ROLE OF ELECTRONIC DATA INTERCHANGE ON SUPPLY CHAIN PERFORMANCE IN MANUFACTURING SECTOR IN KENYA: A CASE OF BIDCO OIL REFINERY

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ABSTRACT

A great deal of attention is paid to the issue of supply chain performance. The benefits a company could gain if it is properly employed could range from cost reductions and operational efficiencies to increased market share and increased revenues. Manufacturing companies attain significant savings from effective materials management and inventory through the use of EDI as it can lead to a reduction in cost, resulting in a significant saving. EDI in Kenya is at the early adoption stage and very few companies have the pre-requisite ICT infrastructure that is necessary for the implementation of EDI. The general objective of this study was to examine the Role of electronic data interchange on supply chain performance in manufacturing sector in Kenya: A case of the BIDCO Kenya Limited. The study was built upon the supply chain operations theory, Resource based theory, Transaction based theory and E-technology perspective theory and specific objectives of this study were to examine; customer service level on EDI, cost reduction on EDI, buyer and supplier integration and organizational policies on supply chain performance. The study adopted descriptive survey and targeted 470 employees and sample of 47 employees or 10% of the target population was considered, random sampling technique method was used and data collected through the use of questionnaires. On the other hand, secondary data was obtained from published documents such as journals, periodicals, magazines and reports to supplement the primary data. A pilot study was conducted to pretest the validity and reliability of instruments for data collection. The data was analyzed with help of SPSS version 20 and Excel. The study variables were regressed the findings showed that they had positive influence and the buyer/supplier integration was the most significant factor followed by customer service level then the cost reduction and finally the organizational policies at 5% level of significance and 95% confidence level.

Key Words: *customer service level, cost reduction, buyer/supplier integration, organizational policies*

INTRODUCTION

With the beginning of the new century, it became clear for practitioners and consultants that making business is far different from what it was 20-30 years ago (Flynn, Huo &Zhao, 2010). The competition between firms is extremely fierce and many survive by finding and employing competitive advantages, other, however, fall down in the battle, Hansen et al. (2009). The benefits one company could gain if it is properly employed could range from cost reductions and operational efficiencies to increased market share and increased revenues. Even though supply chain performance is a hot topic among researchers in the last 10 years, still there hasn't been proposed a universal definition for it. One part of the scientists conceptualizes supply chain performance in terms of buyer-supplier relationships, that is, supply chain relationship

performance. Based on the Business Expectations survey of Limited Companies by the Department of Statistics (DOS) in Malaysia, there was a drastic increase in use of EDI in the manufacturing companies from RM17 billion in 2003 to RM27.7 billion in 2005, followed by a decrease in 2006 of RM23 billion. This contributes significantly to the increase in Gross Domestic Product (GDP) from 45 percent in 2005 to 51 percent in 2006 (Economic Review, 2007). Locally, studies which have been done include, Kariuki (2003) attempted to explain the benefits of EDI among private companies, Gathumbi (1997) examined the Application of Inventory Models in Drug Inventory Management.

STATEMENT OF THE PROBLEM AND CONCEPTUALIZATION

Manufacturing companies attain significant savings from effective materials management, which amounts between 50%-60% of total costs (Songet al., 2006). Effective management of inventory through the use of EDI can lead to a reduction in cost, resulting in a significant saving. The various types of materials to be managed through the use of Electronic Data Interchange (EDI) in any organization include purchased materials, work-in-progress (WIP), materials and finished goods (Banjoko, 2009). Manufacturing firms in Kenya are characterized by elongated or overextended chains retailers (buyers/agents) which, in turn, mean long chains of transactions between chain members and consumers (Amoro, 2011). Customers are concerned with the availability of the product and the ability of the firms to meet their needs timely (Aghazadesh, 2003).Thus the study focuses on Role of electronic data interchange on supply chain performance in manufacturing sector in Kenya. the study was guided by the following specific projects;

1. To establish whether Customer Service Level on EDI affect supply chain performance in manufacturing sector in Kenya.
2. To determine whether Cost Reduction on EDI affect supply chain performance in manufacturing sector in Kenya.
3. To find out whether Buyer/supplier integration on EDI affect supply chain performance in manufacturing sector in Kenya.
4. To assess whether Organizational Policies on EDI affect supply chain performance in manufacturing sector in Kenya

The study sought to assess the role of electronic data interchange on supply chain performance in manufacturing sector in Kenya with reference to Bidco oil refinery. The study targeted 470 BIDCO personnel. The study used the conceptual framework below to test the relationship between the independent and the dependent variables.

MATERIALS AND METHODS

The study adopted a descriptive survey design. A survey design as described by Mugenda & Mugenda (2008) is an attempt to collect data from members of a population in order to determine the current status of that population with respect to one or more variables. The researcher adopted this design since it was an efficient method of collecting descriptive data regarding characteristic of a sample of a population, current practices, conditions or needs. The other reason was because also the design allowed the researcher to gather information regarding the respondent's opinion, attitudes, perceptions and views in a more cost effective way (Kothari, 2003). Due to the homogeneity of the population, the study adopted a random sampling technique. A random sampling allows generalizability to a smaller population with statistically determinable margin of errors (Creswell, 2003). The sample of 47 respondents was used from the target population of 470. It was also supported by Neuman (2000) who argued that a 10% sample of the population is sufficient. The researcher determined the data collection approach largely by identifying the type of information needed (Cooper & Schindler, 2003).

The researcher used questionnaire as the research instrument. This is because of their simplicity in the administration and scoring of items as well as data analysis (Gronhaug, 2005). The study utilized quantitative and qualitative questionnaire that was developed for generating information on key variables of interest from the targeted respondents in this study. The researcher used questionnaires to collect primary data. The questionnaires were self-administered and distributed to the respondents and reasonable time given before they could be collected. The completed questionnaires were sorted and cleaned of errors. Secondary data was collected by a study of records and documents in various departments in the firm involved in supply chain management. A pilot study was undertaken on at least 4 respondents to test the reliability and validity of the questionnaire. The rule of thumb is that 10% of the sample should constitute the pilot test (Creswell, 2003).

Cronbach alpha is the basic formula for determining the reliability based on internal consistency (Kim & Cha, 2002). The standard minimum value of alpha of 0.7 is recommended Malhotra (2004). The theoretical and empirical literature, however, accepts a Cronbach's alpha of 0.4 as minimum Zheka (2006), Beltratti (2005) & Abdulah (2004) in their study adopted the use of 0.4 as the minimum level for item loadings.

The research adopted content validity which refers to the extent to which a measuring instrument provides adequate coverage of the topic under study. The content validity was achieved by subjecting the data collection instruments to an evaluation group of supply chains experts who provided their comments and relevance of each item of the instruments and the experts indicated whether the item was relevant or not. It is recommended that instruments used in research should have CVI of about 0.78 or higher and three or more experts could be considered evidence of good content validity (Amin, 2005).

Data collected was analyzed using both quantitative and qualitative methods with the help of (SPSS) version 20 and excel. The findings were presented using tables and graphs for further analysis and to facilitate comparison. This generated quantitative reports through tabulations, percentages, and measure of central tendency. The researcher further adopted multiple regression model at 5% level of significance and 95% level of confidence to study the strength and direction of the relationship between the independent variables (customer service level, Cost reduction, buyer/ supplier integration and organizational policies) and the dependent variable (supply chain performance).

The regression equation was expressed is $\mathbf{Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon}$, where, Y is the Supply chain performance, β0 is constant (coefficient of intercept), X_1 represents customer service, X_2 the cost reduction, $X_3$is the Buyer / supplier integration, X_4 represents organizational policies, ε is the error term and $\beta_1 \ldots \beta_4$ are the regression coefficients of four variables.

RESEARCH RESULTS AND DISCUSSIONS

A total of 47 questionnaires were targeted for the purpose of data collection. Out of these, 34 respondents returned questionnaires giving a response rate of 72.34%. This response rate was sufficient and representative and conforms to Mugenda and Mugenda (2003) states that a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and over is excellent.

Customer Service Level

For an organization to be truly effective, every single part of it, each department, each activity and each person and each level must work properly together, because every person and every activity affects and in turn is affected by others (Murambi, 2005). The research sought to establish whether customer service level Influence supply chain performance in Bidco Oil Refinery. The majority (58.82%) of the respondents agreed that customer service level did influence supply chain performance. This depicts that the customer service level influenced supply chain performance in the Bidco oil Refinery. This is in tandem with Gattoma (2006) who observed that customer service influenced supply chain performance in firms. The study found out that application of EDI in customer service level, the services offered were effective and efficient as the organization used E-network on search of goods and services thus reduced cost and paperwork and increased productivity of personnel. The respondents were aware of EDI and customer service level and its benefits; respondents also strongly agreed that customer service level led to cost reduction and financial sustainability. Further, the study found out that customer service level was the second most significant factor 5% level of significance. The findings corroborates with literature review by Aghazadesh (2003), who indicated that customers are concerned with the availability of the product and the ability of the firms to meet their needs timely. Lack of adoption of EDI at the customer service has caused erratic deliveries, late

deliveries and inflexibility hence affecting customer satisfaction with in their downstream chain (KAM, 2013).This has also led to unavailability of integrated inventory management systems leading to reduced profits in manufacturing firms due to lack of application of EDI at the customer service level(Otieno,2011).

Cost Reduction

Kamanda,(2001), suggested that any good EDI software system today is designed to greatly reduce the time and effort required to complete purchasing transactions by eliminating traditional paper chain of requisitions, approvals, receiving and payment reconciliation (Araujo, 2007). the majority of the respondents (64.71%) stated the use of EDI reduced cost while 35.29% stated that it did reduce cost in supply chain in Bidco oil refinery. This depicts that EDI reduced cost thus influencing supply chain performance in manufacturing sector in Kenya. These findings corroborates with Behn(2003) who observed that EDI application influenced supply chain performance. The respondents strongly agreed E-government, Electronic data interchange, internet application and good governance influenced the supply chain performance. The findings collates with literature review by Kamanda(2001) who indicated that EDI software system is designed to greatly reduce time and effort to complete purchasing transactions by eliminating paper chain of requisitions, approvals, receiving and payment reconciliation(Araujo.2007).

Organizational Policies

International trade is growing rapidly for both developing and developed countries (World Bank group, 2005) and economies of countries such as the USA and china have become increasingly intertwined (Akech, 2005). the majority of the respondents (58.82%) stated the organizational policies adversely affected supply chain performance while 41.18% stated that organizational policies did not affect supply chain performance in Bidco Oil refinery. The findings relates with literature review by Mabert et al (2003)) who observed that organizational policies of different organizations are influenced by cross cultural differences that shape the effectiveness of a code of conduct of operations of a given institution thus even in supply performance. Organizational policies define the adoption of new technology for example in running and management of business as they are determined by the managerial principles and policies (Wycisk, 2008).

Supply Chain Performance

For decades supply chain performance has been attracting great attention from practitioners due to poor performance resulting from non-adherence to power processes and procedures. The procurement function has not been given the recognition it deserves in developing countries, in most public entities, regardless of the effort by the partners like the World Bank, the international. The study revealed that respondents agreed to a great extent that buyer/supplier integration influences the supply chain performance. The respondents further agreed to a great extent that customer service level influence supply chain performance. Finally, the respondents

agreed to a great extent that organizational policies and cost reduction influenced the supply chain performance. The findings are in line with the findings of Zairi & Al-Mashari (2004) who posited that supply performance can be enhanced by the adoption of technologies such as EDI in procurement to simplify the purchasing and supply management processes (William et al, 2009) and reducing transaction costs if EDI can be applied in buyer/supplier integration, in cost reduction and customer service to enhance supply chain performance (Emiliani, 2010).

REGRESSION ANALYSIS

The researcher applied SPSS version 20 to code, enter and compute the measurements of the multiple regressions for the study. According to Green & Salkind (2003) regression analysis is a statistics process of estimating the relationship between variables. Regression analysis helps in generating equation that describes the statistics relationship between one or more predictor variables and the response variable.

Table 1: Results of multiple regression between Supply chain performance (dependent variable) and the combined effect of the selected predictors

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.808[a]	.753	.222	.3302

Predictors: (Constant), Customer service level, Cost reduction, Buyer supplier integration, organizational policies

The coefficient of determination (R2) explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable (Supply chain performance in manufacturing sector in Kenya) that is explained by all four independent variables (Customer service level, Cost reduction, Buyer supplier integration, organizational policies)

Table 2: Analysis of variance results of the regression analysis between supply chain performance and predictor variables

Model		**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
1	Regression	63.654	4	15.9135	25.6752	.0000[b]
	Residual	17.974	29	.6198		
	Total	81.628	33			

The reports summary ANOVA and F statistic (25.6752) is significant at 0.05 confidence level. The significance value is .0000 and the value of F is large enough to F critical we conclude that the set of independent variables; Customer service level, Cost reduction, Buyer supplier

integration, organizational policies influence Supply chain performance in manufacturing sector in Kenya. The table shows that the independent variables statistically significantly predict the dependent variable, F (4, 29) = 25.6752, $p < .05$, this shows that the overall model was significant.

Table 3: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.878	3.483		2.439	.002
	Customer service level	.754	.388	.002	.535	.001
	Cost reduction	.653	.266	.135	.366	.002
	Buyer/ supplier integration	.765	.288	.017	.311	.000
	Organizational policies	.621	.446	.109	.469	.002

a. Dependent Variable: Supply chain performance in manufacturing sector in Kenya

From the data in the above table, the regression equation becomes:

Y=3.878 + 0.754X1 + 0.653X2 + 0.765X3 + 0.621X4.

Predicted Supply chain performance in manufacturing sector in Kenya = 3.878 + (0.754 x Customer service level) + (0.653 x Cost Reduction) + (0.765 x Buyer/supplier integration) + (0.621 x Organizational policies).

From above regression equation; the study found out that when all independent variables (Customer service level, Cost reduction, Buyer supplier integration, and organizational policies) are kept constant at zero the Supply chain performance in manufacturing sector in Kenya will be at 3.878. At one unit change in Customer service level will lead to 0.754 increases in the Supply chain performance in manufacturing sector in Kenya. Also a one unit change in Cost reduction will lead to 0.653 increase in the Supply chain performance in manufacturing sector in Kenya. Further, a one unit change in Buyer/supplier integration will lead to 0.765 increase in the Supply chain performance in manufacturing sector in Kenya and one unit change in organizational policies will lead to 0.621 increase in Supply chain performance in manufacturing sector in Kenya.. To test for the statistical significance of each of the independent variables, it was necessary to test whether the unstandardized (or standardized) coefficients are equal to 0 (zero) in the population. If $p < .05$, we can conclude that the coefficients are statistically significantly different to 0 (zero).

At 5% level of significance and 95% level of confidence, customer service level had a 0.001 level of significance; cost reduction showed a 0.002 level of significance, Buyer/supplier integration showed a 0.000 level of significance and Organizational policies had a 0.002 level of

significance; hence the most significant factor is Buyer/supplier integration. The findings corroborates with Davenport (2008) who argues that buyer/supplier commitment is an enduring desire to look for ways to ensure there is adoption of technologies such as EDI in procurement to continuously ensure that there is customer satisfaction.

CONCLUSIONS

The study concludes that customer service level, cost reduction, buyer supplier integration, organizational policies influence the supply chain performance in manufacturing sector in Kenya. The study found out that buyer/supplier integration was the most significant factor followed by customer service level influences supply chain manufacturing sector in Kenya. The study also concludes that 75.30% of the supply chain performance in manufacturing sector in Kenya was explained by customer service level, cost reduction, buyer supplier integration, and organizational policies.

RECOMMENDATIONS

The study recommends that improvement in use of EDI at the customer service level can enhance services offered to be efficient and effective. This can reduce costs, paperwork and increased productivity of the personnel. Additionally, the study recommends for better management of cost reduction by application of EDI software systems in an organization. This can reduce time and effort required to complete purchasing transactions.

Further the study recommends for effective organizational policies that assist in lowering cost and backorders through EDI as such policies affect supply chain performance. Finally, the study recommends the use of EDI in fast truck integration of customers and suppliers' processes. This will strengthen buyer/supplier collaboration to enhance competitive advantage through information sharing and making joint decisions.

LIMITATIONS OF THE STUDY

The limitation was some targeted respondents were reluctant to share sensitive information while others misinterpreted the intentions behind the research and refuse to provide accurate information for fear of disclosure besides assurances of confidentiality. However, by discussing the relevance of the study to the respondents it helped to provide the required information. The researcher presented an introduction letter obtained from the university to the organization management and this helped to avoid suspicion and enabled the organization management to disclose much of the information sought by the study. The issue of unreturned questionnaires and uncooperative respondents proved difficult for the researcher. The respondents were assured that the research was only for academic writing, and would not jeopardize their positions in any way. Follow ups were also be made to facilitate the response rate.

SCOPE FOR FURTHER RESEARCH

Since this study was on the role of electronic data interchange on supply chain performance in manufacturing sector in Kenya; the study recommends that; Similar and other studies should be conducted in other manufacturing enterprises for comparison purposes and to allow for generalization of findings on supply chain performance. There is also a need to carry out a further research on the other factors (24.70%) that influence supply chain performance.

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