INFLUENCE OF PROCUREMENT RISK MANAGEMENT ON PROCUREMENT PERFORMANCE OF MEGA PROJECTS IN THE ENERGY SECTOR IN KENYA

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ABSTRACT: *Governments around the world face a rising demand for infrastructure. Most governments, including Kenya, are attempting mega projects to bridge the infrastructural gap. Kenya has prioritized, under the Kenya Vision 2030, a number of Mega projects. However most mega projects have, (or are), experienced procurement related challenges, which threaten their efficient implementation thereby threatening achievement the Vision 2030 aimed at transforming Kenya into a middle income Nation. The energy sector, a critical support sector of the Vision 2030 pillars, plans to increase power production by 10,000Mw by the year 2030, from the current estimated production of slightly above 2000Mw, through an array of mega projects. This study set out to examine the influence of Procurement Risk Management on the procurement performance of Mega projects in the energy sector in Kenya. The study entailed a census of all the 47 mega projects under the various public procuring entities in the energy sector. The unit of observation was the procurement managers in the procuring entities dealing with mega projects. Objectively developed questionnaires were used to collect primary data. The data collected was sorted, coded and entered into the computer statistical package (SPSS), for production of descriptive and inferential statistics. The study found that Procurement risk management has a significant influence on procurement performance of mega projects in the energy sector in Kenya. The study also found inadequacies in the ability procurement processes of Mega projects to collect adequate information for contractor evaluation which may lead to contracting unqualified contractors. This study thus recommends enhanced adoption of Procurement risk management practice. It also recommends review of the procurement mechanism to enhance collection of adequate, accurate data for risk pricing (to reduce political interference) and evaluation processes.*

KEYWORDS: Procurement Risk management, Mega Projects, Procurement Performance.

INTRODUCTION

Background of the Study

Around the world, governments are investing heavily in Mega public projects to reverse a profound infrastructure and service backlogs. For instance in Africa, an estimated 600 million people lack access to electricity; almost 380 million people lack clean water in Sub Sahara Africa alone, and general transport infrastructure is dilapidated or inexistent(OECD, 2011). The demand for this public infrastructure, and waning public finance capacity of most government (WB, 2010), has put pressure on governments to deliver these mega projects on time and on budget (Flyvbjerg, 2014).

Globally, Mega projects have exhibited failure. Global statistics reveal failure in 9 of 10 mega projects (Flyvbjerg, 2014) This has been partially, but greatly, linked to poor procurement performance, in the form of protracted procurement process, contractual misunderstanding,

inadequate skills, and insufficient risk management (Flyvbjerg, 2014; KPMG, 2015; Mckinsey, 2016) Schlumberger Business Consulting (SBC, 2015) estimates that procurement and contracting process for mega projects explains at least 12% of mega project failure. There is growing consensus among industry professionals and academics (Reeves, 2011, KPMG, 2012, & Mckinsey, 2016), that improvements in pre project phases such as procurement could lead to improvements in delivery of mega projects.

Supply chain management practices, the sets of complete set of actions done in an organization to improve supply chain effectiveness and efficiency, such as Global sourcing, Partnership, Early Supplier involvement (Muhammad, Ali & Shazad, 2013; Karimi & Rafiee (2014), and Jie & Cox, 2013) are increasingly being seen as tools for achieving more effective mega project acquisition in bid to deliver these projects on time and on budget. Quest to reverse mega project failure has seen governments worldwide adopting a myriad of supply chain management practices including: PPPs, Risk Management, contract management, global sourcing, as well as E-procurement, with much success (Reeves, 2011, & KPMG, 2012) Russil (2010) observes that procurement risk management involves changing behaviors, procedures and controls which remove procurement risks or reduce them to what is considered to be an acceptable level.

Little (2011) postulates that the concept of risk management is particularly important to Mega projects where the 'issues are a reality", because of the complex nature and value as well as conflicting shareholder interests. Risk management determines Mega projects success (Xu *et al*, 2011 & Jin, 2011)

Statement of Problem

Kenya has prioritized, under the Kenya Vision 2030, a number of Mega projects. However most mega projects have, (or are), experienced procurement related challenges, which threaten their efficient implementation thereby threatening achievement the Vision 2030 aimed at transforming Kenya into a middle income Nation. The energy sector, a critical support sector of the Vision 2030 pillars, plans to increase power production by 10,000Mw by the year 2030, from the current estimated production of slightly above 2000Mw, through an array of mega projects.

Most of the projects including: the KeS24.6 billion school laptop project; KeS200Billion Lamu coal project; KeS15 billion Kinangop power project; KeS700mw Liquefied Natural Gas project; and the $551m greenfield JKIA project; have experienced failure, attributed to procurement related challenges such as: cancelled tender award due to irregularity; socio-political resistance; lack of adequate finances; and non responsive tender process (NCLR, 2014; ROK, 2014; KAA, 2016 & Rita, 2016) Further, an ROK (2056) audit report of firms undertaking energy projects identified massive project failure occasioned by contractor failure due to failure in the procurement mechanism. This raised interest of research on supply chain practices that impact procurement of mega projects in the energy sector. Efficient procurement of mega projects is essential to attain vision 2030 goals.

Specific Objective

To assess how Procurement Risk Management influences procurement performance of mega projects in the energy sector in Kenya.

Research Hypothesis

There is no significant influence of Procurement Risk Management on procurement performance of Mega projects in the energy sector in Kenya.

LITERATURE REVIEW

Theoretical Review: Agency Theory on Procurement Risk Management

Agency theory explains the relationship between the agents and principal and highlights a major problem in the relationship; the potentially differing objectives and risk attitudes (Lan *et al* 2010) following this thought, Shrestha *et al* (2013) highlights two resultant issues; the goal conflict and the information asymmetry. Berg *et al* (2008) points that in supply chain management; it's often difficult for the purchaser (principal) to verify technical capacity and quality especially in complex purchases since they mostly rely on information given by potential contractors (agent). Olufemi (2013) review of Agency literature shows that the theory also portends a risk sharing problem arises when the principal and the agent have different attitudes towards risk.

Agency theory places importance on information. For efficient risk management in procurement of mega projects, there is need to have a rigorous appraisal (WB, 2011) of these mega projects towards a more accurate risk identification to enable procurement risk reduction strategies (Bistch, 2010) This augers well with Flyvbjerg *et al* (2003) proposition of a departure from the convectional approach to mega project development processes, to a more current institutionalistic approach centered on practices and rules that comprise accountability in project processes. The theory thus gives prominence to efficient risk identification. Further, Agency theory extends organizational thinking by pushing the ramifications of outcome uncertainty to their implications for creating risk. The implication is that outcome uncertainty coupled with differences in willingness to accept risk should influence contracts between principal and agent (Whittington, 2012 and Jensen & Meckling 1976)

In the procurement processes, ex ante risk identification allows for risks to be contracted up front and thus managed efficiently by the most able party (Shrestha *et al* 2013) The theory thus also gives prominence to risk allocation and monitoring. Agency theory provides lenses to explore and understand the five landscapes on which procurement risks occur: external dependencies (supply chain robustness, supplier viability); market conditions and behaviors (competitive or not; supply availability); procurement process; management controls; and the ability and agility to handle unexpected event (Russil, 2010); and therein provides a basis on which to develop risk management strategies.

Empirical Review

Literature is abounding with studies on Risk Management. However, this narrows with introduction of the term "Procurement". Crema (2015) studies the risk indicators for managing energy procurement process, while Tumuhairwe and Ahimbisibwe (2016) examine the relationship between procurement records compliance and effective risk management. Tummala and Schoenherr (2011) and Kumar *et al* (2011) on the other hand seek to provide a general but comprehensive approach to managing procurement risk. They identify important steps to include: risk identification, risk assessment, pricing and transfer, monitoring and

control as important steps. Other existing literature adopts a mega project risk management perspective: Dieguez *et al* (2014), serpella *et al* (2014) and Flyvbjerg (2003).

These studies enable understanding of various aspects of risk management in procurement, and in mega projects. However, they fail to empirically examine the relationship between risk management and procurement performance of mega projects. Further, most of these study are either case studies (Crema, 2015, Serpella *et al*, 2014), literature reviews (Dieguez *et al*, 2014) or white papers (CIPS, 2013) A survey could be done to interrogate this relationship.

RESEARCH METHODOLOGY

Sekaran (2010) notes the development and execution of an efficient research strategy is a central part of research. A fitting research design, a functional plan outlining and linking research methods and procedures requisite for acquisition of reliable and valid data capable of empirical analysis (Mkansi & Achiampong, 2012), is applied to guide application of appropriate research methods towards attainment of research objectives. The study on Impact of Procurement Risk management on Procurement performance of mega projects in the energy sector in Kenya adopted an exploratory approach using a descriptive research design. Exploratory research design is a flexible approach that allows consideration of various aspect of the study (Gill & Johnson, 2010), while Descriptive survey research portrays an accurate profile of persons, events, or situations (Cresswell 2009) in their current state.

The study focused on mega projects in the energy sector in Kenya as the unit of analysis. Therefore the population of this study was all the mega projects in the energy sector in Kenya. The target population was thus the 47 mega projects in the energy sector, under the various procuring entities in Kenya; KenGen, KETRACO, KPLC, GDC, Kenya Pipeline, and MoE&P. The study entailed a census of all the 47 mega projects identified in the energy sector in Kenya. Bhattacherjee (2012) notes that a census is preferred when the study population is small; and is advantageous as it offers opportunity to undertake intense study of population. The unit of observation was the procurement managers in the procuring entities in the energy sector who were suited to provide factual data on acquisition of the mega projects.

Whilst various methods could be used to collect primary data, including questionnaires and interview methods objectively prepared Questionnaires were used. As explained in cooper (2011) and Palinkas (2010), they are preferred over interviews as they provide a more effective and efficient way of collecting data where respondents are spread widely. Questionnaires were used to obtain data linking Procurement risk management and procurement performance of mega projects in the energy sector in Kenya. A pilot study was conducted on 10% of the sample to detect and review weakness of the proposed questionnaire, as recommended by Cooper and Schindler (2011) To test reliability, the study relied on the Cronbach's alpha (α). Procurement riks management had a score of 0.892, which is deemed acceptable in line with recommendations by Ritter (2010). The study considered various as aspects of validity, Content, and construct were considered

RESULTS AND DISCUSSION

Response Rate

In the survey of the 47 projects in the energy sector in Kenya, 47 questionnaires were issued. A total of 47 questionnaires were returned. However, only 31 questionnaires were responsive. Therefore, the study achieved a response rate of 65.9%, with 31 responsive questionnaires, out of 47 issued questionnaires. This is deemed a sufficient response rate in a survey in line with Creswell and Plano (2011) recommendation that a response rate above 60% is sufficient to permit data analysis. Similar studies on procurement practices and procurement performance by Odero and Ayub (2017), and Dede and Theuri (2018) yielded 72% and 82% response rate respectively. This shows that the study's response rate is within the norm. Most of the non responses were because some projects were yet to start, or were in the process of acquisition, or had failed to kick off; thus little or no information was available for the projects

Estimated Value of the Projects Surveyed

Analysis of the data collected in the survey indicates that projects are estimated to be worth KES 0.6 Trillion (KES 600,000,000,000): The lowest project value was worth KES 202 Million, while the project with highest value was worth KES 100 Billion. All the projects were running for more than two financial years. These projects therefore fall within the description of mega projects as described by Hall and Khan (2006), Mckinsey (2012), and Flyvbjerg (2003), that mega projects are those endeavors, or undertakings, typically having multi-million or even billion dollar budgets; time-frames measured in years, and attracting a high level of public or political attention.

Descriptive Findings on Procurement Risk Management and Procurement Performance

In order to understand the nature of risk management in the procurement process of Mega projects, respondents were asked to identify the various risks encountered in the Project Procurement process and the various Procurement risk management tools that were employed. Analysis of the feedback identifies financial risks, socio-political risks, and risk of contractor failure as most prominent in the acquisition of mega projects at 27% and 24% as shown in Table 1.

Table 1: Responses on Risk in Procurement Process

E- Procurement Tool	Frequency	Percentage
Financial risks	21	27
Socio-political risks	18	24
Contractor failure risk	10	13
Supply side risks	3	4
Contractual disagreement	4	5
Land and way leave acquisition risk	10	13
Technology risks	5	7
Drilling and off take risk	5	7
Total	**76**	**100**

The analysis of response further shows that the procurement risk management framework adopted during the mega project acquisition process. Government guarantees to mitigate funding risks, stakeholder involvement and management, and risk sharing were the most used, at 26%, 22%, and 16% respectively as shown in Table 2.

Table 2: Responses on Procurement Risk management framework

Procurement Risk Management Framework	Frequency	Percentage
Partial Risk guarantee (government backed)	8	26
Feasibility study	4	13
Stakeholder involvement and management	7	22
Multiple sourcing	2	6
Monitoring and evaluation	4	13
Contract bundling	1	3
Risk sharing	5	16
Total	**31**	**100**

The results indicate that procurement of most projects surveyed faced common risks. These risks are financial, technological, supply market, and socio-political in nature. These risks are similar to risks facing mega projects elsewhere in the world and in the region (Little, 2011). The most popular tools employed were government guarantees, stakeholder involvement, risk sharing, multiple sourcing, and monitoring and evaluation.

The study further sought to understand impact of various aspects of PRM framework on procurement performance of the mega projects. Propositions were made about the influence of various PRM tools on procurement performance. Respondents were asked to indicate the extent, (key: 1-not at all, 2-little extent, 3-moderate extent, 4-great extent, 5- very great extent), to which the propositions characterized the mega projects.

The results of the analysis reveal that the lowest mean score on the propositions was 3.74, while the highest mean score was 4.39; as shown on Table A-1. This implies that the aspects of Procurement Risk management characterize and influence procurement of mega projects greatly. This indicates that procurement risk management has been greatly adopted in the acquisition of mega projects, as recommended by Xu *et al*(2011), Jin (2011) and EU (2010).

The analysis also revealed relatively low mean scores, (Mean 3.82, SD 0.808 and Mean 3.74 SD 1.031), on propositions that "the procurement system has mechanism to collect accurate data for supplier evaluation", and "Risk Pricing is free of political interference" respectively. This implies that to a considerable extent, the procurement system in entities in the energy sector, are not able to collect accurate data for supplier evaluation.

This means that opportunity exists to select and contract contractors who are unqualified. This compares with the Findings of the Audit report of a firm in the energy sector by ROK (2016) that implied challenges in contractor evaluation and selection, after a number of high value projects stalled after the contractor failed to perform.

It also gives prominence to the agency theory as highlighted by Berg *et al* (2008) that it's often difficult for the purchaser (principal) to verify technical capacity and quality especially in complex purchases since they mostly rely on information given by potential contractors

(agent). It further means that the risk pricing mechanism for mega projects is to a considerable extent not free from political interference. This finding agrees with Flyvbjerg (2014) who intimates that mega projects processes will often experience political interference due to their size, nature, and value.

Diagnostic Tests

Data collected on Global Sourcing and procurement performance was tested for normality in line with recommendation by Ghasemi and Zahediasl (2012). Since the unit of observation and analysis was Heads of supply chain or equivalent and Mega projects respectively, data obtained was expected to be seen to be normal. This study relied on the Shapiro-Wilks', W, test; to test Normality of data.

The results for the Shapiro-Wilks Test, W, on Procurement risk management was not significant (P-value=0.270), which according to Razali and Wah (2011), and Garson (2012) indicates a normal distribution. The study also performed the test of multi-co linearity by calculating the Variance Inflation Factor values (VIF) and Tolerance as recommended by Collis and Hussey (2014). The results show that VIF of data on Procurement Risk management (VIF=1.269) was less than 10. This indicates non multi collinearity as recommended in Collis and Hussey (2014).

The study also undertook a test of linearity, using Correlation analysis, to establish whether further analysis would yield the desired relationship (Fields, 2009) that could be further explored using other statistical tools Kothari (2009). The analysis yielded a Pearson Product Moment Correlation Coefficient, r=0.415, P-value (0.016), indicating a significant and positive linear relationship between Procurement risk management and procurement performance.

Regression Analysis

A regression of procurement performance of mega projects in the energy sector in Kenya on Procurement Risk management was done using the following model: $Y = \beta_0 + \beta_1 X_1 + \varepsilon$: Where; Y is Procurement Performance, β_0 is the intercept, β_1 is the change in procurement performance occasioned by a unit change in X_1 (Procurement risk management). The findings, summarized in Table3, shows that the calculated p-value is 0.016, which is less than 0.05, at 95% confidence interval.

Table 3: Regression of Procurement performance on Procurement Risk Management

R	R^2	ADJ R^2	Std Error
.415	.172	.145	.64386

F=6.445, Sig=.016, Coefficients: Constant (β_0=.722, t=.790, sig=.435), PRM (β_1=.063, t=2.539, sig= .016)

This indicates that Procurement Risk Management has a significant influence on Procurement performance of mega projects. Therefore H$_o$: *There is no significant influence of Procurement risk management on procurement performance of Mega projects in the energy sector in Kenya*

is rejected and *Hₐ: There is significant influence of Procurement risk management on procurement performance of Mega projects in the energy sector in Kenya,* is accepted. The regression analysis further indicates variances ($R^{2)}$ as 0.172 which shows that 17.2% of Procurement performance of Mega projects is influenced by Procurement Risk Management practice. From this analysis the regression model could be written as: Procurement performance=0.772+0.063 (PRM practice) This means that an increase in mean index of Procurement Risk Management practice will increase Procurement performance of mega projects by a mean index value of 0.063.

Implication to research and Practice

The study findings support earlier findings and assertions by Picard and Andrieu (2012), Little (2011), and Flyvbjerg (2014) that asserts that risk is a major element of concern in the life cycle of a project as it has potential to significantly affect the cost benefit relationships, demand, production cost, execution time and financial variables of the project. The study provides evidence that procurement risk management, an emerging supply chain practice, has a significant influence on procurement performance of mega projects. Therefore it extends literature on risk management, to the procurement process of mega projects.

The study also makes observation that while there is moderate adoption of procurement risk management in the acquisition process of mega projects, the procurement mechanism of procuring entities in the energy sector is deficient to enable accurate risk pricing and evaluation of contractors. There is therefore need for practitioners, policy makers, and stakeholders in the energy sector in Kenya, to review the procurement mechanism to improve these aspects of procurement risk management.

CONCLUSION

The study concludes that procurement risk management has a significant influence on procurement performance. Adoption of various risk management tools such as multiple sourcing, feasibility study, stake holder management, risk guarantees, risk appraisal and sharing contribute to management of procurement risks that include: financial risks, risk of contractor failure, land and way leave acquisition risks and technology risks. The study concludes that there is need to evaluate the procurement mechanism in the energy sector to improve the ability to collect more accurate and complete information for supplier evaluation, to alleviate to chances of picking and contracting unqualified contractors.

The process, to some considerable extent, doesn't collect accurate information for contractor evaluation in the procurement of mega projects. Similarly, the study concludes that the risk pricing mechanism needs to be evaluated and adjusted accordingly to ensure or reduce opportunity for political interference in risk pricing.

This study thus recommends continued adoption of Procurement risk management practice towards improved procurement performance of mega projects in the energy sector in Kenya. The study further recommends to the energy sector management to review the aspects of risk pricing and supplier evaluation mechanisms, with a view of developing mechanisms to alleviate political interference in risk pricing; and to develop mechanism to enhance accuracy of data collect in the supplier evaluation process. These would contribute to further reduction in procurement costs, and lead times.

Future Research

The study findings indicate moderate adoption of procurement risk management practice. It would be insightful to examine the opportunity for optimized procurement risk management, as well as challenges in procurement risk management in mega project acquisition. This provides opportunity for research on procurement risk management practice in mega projects in Kenya. This study adopted a census study, using descriptive research design. There exists opportunity to undertake case studies of various mega projects to better examine the practice of procurement risk management; this is particularly important, as various mega projects exist in different forms; such as Plant development, exploration and drilling, transmission and distribution. The difference in form may mean that unique risks and risk management practices exist in the various mega projects. It would be insightful to examine them individually.

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APPENDIX A

Table A-1: Aspects of PRM on Procurement Performance

ITEM	Percent (%) 1	2	3	4	5	MEAN	STD D.
Feasibility study enables identification of procurement risks							
	0.0%	3.0%	9.1%	60.6%	27.3%	4.12	0.696
EIA helps to identify and manage risks related to environment issues							
	0.0%	0.0%	9.1%	42.4%	48.5%	4.39	0.659
Rigorous risk appraisal process enables proactive risk management							
	0.0%	0.0%	12.1%	63.6%	24.2%	4.12	0.600
A market study identifies supply side risks related to the procurement of mega projects							
	0.0%	0.0%	21.2%	63.6%	15.2%	3.94	0.609
Accurate information in procurement processes enables proper forecast of costs							
	0.0%	0.0%	33.3%	42.4%	24.2%	3.91	0.765
The procurement process has mechanisms to collect accurate data for supplier evaluation							
	0.0%	3.0%	33.3%	42.4%	21.2%	3.82	0.808
Procurement negotiation lead to a risk sharing							
	0.0%	0.0%	24.2%	57.6%	18.2%	3.94	0.659
Procurement contract management has adaptive risk control mechanisms							
	0.0%	0.0%	27.3%	30.3%	42.4%	4.15	0.834
The entity has mechanism to reduce impact of unavoidable risks such as force majeure							
	0.0%	6.1%	12.1%	42.4%	39.4%	4.15	0.870
Risk pricing mechanism is free of political interference							
	3.0%	6.1%	15.2%	39.4%	36.4%	3.74	1.031