Journal of International Business, Innovation and Strategic Management
Vol 1 Issue (2), 61-80
ISSN: 2617-1805 (Print)

Effect of Enterprise Resource Planning On Supply Chain Performance of the Energy Sector in Kenya: A Case Study of Kenya Power Limited

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To cite this article:

Hassan, R. (2018). Effect of Enterprise Resource Planning On Supply Chain Performance of the Energy Sector in Kenya: A Case Study of Kenya Power Limited. *Journal of International Business, Innovation and Strategic Management*, 1(2), 61-80

Abstract: While enterprise resource planning systems provide promising potential, it is reported that only 10% of firms that use ERP systems have gained substantial benefits. Kenyan energy companies endeavor to improve their performance through operational efficiency has led them to adopt ERP systems. The Kenyan energy sectors have implemented ERP systems but that is not evident on performance and efficiency. For Example Kenya Power Limited (KPL) implemented the SAP R/3 system in 1997 and yet it has been performing poorly. It is due to this that the current study will seek to establish the effect of enterprise resource planning applications on supply chain performance of the energy sector in Kenya. The study specifically sought to establish the effect of ERP in inventory management, quality management, warehouse management and customer relationship management on supply chain performance of energy sector in Kenya. This study employed descriptive research design. The target population of this study consisted of all the 280 employees in management positions from the operations, Human Resource, Quality Assurance, Finance, Supply Chain, Technical Services, Information Technology, Projects and Strategy, Regulatory Affairs and Transport as well as Administration departments. The study used descriptive research design. A sample size of 96 was sampled randomly from this population and be used in responding to the questionnaire. An ordinary least square regression model was used. Findings were presented using tables, graphs and charts. The study findings indicated that all the predictor variables were positively and significantly correlated to supply chain performance. The findings also established that all the predictor variables were positively and significantly related to supply chain performance. The study recommends that the management of KPLC should aim to improve the implementation of ERP in inventory management since it leads to better supply chain performance. The study also recommends that the management of KPLC should encourage the use of ERP in many more quality management activities since this would lead to a more improved supply chain performance. Another recommendation made by the study is that the management of KPLC should come up with strategies which will lead to increased adoption of ERP in warehouse management for instance in activities like valuation of inventory and automation of inbound operations since is positively related to supply chain performance.

Keywords: *Inventory management, Quality management, warehouse management, Customer relationship management, Supply chain performance*

Introduction

The globalization of competition means that apart from ensuring their own successful operation, companies that hope to survive must establish highly responsive supply chains, with upstream, midstream, and downstream partners (Yang,Wang & Li, 2009). The Enterprise Resource Planning (ERP) system plays the role of central nervous system in promoting globalization of enterprise operations and shortening product lifecycle. Rashid, Hossain and Patrick (2002) give the following as some of the core ERP modules that are found in the successful ERP systems: accounting, financial, manufacturing, production, transportation, sales and distribution, human resources, customer relationship and ebusiness among others. The five dominating ERP software suppliers are SAP, Oracle, PeopleSoft, Baan and J.D. Edwards. According to Addo and Helo (2011) ERP systems enables the company integrate all the primary business in order to enhance efficiency and maintain a competitive positionbutwithout successful application of the system, the projected benefits of improved productivity and competitive advantage would not be forthcoming. ERP is a companywide information system that controls the business processes, information, align transactions to ensure performance, ensure optimization using universally accepted practices. ERP has the potential to cover the entire value chain under a cohesiveplatform supporting management decisions, information access, process support and improvements.

In addition a lot of organizations have adopted and applied Enterprise Resource Planning (ERP) systems. An ERP system can be characterized as an information system made up of different modules, each supportingthe business processes. The modules are integrated and all gathered data are stored in a central database (Aernoudts, Boom, Pijl&Vosselman, 2005). The fact that all data are centrally stored makes it possible to extract data into information. The most popular reasons that have been given by firms for implementing ERP systems include the need to standardize and improve processes, to improve information quality, and to improve systems integration (Jacobs, Chase &Aquilano, 2009). Other firms considered extending their system scope to integrate their suppliers, customers or both to the system in order to increase their supply chain functionalities (Olhanger&Selldin, 2003). ERP solutions can be said to be the vital backbone on which effective, cost efficient and dynamic supply chain collaboration can take place. However, the adoption of ERP has made possible the sharing of large amounts of information along the supply chain, and has enabled real time collaboration between supply chain partners, providing organizations with forward visibility, thus improving inventory management and distribution.

ERP can be said to be an essential enabler of SCM competencies (Akkermans, Bogerd&Yucesan, 2003). For a company to provide effective ERP integration to the supply chain management, it should encompass all the functions responsible for development and execution of each of the core functions: plan, source, make, deliver, and return processes, as well as the supporting infrastructure (Cohen, 2006). It has been seen that ERP applications in the supply chain are able to ensure real-time production data exchange with suppliers, eliminate the need for excess stock through demand planning, supply planning, forecasting, automatic allocation, and continuous replenishment programs.

This in turn will increase inventory turnover, reduce inventory levels and increase on-time program deliveries. Customer service levels will improve, since an organization is able to track inventory throughout its life cycle and to know at all times what is available-to promise at all locations (PwC, 2012).

Statement of the Problem

Firms that use ERP systems hope to gain benefits from integration of data and business processes across different business functions, such as quality management, inventory management, warehouse management and

customer relationship management. Nonetheless, while enterprise resource planning systems provide promising potential, it is reported that only 10% of firms that use ERP systems have gained substantial benefits (Yusuf, Gunasekaran & Wu, 2006). Gargeya & Brady (2005) state that studies, mostly conducted in developed countries, show that organizations often run into costly and sometimes fatal difficulties with implementation and subsequent maintenance of ERP systems. Kenyan energy companies endeavor to improve their performance through operational efficiency has led them adopt ERP systems. In Kenya, some public companies have successfully implemented ERP systems. For instance KPA introduced SAP ERP to automate work processes in order to increase efficiency (Wanyama, 2013).

According to Otieno (2010) the Kenyan energy sectors have implemented ERP systems but that is not evident on performance and efficiency. For Example Kenya Power Limited (KPL) implemented the SAP R/3 system in 1997 but is yet to realize optimum benefits from ERP investments. This is because the basic infrastructure for supporting ERP is insufficient to enable the company reap optimum benefits from ERP investments. ERP implementation and usage also require specialized skills which is not sufficiently available in the company (Otieno, 2010). Studies have extensively investigated the use of ERP in the Kenyan sectors. It is however worth noting that the focus has purely been on the challenges of implementation of the system and not on its effect thus presenting conceptual research gaps. Studies that have focused on the application of this system in the energy sector are Mwatua (2010) and Kutswa (2011). The two studies focused on the challenges of implementing the system in the energy sector thus presenting conceptual research gaps.

Other studies have linked ERP to performance, for instance, Ogutu (2014) who linked the use of ERP on performance of the energy sector also presenting a conceptual research gap. The contrast however is the focus on the overall performance and not on supply chain performance. Other studies for instance a study by Makori (2014) focused on performance but in a different sector and not energy sector thus presenting contextual research gap. This builds a strong case for conducting this study. The study hence focused on establishing the effect of enterprise resource planning applications on supply chain performance of the energy sector in Kenya.

Specific Objectives

i. To establish the effect of inventory management on supply chain performance of energy sector in Kenya
ii. To determine the effect of quality management on supply chain performance of energy sector in Kenya
iii. To find out the effect of warehouse management on supply chain performance of energy sector in Kenya
iv. To assess the effect of customer relationship management on supply chain performance of energy sector in Kenya

Literature Review

Theoretical Review

System Theory

System theory was developed by Bertalanffy (1968) as the basis for the field of study known as ‘general system theory’, a multidisciplinary field. Some influences from the contingency approach can be found in system theory. Systems theory is the interdisciplinary study of systems in general, with the goal of elucidating principles that can be applied to all types of systems at all nesting levels in all fields of research (Bertalanffy,

1968). General systems theory emphasizes the way in which organized systems (human and non-human) respond in an adaptive way to cope with significant changes in their external environments so as to maintain their basic structures intact.

Systems theory models of decision-making in human groups and organizations emphasize their interaction with "outside" actors and organizations and concentrate on identifying the particular elements in the environment of the group or organization that significantly affect the outcomes of its decision-making. To understand what an organization did, try to find out what threat or opportunity it was responding to and how its pre-existing response mechanisms worked to do this (Bertalanffy, 1968).According to this school of thought, systems (such as enterprise resource planning systems) are characterized by a combination of interdependent parts (Enterprise resource planning system modules) that result in flows across these parts. Among the flows that link parts of a system, the flow of information is viewed as the most critical (Scott, 2003). Hence, an understanding of information flows is necessary to exploit the strength of each of the parts (enterprise resource planning modules) and the system as a whole (the enterprise resource planning system).

Organizational Information Processing Theory (OIPT)

Organizational information processing theory (OIPT), a specific contingency approach that also has roots in general system theory, was developed by Galbraith (1973) to explain the information processing phenomena (Galbraith, 1973, 1974, 1977; Huber, 1990; Knight & McDaniel, 1979; Tushman and Nadler, 1978). We concur with prior ERP research (Chou & Chang, 2008; Gattiker & Goodhue, 2004, 2005) that OIPT is an appropriate theoretical lens that takes a systemic approach to explore ERP system and its influence on supply chain performance. The ensuing discussion uses OIPT as the theoretical underpinning of the effects of ERP systems on supply chain performance. Organizational Information Processing Theory focuses on the limited ability of organizations to process information.

Uncertainty is a central concept in the theory that drives the need for information processing. When uncertainty is low, firms typically use four mechanisms to increase coordination among interdependent organizational tasks hierarchy of authority, rules and programs, planning and goal setting, and narrow span of control. However, when uncertainty is high, firms tend to address it in two ways. One approach is to reduce the need for information that is processed through the use of slack resources, self-contained tasks, or environment management. The other approach is to increase the capacity to process information through the use of information systems (IS) or lateral relations (Galbraith, 1977). Low uncertainty environments are an anomaly in today’s world (Galbraith, 2002).

Organizational Fit Theory

The theory was proposed by Drazin and Van de Ven (1985). This theory is also known as cultural fit theory. This theory observes that “no one acts alone” and everyone placed in his environment has technical and nontechnical elements that shape or influence the innovation of technology. This theory is dependent on the perfect mix of strategy, technology, task, organizational size, structure, and culture of the organization as there is no universal way to management for maximum efficiency and optimal performance to form a proper 'fit' with the environment and its systems (Reinking, 2012). Hence, there must be congruence between the information system and the organizational as information systems become more and more integral to the business.

The institution must strive to find a system that is a good fit for the organization that quickly and naturally fall into the rhythm with the organization.

As Otieno (2010) finds out from survey findings, that public organizations favored SAP/R3 more than private organizations (41.5% vs 10.5%) adoption driven by their best fit, current business practices and package flexibility as more firms favored systems evolved from MRP II while the private firms (71% vs 42%) favored a mix of multiple systems which he owed the phenomenon to complexity of the organizations (Otieno, 2010). He noted that private firms are more likely to be involved in more business, complex operations, and more presence locally and globally as such ERP systems might not be covering their needs which in cases might be specialized. On the other hand, local legislation has a great impact on public institutions as systems have to be configured to conform to Kenya's complex taxation policy, tax returns process, and lack of legislation to support electronic documents.

The Resource Based View (RBV)

This theory states that to transform a short-run competitive advantage into a sustained competitive advantage requires that these resources are heterogeneous in nature and not perfectly mobile. Effectively this translates into valuable resources that are neither perfectly imitable nor substitutable without great effort. If these conditions hold, the bundle of resources can sustain the firm's above average. Barney (2011) argues that the RBV approach has evolved from a nascent, upstart perspective to one of the most prominent and powerful theories for describing, explaining, and predicting organizational relationships. The RBV theory attempts to explain how technology creates value (Zhu & Kraemer, 2005). The RBV theory attributes improvement in firm performance to valuable resources or resource bundles (Barney 1991, Peteraf 1993). ICT creates value to the firm indirectly as it affects other resources or processes which in turn lead to performance improvement and hence competitive advantage.

Therefore, researchers may find it particularly beneficial to use intermediate-level dependent variables at the business process, department, or project level (Wade & Hulland 2004). In light of this logic, the study will particularly address the impact of ICT on warehouse management through which such impact can be felt in the organization. Revenue generation and cost reduction are the two major dimensions of process performance improvements through supply chain integration ICT adoption is aimed at process improvement primarily cost reduction and revenue generation (Mukhopadhyay & Kekre, 2002). Such improvements, seen from the RBV, stem from resource synergy along the supply chain. Effective SCM aims to synchronize supply, production, and delivery (Lee et al, 2000).

For this to happen, firms needs to leverage the connectivity of the Internet to create an inter-firm digital platform, enabling real-time information sharing, and improving coordination of allocated resources across the supply chain (Lee, 2004). The digital platform helps establish connections among separate resources owned by supply chain partners, thus translating them into bundles of coexisting resources responsive to each other (Zhu & Kraemer, 2002). This is consistent with the notion of creating resource synergy as advocated by the RBV (Conner, 1991).

Conceptual Framework

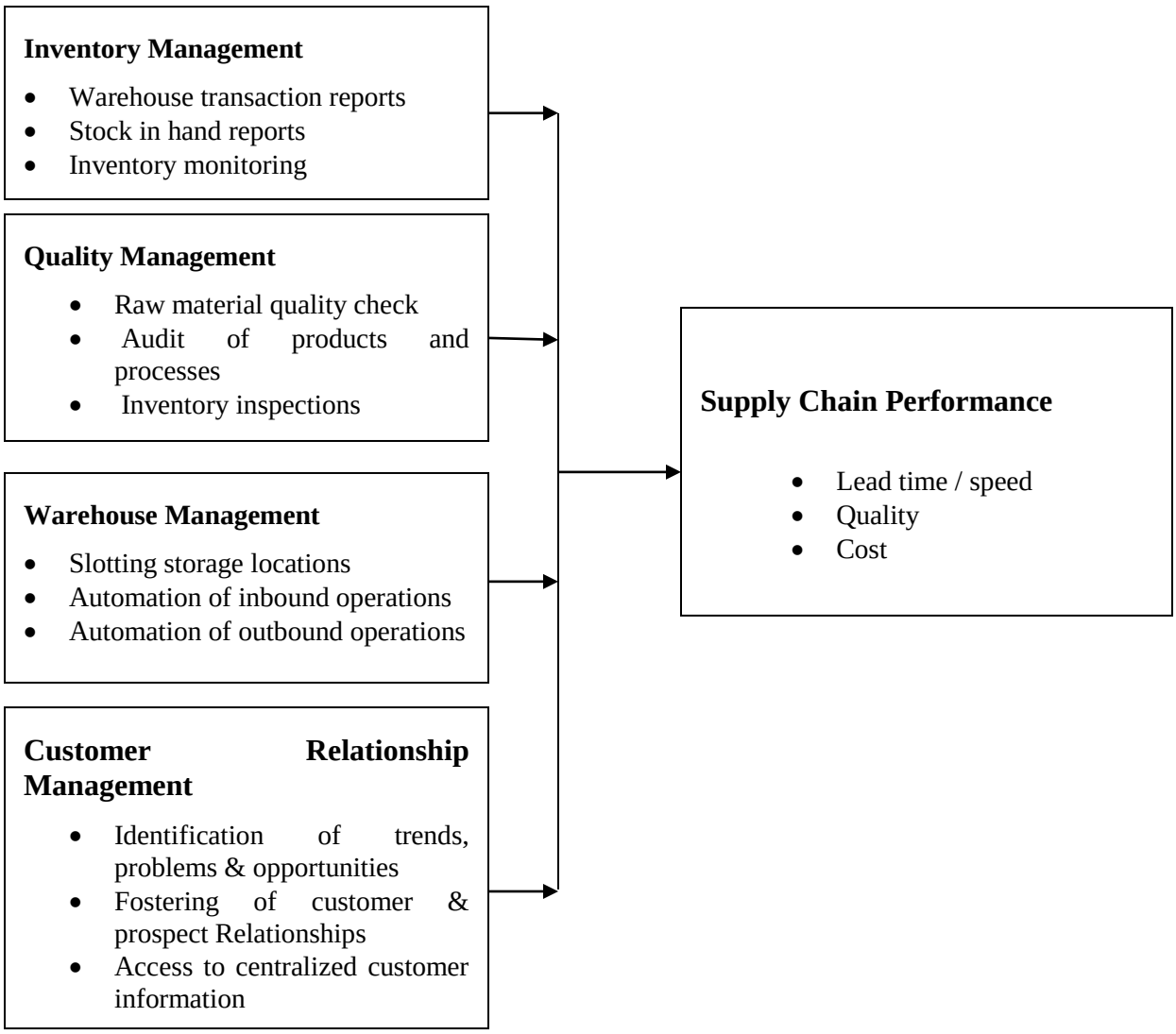

Figure 2.1: Conceptual Framework

Research Methodology

This study employed descriptive research design. Descriptive research is conducted to describe the present situation, what people currently believe, what people are doing at the moment and so forth (Collins, Onwuegbuzie and Jiao, 2007). According to the KPLC human resource department (2015), the company has 7060 employees with 280 in management positions. The study target population comprised of those in management positions from the operations, Human Resource, Quality Assurance, Finance, Supply Chain, Technical Services, Information Technology, Projects & Strategy, Regulatory Affairs and Transport & Administration departments. The sampling frame of the study was respondents from the top and middle level management positions from the operations, Human Resource, Quality Assurance, Finance, Supply Chain, Technical Services, Information Technology, Projects & Strategy, Regulatory Affairs and Transport & Administration departments.

The study respondents were 96. The use of employees from the departments is because of their knowledge regarding operation of enterprise resource planning due to its application in the departments. The study used quantitative primary data gathered by use of closed ended questions. The data collection instrument to be used was a structured questionnaire. SPSS was used to produce frequencies, descriptive and inferential statistics which were used to derive conclusions and generalizations regarding the population. Data was presented using charts, graphs and Tables. A multiple linear regression model was used to test the significance of the effect of enterprise resource planning applications on supply chain performance of the energy sector in Kenya. The multiple linear regression model is as laid below. $Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e$

Where: Y = Supply Chain Performance X_1 = ERP in Inventory and Material Management, X_2= ERP in quality management, X_3 = ERP in warehouse management X_4 = ERP in customer relationship management, e= Error term and α= constant and β= coefficient of independent variables

Results

Demographic Characteristics

Gender Composition of Respondents

Results in Figure 2 reveal that a majority of the respondents, 61% were male while 39% were female. The results imply that there is a gender disparity among top management employees at KPLC where majority number of employees were male. The findings can imply that the energy sector is male dominated.

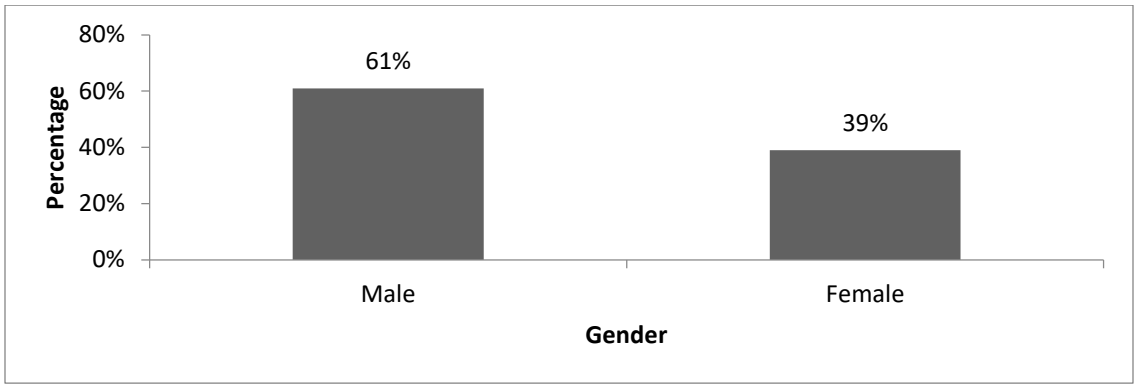

Figure 2: Gender Composition of Respondents

Age bracket of Respondents

Results in Figure 3 reveal that majority, 42%, of the respondents were aged above 45 years, 33% were aged between 36 and 45 years while those aged between 26 and 35 years were 14%. 11% of the respondents were aged 18 and 25 years. The findings imply that majority of respondents were aged between 45years and above. Age can be associated with working experience. The fact that majority of the respondents were aged 45 years and above might imply that they were more experienced in their respective jobs.

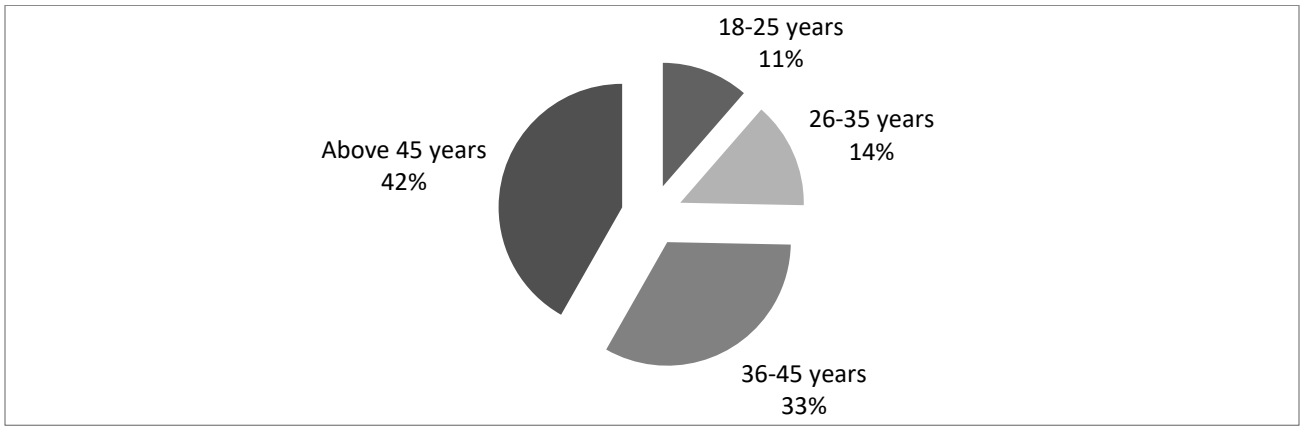

Figure 3: Age bracket of Respondents

Position of Respondents

Results in Figure 4.4 reveal that 72.7% of the respondents were assistant managers while only 27.3% were managers. The findings imply that information used in the study was obtained from the targeted group of respondents hence valid to be used in making conclusions regarding the variables. This also shows that the study covered relevant the positions in the firms thus the information provided by the respondents was reliable for the study.

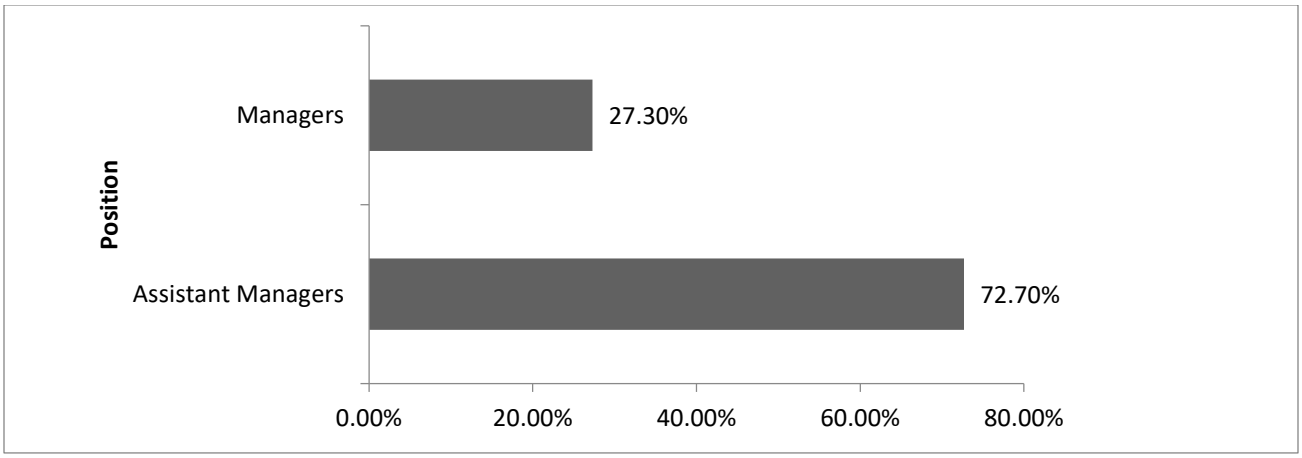

Figure 4: Position of the respondents

Work experience

Results in Figure 5 reveal that 49% of the respondents had work experience of more than 4 years. 35% had work experience of between 2 to 4 years and 16% of respondents had work experience of less than 2 years. Majority of the respondents had worked in the energy sector for over 4 years hence they had high understanding of the questions under the questionnaire regarding the energy sector. This contributed to accuracy of the data collected and hence high validity required. Meaningful conclusions can hence be made from the data collected in this study.

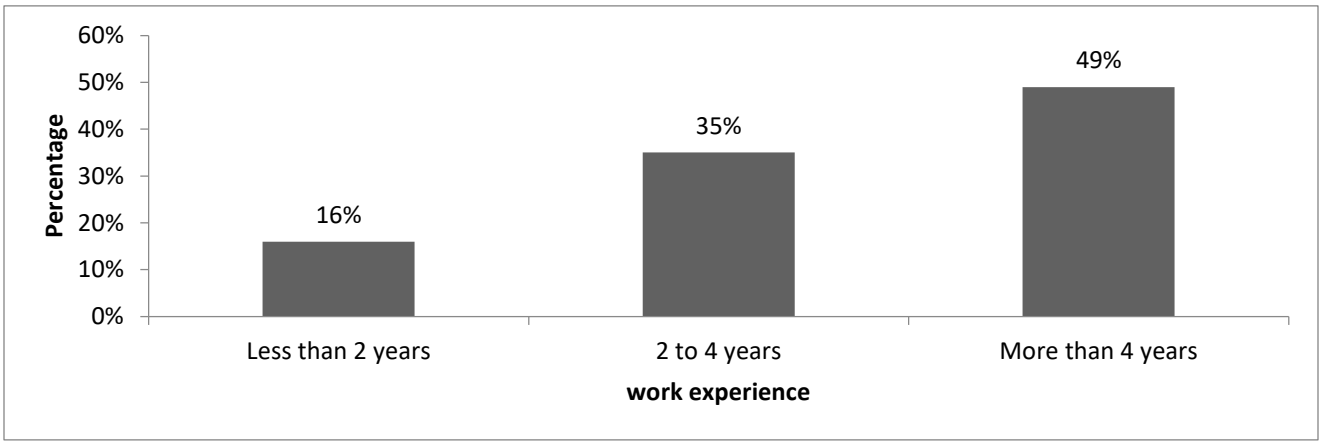

Figure 5: Work experience

Descriptive Analysis

The respondents were requested to indicate their agreement or disagreement with statements based on the five variables under study namely application of ERP in inventory management, quality management, warehouse management, customer relationship management and supply chain performance. The statements were on a scale of 1 to 5 where 1 was strongly disagree, 2 was disagree, 3 was neutral,4 was agree and 5 was strongly agree. The descriptive analysis per variable is as presented. Average response per variable and standard deviation were also established.

Inventory management

The respondents were asked to indicate whether ERP was used in inventory management. The findings presented on Figure 6 indicate that 93% of the respondents agreed that ERP was used in inventory management while only 7% said that it was not. The findings imply that there is adoption of ERP system in inventory management at KPLC. The findings are consistent with an argument by Otieno (2010) that the Kenyan energy sectors have implemented ERP systems but that is not evident on performance and efficiency.

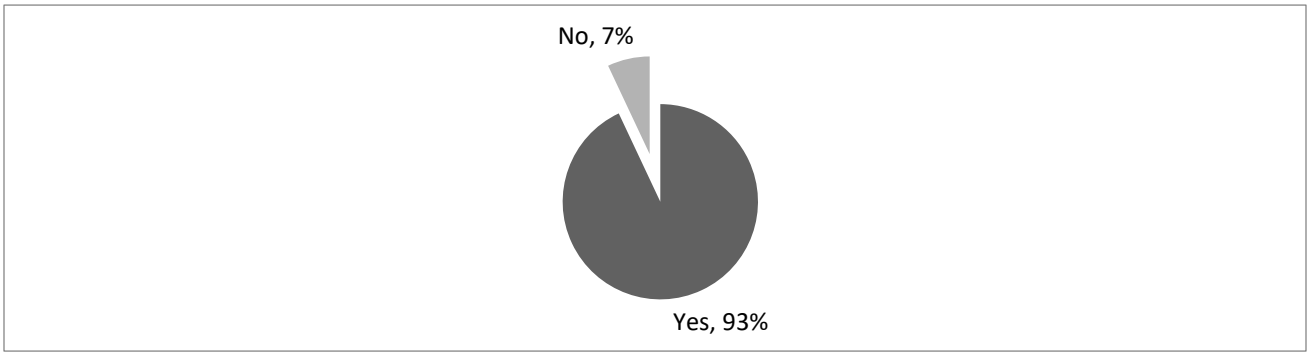

Figure 6: Use of ERP in Inventory management

The respondents were further asked to rate statements on the use of ERP in inventory management on a scale of 1 to 5. The findings indicated that majority of the respondents neither agreed nor disagreed with the statements concerning inventory management as indicated by an overall mean score of 2.785. The respondents were neutral on the statement that the company uses ERP in tracking warehouse transaction reports, preparation of stock in hand reports, in inventory monitoring as well as in reporting inventory status as indicated by a mean score of 2.85, 2.55, 2.55 and 2.75 respectively. Majority of the respondents disagreed with the statement that the company uses ERP in setting inventory targets process while majority agreed that the company uses ERP in reconciling inventory balances as indicated by mean score of 2.02 and 3.99 respectively. The study findings agree with the argument by Tarn & Beaumont (2002) : Goyal (2006) that some of the activities of inventory and material control which require the use of ICT involves identifying inventory requirements, setting targets, providing replenishment techniques and options, monitoring item usages, reconciling the inventory balances, and reporting inventory status. KPLC uses some ERP to conduct some of these activities.

Table 1: Descriptive analysis of inventory management

Statement	1	2	3	4	5	Mean	Std Dev
The company uses ERP in tracking warehouse transaction reports	27.50%	20.80%	14.10%	14.10%	23.50%	2.85	1.54
The company uses ERP in preparation of stock in hand reports	35.90%	13.70%	23.40%	13.70%	13.30%	2.55	1.43
The company uses ERP in inventory monitoring	29.70%	19.90%	25.40%	15.20%	9.80%	2.55	1.32
The company uses ERP in setting inventory targets	48.40%	21.50%	16.80%	6.60%	6.60%	2.02	1.23
The company uses ERP in reconciling inventory balances	12.50%	5.10%	6.20%	23.40%	52.70%	3.99	1.39
The company uses ERP in reporting inventory status	20.50%	28.70%	30.80%	12.40%	7.60%	2.75	1.30
Average						**2.785**	**1.368**

Quality management

The respondents were asked to indicate whether ERP was used in quality management. The findings presented on Figure 7 indicate that 95% of the respondents said that ERP was used in quality management while only 5% said it was not. The findings imply that there is adoption of ERP system in quality management at KPLC. The findings are consistent with Wanyama (2013) who indicated that some public companies in Kenya have successfully implemented ERP systems to automate work processes in order to increase efficiency.

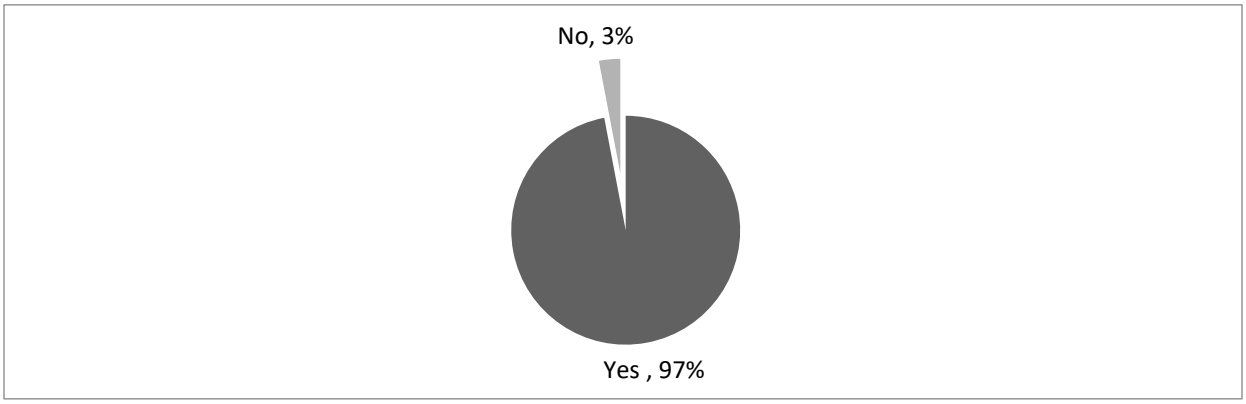

Figure 4.7: Use of ERP in quality management

The respondents were further asked to rate statements on the use of ERP in quality management on a scale of 1 to 5. Overall, the findings indicate that majority of the respondents neither agreed nor disagreed with the statements concerning quality management as indicated by a mean score of 3.432. The results indicated that majority of the respondents agreed that the company uses ERP in inventory inspections as well as defect tracking as indicated by a mean score of 4.06 and 4.09 respectively. Further results indicated that majority of the respondents neither agreed nor disagreed with the statement that the company uses ERP in audit of products and processes, the company uses ERP in procurement processes and that the company uses ERP in controls. This is supported by a mean score of 3.03, 2.75 and 3.23 respectively. These findings are consistent with arguments by Pyzdek & Keller (2010) and Lee, Olson, Lee, Hwang & Shin (2007) that quality management practices include continuous quality improvement, Six sigma practice and lean production where continuous quality improvement practice is an ongoing effort to improve products, services or processes.

Table 2: Descriptive analysis of quality management

Statement	1	2	3	4	5	Mean	Std Dev
The company uses ERP in audit of products and processes	16.50%	20.40%	23.90%	22.40%	16.90%	3.03	1.33
The company uses ERP in inventory inspections	4.70%	11.30%	11.30%	18.40%	54.30%	4.06	1.24
The company uses ERP in defect tracking	1.60%	7.80%	12.50%	35.90%	42.20%	4.09	1.00
The company uses ERP in procurement processes	27.70%	12.10%	25.00%	27.70%	7.40%	2.75	1.32
The company uses ERP in controls	15.60%	11.30%	32.80%	15.20%	25.00%	3.23	1.36
Average						**3.432**	**1.25**

Warehouse management

The respondents were asked to indicate whether ERP was used in warehouse management. The findings presented on Figure 8 indicate that 96% of the respondents agreed that ERP was used in warehouse management while only 4% disagreed. The findings are consistent with the findings of Mwatua (2010) and Kutswa (2011) who indicated that there is application of ERP in the Kenyan energy sector.

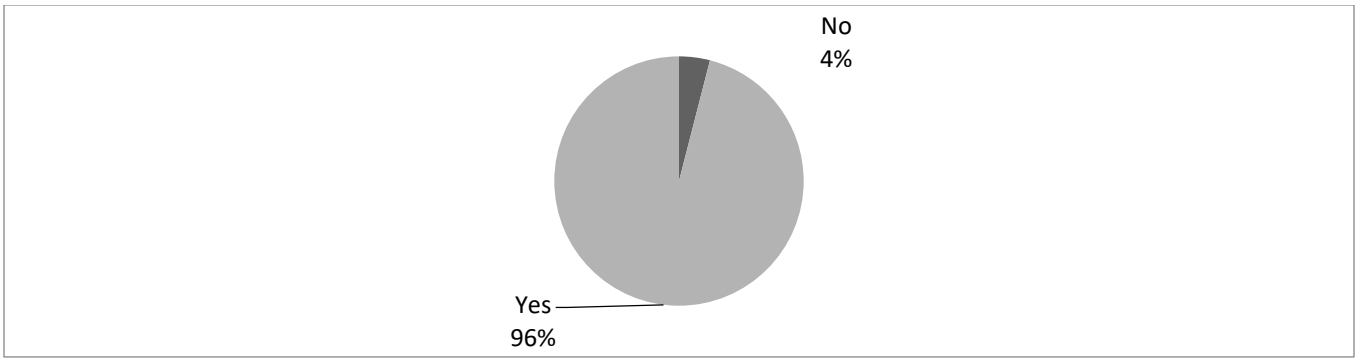

Figure 8: Use of ERP in warehouse management

The respondents were further asked to rate statements on the use of ERP in warehouse management on a scale of 1 to 5. Overall, the findings indicate that majority of the respondents neither agreed nor disagreed with the statements concerning warehouse management as indicated by a mean score of 2.73. The findings indicated that majority of the respondents agreed with the statement that the company uses ERP to support linked facilities as shown by a mean score of 3.53. The respondents neither agreed nor disagreed that the company uses ERP to value inventory and automate inbound operations as shown by a mean score of 3.12 and 3.16 respectively. Majority further disagreed that the company uses ERP to automate outbound operations and to make inventory be up to date as indicated by a mean score of 1.94 and 1.90 respectively. These findings are consistent with Obal (2007) who indicated that the use of ERP system in warehouse management supports integrated functionality that automates inbound, warehousing and outbound operations, resulting in improved productivity, space utilization and customer satisfaction. Furthermore, the results are consistent with an argument by Lee, Zhang and Au (2009) who argued that the use of ERP in warehouse management allows items to be easily tracked with respect to the basic warehousing handling activities such as receiving, putting away, picking and shipping.

Table 3: Descriptive analysis of warehouse management

Statement	1	2	3	4	5	Mean	Std Dev
The company uses ERP to automate inbound operations	18.40%	10.90%	26.60%	28.50%	15.60%	3.12	1.32
The company uses ERP to automate outbound operations	59.00%	10.50%	14.10%	10.50%	5.90%	1.94	1.3
The company uses ERP to support linked facilities	17.20%	6.60%	16.00%	26.20%	34.00%	3.53	1.45
The company uses ERP to value inventory	25.30%	8.80%	21.80%	25.70%	18.40%	3.16	1.29
The company uses ERP to make inventory be up to date	53.10%	13.30%	16.20%	9.70%	7.70%	1.90	1.33
Average						**2.73**	**1.338**

Customer Relationship Management

The respondents were asked to indicate whether ERP was used in customer relationship management. The findings presented on Figure 9 indicate that majority, 98% of the respondents agreed that ERP was used in warehouse management while only 2% said it not which implies adoption of ERP system in customer relationship management at KPLC. The findings confirms the findings of a study by Ogutu (2014) who indicated that ERP is indeed being used in the energy sector in Kenya and even linked the use of ERP on performance of companies in the energy sector in Kenya.

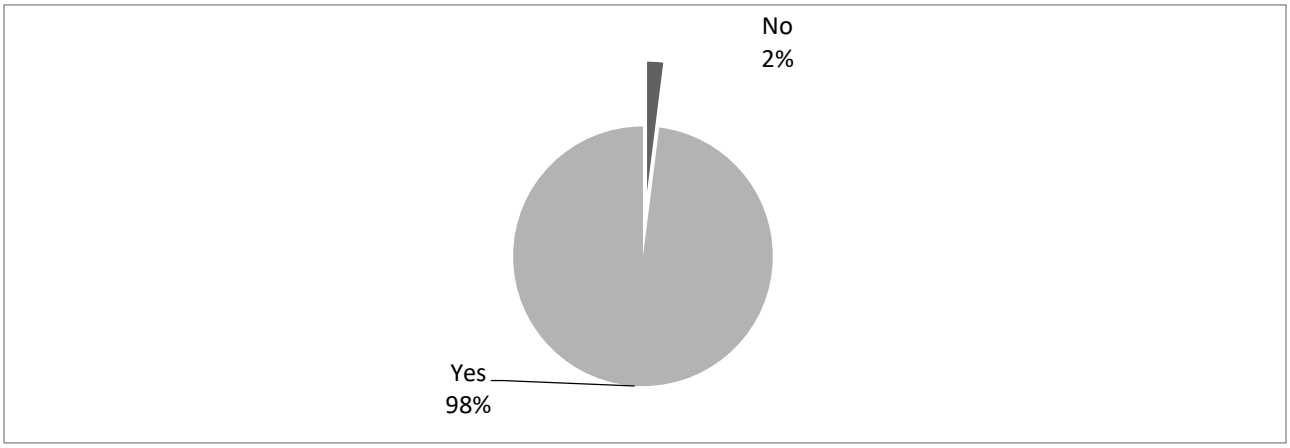

Figure 9: Use of ERP in customer relationship management

Statements on the use of ERP system on customer relationship were rated and findings presented on Table 4.4. The results indicated an overall mean score of 3.63 which indicated that majority of the respondents agreed on most statements concerning customer relationship management. Mean scores of 3.62, 4.07, 3.5, 4.05 and 3.6 indicated that majority of the respondents agreed that the company uses ERP for real time availability checks, contract management, billing management, order tracking and customer segmentation. Majority of the respondents were neutral on the statement that the company uses ERP for collaborative order management as shown by a mean score of 3.30. The findings of the study are consistent with the argument by Chalmers (1999) and Rashid, Hossain and Patrick (2000) who indicated that ERP can be used for customer relationship management activities like automating and streamlining of front-office functions such as sales, marketing, collaborative order management, and customer service, real-time availability checks, contract management, billing management, fulfillment visibility, and order tracking besides facilitating marketing planning, campaign management, telemarketing, lead generation and customer segmentation.

Table 4: Descriptive analysis of customer relationship management

Statement	1	2	3	4	5	Mean	Std Dev
The company uses ERP for collaborative order management	12.10%	16.40%	19.10%	34.00%	18.40%	3.3	1.28
The company uses ERP for real time availability checks	6.60%	17.60%	13.70%	31.60%	30.50%	3.62	1.27
The company uses ERP for contract management	1.60%	5.90%	14.80%	39.50%	38.30%	4.07	0.95
The company uses ERP for billing management	18.00%	14.10%	5.90%	23.80%	38.30%	3.5	1.54
The company uses ERP for fulfillment visibility	11.20%	15.30%	21.20%	32.10%	20.20%	3.29	1.29
The company uses ERP for order tracking	2.50%	7.70%	12.90%	38.60%	37.40%	4.05	0.97
The company uses ERP for customer segmentation	16.20%	15.10%	7.80%	25.60%	35.40%	3.6	1.57
Average						**3.632**	**1.267**

Supply Chain Performance

A trend analysis was also established to indicate a change in the lead time, revenue, costs of operation and number of innovations in supply chain. The results presented on Figure 10 revealed that lead time has indicated fluctuating average changes from the year 2011 to the year 2015. Similar trends are seen in revenue of KPLC over the same period of time. There is instability in the changes in revenue recorded over the period. Furthermore, unsteady increasing and decreasing trends of average changes in operational costs is also indicated. The changes in the number of innovations has also has continued to record decreasing gradual trends over the study period. These findings confirm the problem which led to this study being conducted. The main problem was fluctuations and poor supply chain performance in the energy sector in Kenya. The findings are consistent with the findings of a study by Otieno (2010) who stated that even though the Kenyan energy sectors have implemented ERP systems, there has been no evidence on performance and efficiency.

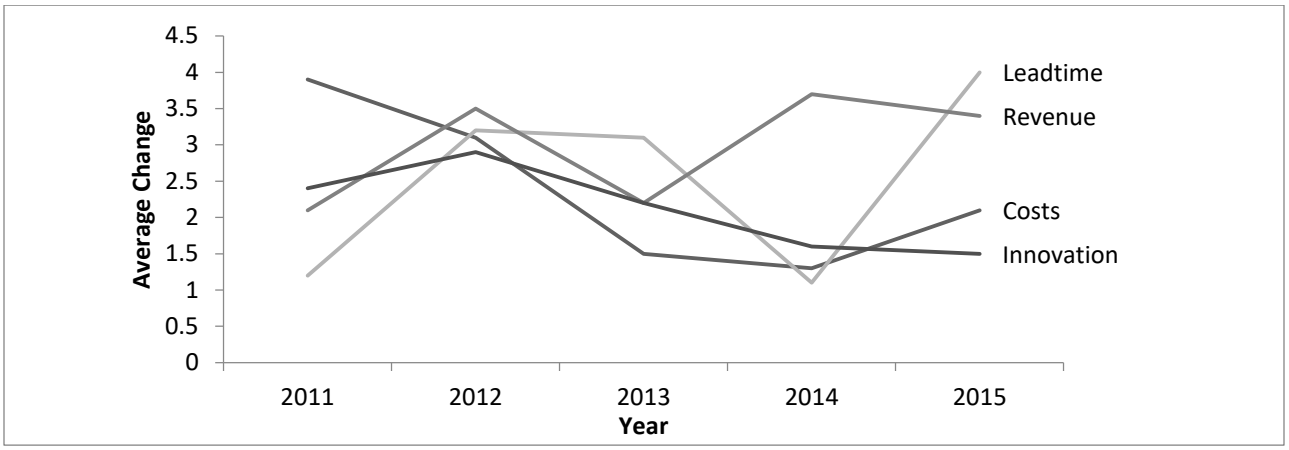

Figure 10: Trend Analysis of Performance

The respondents were also asked to rate statements on supply chain performance of KPLC. The study findings indicated that respondents were in agreement with the statements on supply chain performance. Majority of the respondents agreed that there has been a decreased lead time between processes in the company, the quality of service delivered has improved as shown by decreased customer complaints, the costs of operations have decreased and there has been an increased number of innovations. This is shown by mean scores of 4.17, 4.28, 4.26 and 4.19 respectively. Majority of the respondents were neutral on the statement that the revenue generated has improved as shown by mean score of 3.21.

Table 5: Descriptive Analysis of Supply Chain Performance

Statement	1	2	3	4	5	Mean	Std Dev
There has been a decreased lead time between processes in the company	1.60%	1.60%	23.80%	24.60%	48.40%	4.17	0.95
The quality of service delivered has improved as shown by decreased customer complains	1.60%	2.00%	8.20%	43.40%	44.90%	4.28	0.82
The costs of operations have decreased	0.40%	7.80%	14.10%	21.10%	56.60%	4.26	1
The revenue generated has improved	22.00%	13.30%	12.90%	25.50%	26.30%	3.21	1.51
There has been an increased number of innovations	2.50%	2.70%	21.90%	27.40%	45.50%	4.19	0.96
Average						4.022	1.048

Correlation Analysis

Correlation analysis was conducted to establish the association between the study variables. A correlation matrix was used to indicate the correlation coefficients. The findings of the study indicates that the use of ERP in inventory management was positively and significantly associated with performance (R=0.493, P-Value = 0.000). The correlation was significant at 1% level of significance. The results imply that the more ERP is used in inventory management the better the supply chain performance. The findings are consistent with the findings of a study by Kamakia (2015) who indicated that proper inventory management mechanisms lead to an improvement of Supply Chain Performance of firms. The findings also revealed that the use of ERP in warehouse management was positively and significantly associated with performance (R=0.679, P-Value = 0.000). The correlation was significant at 1% level of significance.

The implication of the results is that the more ERP is used in warehouse management the better the supply chain performance. These findings are consistent with the findings of a study by Makori (2014) which revealed a positive significant relationship between ERP applications in activities including warehouse management and supply chain performance despite the challenges that are faced by organizations when it comes to implementation of ERPs. Further findings revealed that the use of ERP in quality management was positively and significantly associated with performance (R=0.575, P-Value = 0.000). The level of significance of correlation was significant at 1%. The results imply that the more ERP is used in quality management the better the supply chain performance. The findings are consistent with Madapusi (2008) who argued that companies must deploy the quality management module since it contributes significantly to all performance measures. The findings are further consistent with an argument by Dudgikar, Kumthekar and Khot (2012) who also also agreed that the quality module nurtures the seeds of lasting improvements in supply chain performance. The study results also indicated that the use of ERP in customer relationship management was positively and significantly associated with performance (R=0.576, P-Value = 0.000). The correlation was significant at 1% level of significance. The result indicates better supply chain performance when ERP is used in customer relationship management.

Table 6: Correlation analysis

		Inventory management	Quality management	Warehouse management	Customer relationship management
Inventory management	Pearson Correlation	1			
Quality management	Pearson Correlation	.538**	1		
Warehouse management	Pearson Correlation	.535**	.613**	1	
Customer relationship management	Pearson Correlation	.154*	.373**	.477**	1
performance	Pearson Correlation	.493**	.575**	.679**	.576**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000

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

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

Regression Analysis

The general objective of the study was to establish the effect of enterprise resource planning on supply chain performance of the energy sector in Kenya. A regression analysis was used to link the study variables. The P-values of the beta coefficients of the model were used to test the significance of the effect of the predictor variables on the dependent variable and hence used to answer the research questions. The results for the model summary are presented in Table 7 showed that the use of ERP in inventory management, quality management, warehouse management and customer relationship management had a positive association with supply chain performance (R = 0.640). The results also revealed that the use of ERP in inventory management, quality management, warehouse management and customer relationship management jointly accounted for 41% of the variation in supply chain performance (R square = 0.41). A test was carried out to test the fitness of the model of effect of enterprise resource planning on supply chain performance of the energy sector in Kenya

Table 7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.640	0.41	0.401	0.54908

Results for the model summary indicated that the F statistic value of 43.602 was significant at 5% level of confidence (P-value = 0.000) which is less than 0.05, meaning that the model was significant and it fit well. This implies that the model linking the predictor variables (use of ERP in inventory management, quality management, warehouse management and customer relationship management) and the dependent variable (Supply Chain performance) was significant. It was hence a good predictor.

Table 8: Model Fitness (ANOVA)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	52.583	4	13.146	43.602	.000
	Residual	75.674	74	0.301		
	Total	128.257	78			

Table 4.9: Model Coefficients

		B	Std. Error	Beta	t	Sig.	VIF
1	(Constant)	2.331	0.173		13.446	0.000	
	Use of ERP in inventory management	0.196	0.042	0.301	4.716	0.000	1.73
	Use of ERP in warehouse management	0.260	0.065	0.288	4.016	0.000	2.188
	Use of ERP in quality management	0.217	0.052	0.251	4.191	0.000	1.529
	Use of ERP in customer relationship management	0.217	0.06	0.269	3.631	0.000	2.337

The study findings indicate that all the predictor variables were positively and significantly related to supply chain performance. Holding other factors constant, supply chain performance is 2.331. The results also indicate that no Variance Inflation Factor (VIF) above 10 was recorded which indicate that there was no problem of Multicollinearity among the independent variables. Multicollinearity is said to exist between two variables if they are highly correlated with a Pearson correlation coefficient greater than 0.8 (William, 2008). Multicollinearity affects the regression coefficients as it give spurious and highly sensitive results. Since the study established that there was no Multicollinearity, the coefficients indicated in the regression model were hence good predictors of supply chain performance in the energy sector in Kenya. The findings indicated that the relationship between the use of ERP in inventory management and supply chain performance was positive and significant (Beta = 0.196, Sig = 0.000). This implies that a one unit increase in the use of ERP in inventory management leads to a 0.196 units improvement in supply chain performance. The findings are consistent with Kamakia (2015) who indicated that proper inventory management mechanisms lead to an improvement of Supply Chain Performance of firms.

The relationship between the use of ERP in quality management and supply chain performance was positive and significant as shown by the results (Beta = 0.217, Sig = 0.000). This implies that a one unit increase in the use of ERP in quality management leads to a 0.217 units improvement in supply chain performance. The findings are consistent with the findings of a study by Fatuma (2015) conducted on quality management practices and supply chain performance of large scale manufacturing firms in Kenya and found that there is a positive relationship between dependent variable supply chain performance quality management. According to the findings, relationship between the use of ERP in warehouse management and supply chain performance was positive and significant as shown by the results (Beta = 0.260, Sig = 0.000). This implies that a one unit increase in the use of ERP in warehouse management results to a 0.260 units improvement in supply chain performance. These findings agree with the findings of a study by Nemati and Mangaladurai (2014) which established a positive and significant relationship between application of ERPS and supply chain performance of firms. Also the relationship between the use of ERP in customer relationship management and supply chain performance was positive and significant as shown by the results (Beta = 0.217, Sig = 0.000). This implies also that a one unit increase in the use of ERP in customer relationship management results to a 0.217 units improvement in supply chain performance. These findings are consistent with the findings of a study by Ogutu (2014) who conducted a study on enterprise resource planning systems and performance of power sector in Kenya and established that ERP system is predominantly used in supply chain management, customer service, production and distribution and has a positive effect on performance of the firm.

Conclusions

The results from the study led to the conclusion that ERP system is used at KPLC in inventory management mainly in tracking warehouse transaction reports, preparation of stock in hand reports, in inventory monitoring as well as in reporting inventory status. Another conclusion is that the use of ERP in inventory management is positively and significantly associated and related to supply chain performance. The study also concluded that ERP is used at KPLC in quality management mainly in inventory inspections and defect tracking. Furthermore, the use of ERP in quality management is positively and significantly associated and related to supply chain performance. Another conclusion made by the study is that ERP is used in warehouse management at KPLC mainly in to support linked facilities, to value inventory and automate inbound operations and to make inventory be up to date. The study also concluded that the use of ERP in warehouse management is positively and significantly associated and related to supply chain performance.

The findings also led to the conclusion that ERP is used at KPLC mainly for real time availability checks, contract management, billing management, order tracking and customer segmentation. Furthermore, the use of ERP in customer relationship management is positively and significantly associated and related to supply chain performance. Lastly, the study concluded that the use of ERP in inventory management, quality management, warehouse management and customer relationship management jointly accounted for 41% of the variation in supply chain performance of KPLC.

Recommendations of the Study

The study recommends that the management of KPLC should aim to improve the implementation of ERP in inventory management since it leads to better supply chain performance. The study also recommends that the management of KPLC should encourage the use of ERP in many more quality management activities since this would lead to a more improved supply chain performance. Another recommendation made by the study is that the management of KPLC should come up with strategies which will lead to increased adoption of ERP in warehouse management for instance in activities like valuation of inventory and automation of inbound operations since is positively related to supply chain performance. The study also recommends that the management of KPLC should encourage as well as come up with strategies geared towards improving as well as encouraging adoption of ERP system in customer management activities like availability checks, billing management and order tracking so as to save time and improve performance.

Conflict of Interest

No potential conflict of interest was reported by the authors.

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