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**INFLUENCE OF SUPPLIER QUALITY COMMITMENT ON
THE PERFORMANCE OF STATE CORPORATIONS IN
KENYA**



INFLUENCE OF SUPPLIER QUALITY COMMITMENT ON THE PERFORMANCE OF STATE CORPORATIONS IN KENYA

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Abstract

Purpose: The purpose of this study was to establish the influence of supplier quality commitment on the performance of state corporations in Kenya.

Methodology: The study adopted cross-sectional survey design using both quantitative and qualitative approaches. The target population was all the 187 state corporations in Kenya. The study employed a census approach. Primary data was collected using questionnaires. A pilot study was conducted to measure the research instruments reliability and validity. Descriptive statistics were used aided by Statistical Packages for Social Sciences version 24 to compute percentages of respondents' answers. Inferential statistics using linear regression and correlation analysis were applied to assist examining relationship between the research variables. The results were presented using tables and graphs.

Results: The study findings revealed that supplier quality commitment explained 34.6% of the total variations in performance of state corporations in Kenya. Further, results indicate that the overall model was statistically significant as supported by a p value of 0.000. This was supported by an F statistic of 74.994 and the reported p value (0.000) which was less than the conventional probability of 0.05 significance level. In addition, the study findings show that there is a positive and significant relationship between supplier quality commitment and performance of state corporations in Kenya as supported by a p value of 0.000 and a beta coefficient of (0.793). This implies that an increase in supplier quality commitment by 1 unit would increase the performance of state corporations by 0.793 units.

Unique contribution to theory, practice and policy: Based on the findings, the study recommended that organizations should consider the following quality dimensions; management commitment, product development, process improvement, quality planning and quality assurance in supply chain, quality assessment in production, inspection and experimentation and quality staff of supplier. The improvement of the mentioned quality aspects will lead to improved service provision by suppliers, which will translate into increased performance of state corporations.

Also it's important to check the supplier's reliability in terms of timeliness and also check if suppliers are in conformance with ISO standards.

Keywords: *supplier, quality commitment, performance, state corporations*

INTRODUCTION

Background of the Study

This study sought to investigate the influence of supplier evaluation on the performance of state corporations in Kenya. In today's highly competitive environment, an effective supplier evaluation process is very important to the success of any organization (Liu & Hai, 2010). Selecting the right supplier is always a difficult task for the procurement manager. Suppliers have varied strengths and weaknesses, which require careful assessment by the purchasers before ranking, can be given to them. Therefore, every decision needs to be integrated by trading-off performances of different suppliers at each supply chain stage (Liu & Hai, 2010).

In a supply chain, collaboration between the company and the supplier is the most important connection of the distribution channel. The global competitive environment, make the organizations highly dependent on the success of the supplier selection process. The lack of coordination or error in this process may lead to excessive delay or poor customer services. In this sense, as it has direct influence on reducing the costs, on profitability and flexibility of a business, decisions taken by the purchasing department significantly affects the efficiency and effectiveness of the business (Chan & Kumar, 2014).

In order to survive in today's competitive global market and to respond to customer's demands companies have no choice but to offer high-quality products and services. Production of high-quality products in turn requires selection of the appropriate suppliers by these companies. As a result, most global firms devote a considerable amount of time and effort to evaluation and selection of the "right" suppliers (Sharon & Wang 2014). The decision makers often resort to various supplier selection models to guide them through the decision-making process. Thus managers are giving a good portion of resources to supplier evaluation especially the developed countries. (Medlin, 2013)

In Kenya, the PPAD Act 2015 and procedure 2006 serves as a guide that provides guidelines and procurement procedure and supplier evaluation for public procurement entities to ensure judicious, economic and efficient use of state resources ensuring that public procurement is carried out in affair, transparent and non-discriminatory manner. Among other criteria, the Act 2005 states that tenderers and other suppliers should possess the necessary professional and technical qualifications and competence, financial resources, equipment and other physical facilities, managerial capability, reliability, experience in the procurement object and reputation; and the personnel to perform the procurement contract. In spite of all these, public institutions such as Universities have never realized the objective of supplier evaluation (PPOA, 2009).

Problem Statement

Despite the trend toward privatization over the past 20 years, state corporations (SCs) are still significant economic players (WB, 2014). Globally, SCs account for 20 percent of investment, 5 percent of employment, and up to 40 percent of output in some countries (GoK, 2015). In developing countries, SCs produced about 15 percent of regional GDP in Africa (Kikeri & Kolo 2006).

In Kenya SCs have become a strong entity and useful engines to promote development (Njiru, 2008). The General Economic Services Sector which is a major contributor to GDP and employment creation in the economy in the last three years (2003-2005) contributed 20%, 21% and 23% respectively to GDP (ROK, 2013).

The performance of SCs however, has been a matter of on-going concern in an environment of resource scarcity. In 2011/12, eleven (11) commercial SCs made losses; this represents 21%, of all commercial oriented Government Owned Entities (RPTPR, 2013). Parliament Report (2015) indicated that SCs in Kenya have lost money to tune of Ksh. 2 billion in the financial year of 2015-2016 through fraudulent payment of suppliers. Transparent International (2013) that state corporations in Kenya are facing serious challenges especially in procurement where millions of shillings have been paid to unscrupulous supplier.

Despite the reforms and initiatives to reinvent the SCs in Kenya, many of them still perform poorly (RPTPR, 2013). Unlike in the past, SCs today are under strong pressure to improve their performance (WB, 2014). Research has found that supplier quality commitment could help organizations to remain viable and competitive. Studies have been undertaken on supplier selection and evaluation. Schiele (2007), established that extensive supplier audits significantly influence a firm's performance level. Timmons (2010), studied how important the selection and evaluation of suppliers is in the management of purchasing and established that purchasing management has a significant bearing on the performance of organizations. It is therefore very important for SCs in Kenya to adopt best practices such as supplier evaluation to enable the SCs sector realize full potential (RPTPR, 2013). Also Despite the compelling link between firm performance and supplier evaluation, few studies have addressed it. Thus this study sought to investigate influence of supplier quality commitment on the performance of state corporations in Kenya.

The study Objective

To establish the influence of supplier quality commitment on the performance of state corporations in Kenya

LITERATURE REVIEW

Theoretical Review

Grey System Theory

Grey system, originally developed by Deng (1982) on the basis of grey sets, is an important methodology for solving problems which involve uncertainties and aims at handling systems with unknown or incomplete information. Here, on the grounds of grey relations "grey" means poor, incomplete or uncertain information. Thus, the systems which lack information are referred to as Grey Systems (Deng, 1989). A grey system is a system which contains both known and uncertain unknowns (Zheng & Lewis, 1993). According to the theory, the information is classified into three categories. This classification depends on the degree of information obtained. It is said to be white when it is completely certain; black when it is totally unknown and grey when it is insufficient (Yang et al., 2014). The grey theory is a new and different approach which handles the uncertainty of a system. Supplier evaluation problem, sometimes it involves uncertainty and it can be equated as a grey system. The importance of the attributes and the ratings of attributes can be expressed in grey numbers which gives the flexibility to express decisions more easily.

The theory of Grey System considers the following factors in deciding on the best supplier; existence of key factors important to the buyer, the numbers of factors are limited and countable and can be directly attributed to potential suppliers, in dependability of factors and factor expandability.

The theory Grey System applies the principle of series comparability to generate a grey relation. An evaluation matrix may be developed to facilitate this process. The best supplier is selected by choosing a goal and weighting the values of all evaluation factors based on the characteristics of materials to be sourced based on demand patterns (Zou, 2008). In a supplier selection environment, this theory can be applied evaluation of critical performance areas by the procuring entities. This theory is important to my study since the criteria of evaluating the performance of the supplier is very critical because if the performance of the supplier is good them such suppliers are chosen. And this theory gives criteria that can be used in evaluation. Thus state corporations can use this system when evaluating their suppliers.

Empirical Review

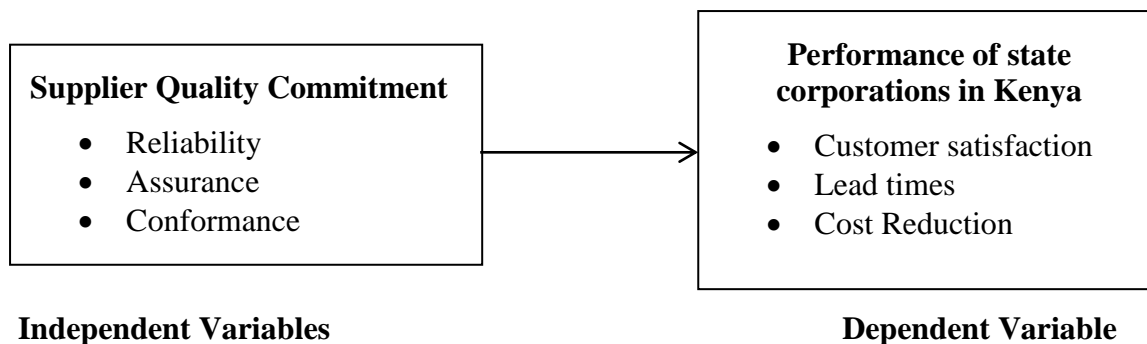
Quality assessment is a key factor of suppliers by which they can improve and maintain quality and delivery performance. It is very important for the company and suppliers. Quality and availability of product depends on this criterion. This factor has been measured on the basis of the importance of the following quality dimensions: management commitment, product development of suppliers, and process improvement of suppliers, quality planning and quality assurance in supply chain, quality assessment in production, inspection and experimentation and quality staff of supplier (Beamon, 2009). The rejection rate of the product is defined in the terms of the number of parts rejected by the customers in fixed time period because of some quality problems. It also includes the defective parts detected in the incoming products. This encounters the issues like whether or not the frequent quality assessment of the parts has been done by the Supplier.

Parasuraman *et al.* (1988) propose a service quality model with five dimensions namely tangibility, reliability, responsiveness, assurance and empathy. Malfunctioning or failing within a specified time period. Assurance is defined as “the employees’ knowledge and courtesy and the service provider’s ability to inspire trust and confidence” (Bitner *et al.*, 2006). According to Andaleeb and Conway (2006), assurance may not be so important relative to other industries where the risk is higher and the outcome of using the service is uncertain. Thus, for the Customer Satisfaction medical and healthcare industry, assurance is an important dimension that customers look at in assessing a hospital or a surgeon for an operation. The trust and confidence may be represented in the personnel who link the customer to the organization (Zeithaml *et al.*, 2006).

Empathy is defined as the caring, individualized attention the firm provides its customer (Bitner *et al.*, 2006). The customer is treated as if he is unique and special. There are several ways that empathy can be provided: knowing the customer’s name, his preferences and his needs. Many small companies use this ability to provide customized services as a competitive advantage over the larger firms (Glemer *et al.*, 2006). This dimension is also more suitable in industries where building relationships with customers ensures the firm’s survival as opposed to “transaction marketing” (Andaleeb & Conway, 2006). Thus, in the context of quick service restaurant, empathy may not be so applicable where customers look for quick service and the queues at the counters are long.

Reliability is defined as “the ability to perform the promised service dependably and accurately” or “delivering on its promises” (Zeithaml *et al.*, 2006). This dimension is critical as all customers want to deal with firms that keep their promises and this is generally implicitly communicated to the firm’s customers. Some companies such as FedEx may make it an explicit service positioning. For the food & beverage industry, reliability can be Customer Satisfaction interpreted to mean fresh food delivered at the correct temperature and accurately the first time (Andaleeb & Conway, 2006).

Conceptual Framework



Independent Variables

Dependent Variable

Figure 1: Conceptual Framework

METHODOLOGY OF THE STUDY

The study adopted cross-sectional survey design using both quantitative and qualitative approaches. The target population was all the 187 state corporations in Kenya. The study employed a census approach. Primary data was collected using questionnaires. A pilot study was conducted to measure the research instruments reliability and validity. Descriptive statistics were used aided by Statistical Packages for Social Sciences version 24 to compute percentages of respondents’ answers. Inferential statistics using linear regression and correlation analysis were applied to assist examining relationship between the research variables. The results were presented using tables and graphs.

RESULTS AND DISCUSSIONS

Response Rate

The number of questionnaires that were administered was 187. A total of 144 questionnaires were properly filled and returned. This represented an overall successful response rate of 77% as shown on Table 1. This agrees with Babbie (2004) who asserted that return rates of 50% are acceptable to analyse and publish, 60% is good and 70% is very good. Based on these assertion 77% response rate is adequate for the study.

Table 1: Response Rate

Response	Frequency	Percent
Returned	144	77%
Unreturned	43	23%
Total	187	100

Demographic Information

Gender of the Respondents

The respondents were requested to indicate their gender. Results in table 2 reveal that majority of 59% of the respondents were male while 41% were female. This implies that there is male dominance in the state corporations and especially, in the procurement department. Nonetheless, the 1/3 gender rule has been observed since the composition of either gender exceeds 33.3% which is the required minimum threshold according to the constitution of Kenya (2010).

Table 2: Gender of the Respondents

Gender	Frequency	Percent (%)
Male	85	59
Female	59	41
Total	144	100

Age of the Respondents

The respondents were asked to indicate their age bracket. Results in table 3 reveal that 44.4% of the respondents were in the age bracket of 31-40 years, 32.6% aged between 41-50 years, 17.4% aged between 18-30 years while only 5.6% aged above 50 years. The results imply that over 70% of the respondents are aged between 31-50 years. This age bracket represents relatively young and energetic employees and this may translate into improved performance of the firms.

Table 3: Age of the Respondents

Age	Frequency	Percent (%)
18 – 30 years	25	17.4
31 – 40 years	64	44.4
41-50 years	47	32.6
50 years and above	8	5.6
Total	144	100

Respondents' Level of Education

The respondents were asked to indicate their highest level of education. Results in table 4 reveal that 48.6% of the respondents had attained bachelor's degree, 33.3% had post graduate degree, 14.6% had certificate/diploma while 3.5% had doctorate. The results imply that all the respondents were knowledgeable and that their education level was sufficient for effective performance. The results further imply that all the employees were in a position to understand the operations of the firms, especially, the firms' relationship with suppliers.

Table 4: Respondents' Level of Education

Education Level	Frequency	Percent (%)
Certificate/diploma	21	14.6
Bachelors	70	48.6
Post Graduate	48	33.3
Doctorate	5	3.5
Total	144	100

Respondent's years of Experience

The respondents were asked to indicate the number of years they had worked in the procurement department. Results in table 5 reveal that majority (61.8%) of the respondents had worked in the procurement department for a period of 1-10 years, 18.8% indicated less than one year, 16% indicated 11-20 years while 3.5% indicated above 20 years. This implies that majority of the respondents have worked in the procurement department long enough and, therefore, possess adequate knowledge and skills of the supply chain process. The employees thus, have the potential to influence the performance of their firms.

Table 5: Respondent's years of Experience

Experience	Frequency	Percent (%)
less than one year	27	18.8
1 -10 years	89	61.8
11 – 20 years	23	16
Above 20 years	5	3.5
Total	144	100

Organizations' Period of Operation

The respondents were asked to indicate the number of years their organization has been in operation in Kenya. Results in table 6 reveal that majority (56.9%) of the respondents indicate more than 20 years, 16.7% indicated 16 to 20 years while 13.2% indicated 6 to 10 years and 11 to 15 years respectively. This implies that majority of the state corporations have been in operation long enough. As such, the firms are expected have sufficient information about their suppliers.

Table 6: Organizations' Period of Operation

Existence	Frequency	Percent
6 to 10 years	19	13.2
11 to 15 years	19	13.2
16 to 20 years	24	16.7
More than 20 years	82	56.9
Total	144	100

Descriptive Statistics

Reliability

The descriptive results on supplier reliability are presented in table 7. Results revealed that majority of the respondents who were 58.3% (27.10%+31.20%) agreed with the statement that suppliers are reliable in terms of timeliness, 31.2% were neutral to the statement while 10.40% disagreed with the statement. Further, 68.3% of the respondents agreed that suppliers are reliable in terms of consistency, 25.70% were neutral while 16% did not agree with the statement. In addition, 72.3% of the respondents agreed that suppliers are reliable in terms of accuracy, 21.50% were neutral while 6.3% disagreed that suppliers are reliable in terms of accuracy. Using a five-point scale likert mean, the overall mean of the responses was 3.70 which indicates that majority of the respondents agreed with the statements about supplier reliability. Additionally, the standard deviation of 0.94 indicates that the responses were varied. The results herein imply that suppliers are reliable.

Table 7: Reliability

Statements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Std. Dev
Suppliers are reliable in terms of timeliness	0.00%	10.40%	31.20%	27.10%	31.20%	3.79	1.00
Suppliers are reliable in terms of consistency	2.80%	13.20%	25.70%	47.90%	10.40%	3.50	0.95
Suppliers are reliably in terms of accuracy	2.80%	3.50%	21.50%	54.90%	17.40%	3.81	0.86
Average						3.70	0.94

From the above table (7) it was found that state corporation supplier are indeed reliable in terms consistency and accuracy however quite a number of respondents seemed un aware of whether the supplies were reliable in terms of timeliness. Checking reliability of suppliers would assist in State Corporation improving their performance.

Assurance

The descriptive results on supplier assurance are presented in table 8. Results revealed that 71.5% of the respondents agreed that our suppliers are credible, 18.8% were neutral while 9.7% did not agree that suppliers are credible. Further, 78.4% of the respondents agreed that our suppliers have respect for their customers, 18.8% were neutral while 2.8% disagreed. In addition, 75% of the respondents agreed that there is safety and security in our suppliers, 18.7% were neutral while 6.4% disagreed. Finally, 75% of the respondents agreed with the statement that our suppliers inspire trust where quality is concerned, 15.3% neither agreed nor disagreed while 9.7% failed to agree that suppliers inspire trust where quality is concerned.

Using a five-point scale likert mean, the overall mean of the responses was 3.86 which indicates that majority of the respondents agreed with the statements about supplier assurance. Additionally, the standard deviation of 0.81 indicates that the responses were varied. The results herein imply that there is assurance from the suppliers.

Table 8: Assurance

Statements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Std. Dev
Our suppliers are credible	0.00%	9.70%	18.80%	61.10%	10.40%	3.72	0.78
Our suppliers have respect for their customers	0.00%	2.80%	18.80%	57.60%	20.80%	3.97	0.71
There is safety and security in our suppliers	2.80%	3.60%	18.70%	54.20%	20.80%	3.87	0.88
Our supplier inspire trust were quality is concerned.	0.00%	9.70%	15.30%	51.40%	23.60%	3.89	0.88
Average						3.86	0.81

This study findings mirror those of Beamon (2009), who observed that quality assessment is a key factor of suppliers by which can improve and maintain quality and delivery performance. The study measured quality based on the following dimensions; management commitment, product development of suppliers, and process improvement of suppliers, quality planning and quality assurance in supply chain, quality assessment in production, inspection and experimentation and quality staff of supplier

Conformance

The descriptive results on supplier conformance are presented in table 9. Results revealed that 43.8% of the respondents agreed that suppliers are in conformance with the ISO standards, 36.8% were neutral while 19.4% disagreed that suppliers are in conformance with the ISO standards. Further, 64.6% of the respondents agreed that suppliers are in conformance to prompt services, 18.80% were neutral while 16.70% disagreed with the statement. Using a five-point scale likert mean, the overall mean of the responses was 3.48 which indicates that majority of the respondents agreed with the statement about supplier conformance. Additionally, the standard deviation of 1.01 indicates that the responses were varied. The results herein imply that suppliers are in conformance.

Table 9: Conformance

Statements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Std. Dev
Suppliers are in conformance with the ISO standards	6.90%	12.50%	36.80%	30.60%	13.20%	3.31	1.07
Suppliers are in conformance to prompt services	0.00%	16.70%	18.80%	47.20%	17.40%	3.65	0.96
Average						3.48	1.01

Further, the respondents were asked to give their suggestion on the influence of supplier quality commitment on performance of state corporations in Kenya. Majority of the respondents noted that supplier quality commitment results to better service delivery, quality output, adherence to international standards and timeliness in production and distribution of goods and services.

Inferential Statistics

Correlation Analysis

The correlation analysis results in table 10 revealed that there was a positive and a strong significant association between supplier quality commitment and performance of state corporations as supported by ($r=0.588$, $p=0.000$). This implied that both supplier quality commitment and performance of state corporations change in the same direction.

Table 10: Correlation Matrix

		Performance	Supplier Quality Commitment
Performance	Pearson Correlation	1.000	
	Sig. (2-tailed)		
Supplier Quality Commitment	Pearson Correlation	.588**	1.000
	Sig. (2-tailed)	0.000	

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

Regression Analysis

The study sought to establish the relationship between supplier quality commitment and performance of state corporations. An ordinary least square regression model was used. The results of the model summary are given in Table 11. The findings revealed that supplier quality commitment explained 34.6% of the total variations in performance of state corporations in Kenya.

Table 11: Model Fitness

Indicator	Coefficient
R	0.588
R Square	0.346
Adjusted R Square	0.341
Std. Error of the Estimate	0.6358059

Table 12 below provides the results on the analysis of variance (ANOVA). The results indicate that the overall model was statistically significant as supported by a p value of 0.000. This was supported by an F statistic of 74.994 and the reported p value (0.000) which was less than the conventional probability of 0.05 significance level. The results imply that supplier quality commitment is a good predictor of firm performance.

Table 12: Analysis of Variance

Indicator	Sum of Squares	Df	Mean Square	F	Sig.
Regression	30.316	1	30.316	74.993	0.000
Residual	57.403	142	.404		
Total	87.719	143			

Table 13 presents the regression of coefficients results. The findings show that there is a positive and significant relationship between supplier quality commitment and performance of state corporations in Kenya as supported by a p value of 0.000 and a beta coefficient of (0.793). This implies that an increase in supplier quality commitment by 1 unit would increase the performance of state corporations by 0.793 units.

Table 13: Regression of Coefficients

	B	Std. Error	t	Sig.
(Constant)	.834	.352	2.370	.019
Supplier Quality Commitment	.793	.092	8.660	.000

The specific model;

$$Y = \beta_0 + \beta_1 X_1 + e$$

$$\text{State Corporations Performance} = 0.834 + 0.793 \text{Supplier Quality Management}$$

This study findings mirror those of Beamon (2009), who observed that quality assessment is a key factor of suppliers by which can improve and maintain quality and delivery performance. The study measured quality based on the following dimensions; management commitment, product development of suppliers, and process improvement of suppliers, quality planning and quality assurance in supply chain, quality assessment in production, inspection and experimentation and quality staff of supplier.

DISCUSSION CONCLUSIONS AND RECOMMENDATIONS

Discussion

The objective of the study was to establish the influence of supplier quality commitment on the performance of state corporations in Kenya. Descriptive results revealed that suppliers are reliable in terms of timeliness, consistency and accuracy. Further, suppliers were found to be credible, have respect for their customers and inspire trust where quality is concerned. In addition, the respondents noted that the suppliers are in conformance with the ISO standards and also conform to prompt services.

Correlation analysis showed that supplier quality commitment and performance of state corporations are positively and significantly associated. Regression analysis indicated that supplier quality commitment has a positive and significant influence on performance of state corporations. The hypothesis results indicated that there is a positive significant relationship between supplier quality commitment and performance of state corporations in Kenya.

Conclusions

Based on the findings the study concluded that supplier quality commitment influenced the performance of state corporations in Kenya. This can be explained by the regression results which showed that the influence was positive and significant. This study further concludes that suppliers in state corporations are actually reliable in terms of consistency and also in terms of accuracy. Credibility of the supplier is a very important aspect that firms need to consider when evaluating suppliers in terms of quality commitment and the study shows that suppliers are credible.

Recommendations

Based on the findings, the study recommended that the organizations should consider the following quality dimensions; management commitment, product development, process improvement, quality planning and quality assurance in supply chain, quality assessment in production, inspection and experimentation and quality staff of supplier. The improvement of the mentioned quality aspects will lead to improved service provision by suppliers, which will translate into increased performance of state corporations. Also it's important to check the suppliers' reliability in terms of timeliness and also check if suppliers are in conformance with ISO standards.

Areas of Further Research

This study looked at one criterion of evaluating suppliers namely supplier quality commitment, but there are very many criteria's that can be explored further and their literature reviewed some include supplier consistency, supplier organisational culture, ways of communication by suppliers, supplier cleanliness in terms of eco-friendly products especially in regard to rules and regulation instituted by the law. The study recommends that a similar study should be conducted in the private sector for comparison purposes as this study was done on state corporations in Kenya.

REFERENCES

- Babbie, e., 2004. *The practice of social research*. belmont, ca; : wadsworth. (301.072_bab).
- Beamon, B. (2009) Measuring supply chain performance. *International Journal of Operations and Production Management* 19 (3), 275–292.
- Chan, F. T. (2014). Performance measurement in a supply chain. *The international journal of advanced manufacturing technology*, 21(7), 534-548.
- comparison standard in measuring service quality: implications for further research.
- Deng J. L. (2006). Introduction to Grey system theory. *The Journal of Grey System* 1:1-24
- Journal of Marketing*, 58,111-24.
- Liu J, Ding F.Y., & Loll V. (2010). Using data envelopment analysis to compare suppliers for supplier selection and performance improvement. *Supply Chain Management: An International Journal*; 5(3) 143–50.
- Meldin (2013). Supplier Evaluation: Benefits, Barriers and Best Practices. 91st *Annual International Supply Management Conference*. Emptoris, Inc

Parasuraman, A., Zeithaml, V.A., & Berry, L.L.(1988). Reassessment of expectations as a

Yang Y., Liu S. & John R. (2014). Uncertainty representation of Grey numbers and Grey sets. IEEE Transactions on Cybernetics Dikmen 44(9),1508-1517.

Zeithaml, V.A., Bitner, M.J., & Gremler, D.D. (2006). *Services marketing: integrating customer focus across the firm* (4th ed., pp.117). Singapore: McGraw-Hill.

Zheng Y. & Lewis R. W. (1993). On the optimization concept of Grey Systems, Applied Mathematical Modeling 17(7):388-392.