in record management will not only reduce the costs associated with filing but also reduce paper work, unnecessary time wastage during retrieval of document and also boost productivity of the employees.
2. The different management in the manufacturing companies should invest in training of the employees as far as EDI usage is concerned. In this case, yearly seminars and workshops would enhance the employees' knowledge on the use of EDI what would eventually impact the supply chain performance.
3. The top management to lead from the front. In this case, the top management should commit more resources to support the implementation of EDI system in the manufacturing companies in Kenya. EDI implementation will not only make the supply chains more efficient but also improve on the performance of the individual

manufacturing firms. Over the last few years, the Kenyan government has been on the verge of making the manufacturing sector the most efficient sector in Kenya so as to be able to move the economy of the country from being an agricultural-dependent economy.

4. The manufacturing firms in Kenya to come up with policies and measures to guide the use of the EDI systems amongst themselves. This would not only refrain some of the companies from using the system for the wrong reasons but also improve on the security and privacy of the documents and contents shared amongst these firms. In this regard, these firms will be protecting themselves from all sorts of cybercrimes.

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