

**EMERGING SUPPLY CHAIN MANAGEMENT PRACTICES
AND PROCUREMENT PERFORMANCE OF PUBLIC
MEGA PROJECTS IN THE ENERGY SECTOR IN KENYA**

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**Emerging Supply Chain Management Practices and Procurement
Performance of Public Mega Projects in the Energy Sector in Kenya**

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

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DEDICATION

To my Family, my students, and friends of good will.

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LIST OF ABBREVIATIONS AND ACRONYMS

EIB	European Investment Bank
EIU	Economic Intelligence Unit
ERC	Energy Regulatory Commission
FY	Financial Year
GDP	Gross Domestic Product
GOK	Government of Kenya
IPP	Independent Power Producers
IT	Information Technology
JKIA	Jomo Kenyatta International Airport
KAA	Kenya Airports Authority
KenGen	Kenya electricity Generation Company
KES	Kenya Shillings
MoE&P	Ministry of Energy and Petroleum (Kenya)
MOF	Ministry of Finance (Kenya)
NCLR	National Council For Law Reporting
OECD	Organisation For Economic Cooperation and Development

PFI	Public Finance initiative
PPPU	Public Private Partnership Unit (Kenya)
PPIAF	Public Private Infrastructure Advisory Facility
PPP	Public private Partnership
PPDA 2005	Public Procurement and Disposal Act 2005
PPAD 2015	Public Procurement and Asset Disposal Act 2015
PPOA	Public Procurement Oversight Authority
SCM	Supply Chain Management
UN	United Nations
USAID	United States Agency for International Development
VFM	Value for Money
WB	World Bank

OPERATIONAL DEFINITION OF TERMS

E-Procurement	The practice of undertaking the procurement process over web based applications to enable e-tendering, e-auctioning, vendor management, purchase order integration, e-invoicing, e-payment, and contract management (Gruenen <i>et al</i> , 2010)
Global Sourcing	The practice of sourcing across geo political boundaries to achieve operational and strategic efficiency by leveraging on global capabilities (PWC, 2010)
Innovation:	is defined as the process of generating new idea, and implementing these ideas to provide solution to the society. It is also defined as a new or improved process and service. (Rivera, Roman & Simmons 2012)
Mega projects:	‘Mega’ or ‘giant’ projects are defined as those endeavors typically having multi-million or even billion dollar budgets; time-frames measured in years, and attracting a high level of public or political attention (Hall & Khan 2006)
Public Private Partnership	A model of procurement and delivery of public mega projects involving a significant level of private entity design and implementation usually over multi year periods of private entity financing. (Reeves, 2011)

Procurement Risk Management 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 (Russil, 2010)

Risk management: This is the identification, assessment and prioritization of risk, leading to a coordinated economical application of resources to monitor and control probability and impact of unfortunate events. (Hubbard&Douglas, 2009)

Technology transfer: Technology transfer refers to the transfer of knowledge and experience to improve local level of knowledge and technology for improved efficiency. (Hossain, 2012)

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 emerging supply chain management practices: public private partnerships (PPPs), E-procurement, procurement risk management, and global sourcing; and the moderating effect of regulatory framework; on the procurement performance of Mega projects in the energy sector in Kenya. The study reviewed literature on the study variables and various models and theories: the Bensaou relationship model, the resource based view theory, Agency theory, and the Porter's value chain analysis model; and discussed them in line with the study variables. 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. Using regression analysis to test the null hypotheses that: Emerging supply chain practices do not have significant influence on procurement performance of mega projects in the energy sector in Kenya; the study found that emerging supply chain practices: Public Private Partnership, E-procurement, Procurement Risk Management, and Global Sourcing; have a positive significance influence on procurement performance of mega projects in the energy sector in Kenya. Regulatory framework does not have a significant moderating effect on procurement performance. This study thus recommends enhancement of efforts to adopt public private partnerships in the acquisition of mega projects. Also, the study recommends a broader, integrative adoption of E-procurement, beyond the shallow application of online advertisement of bids and emails. The study recommends continued adoption of risk management practices in the procurement process. The study further recommends the need to review the procurement process of mega projects with a view of enhancing the procurement mechanism to collect all relevant data for contractor evaluation process. Additionally, there is need to sustain the global sourcing practice in acquisition of mega projects in the energy sector to sustain the quality, price, and technological benefits that accrue.

CHAPTER ONE

INTRODUCTION

This chapter provides an insightful background on supply chain management practices in the acquisition of mega projects, and elucidates the concept of procurement performance. The chapter also provides a compelling argument justifying this research and an outline of the research objectives and research hypothesis.

1.1 Background to the study

Supply chain management (SCM) in the public sector, as outlined in Ambe and Weiss (2011), often entails managing parties involved in delivering a specified public outcome. Around the world, governments are investing heavily in Mega public projects to reverse 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, 2012). 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). SCM practices are increasingly being seen as tools for achieving more effective mega project acquisition in bid to deliver these projects on time and on budget.

Supply chain management practices, the sets of complete set of actions done in an organization to improve supply chain effectiveness and efficiency (Muhammad, Ali & Shazad, 2013), have been evolving over the past decades. Karimi and Rafiee (2014) intimates that these practices originally included logistics outsourcing, supply base reduction, long term relationships, communication, cross functional teams and early supplier involvement. Jie and Cox (2013) assert that they now include supplier partnership, outsourcing, IT sharing, and customer collaboration. Karimi and Rafiee (2014) classify the modern supply chain practices into the following dimensions: Risk and award sharing; cooperation; process integration; and information sharing.

These represent some of the downstream and upstream supply chain practices, meant at improving the supply chain's capability of delivering value to its customers. Abdallah (2013) posits that supply chain practices have a significant influence on supply chain processes effectiveness.

New supply chain management practices have emerged, while others have evolved. These include, the increased uptake of public private partnerships by governments worldwide (Reeves, 2011) that presents a paradigm shift in the manner of acquiring huge projects; from the traditional design to procure model often plagued by perennial time and cost overruns (Flyvbjerg, 2014) Public Private Partnership (PPP) is a developing model of acquiring and implementing public projects that involves a significant level of private entity finance, design and implementation, usually over multi year periods of financing (EIB, 2010 & WB, 2011) Around the world, PPPs are increasingly being used to acquire enormous projects. For instance: an estimated \$755 billion in private investment across nearly 2,500 infrastructure projects have been recorded in roads, schools, water reclamation, hospitals, prisons and the provision of health (Capital, 2012).

Reeves (2011) advances that PPPs introduce significant efficiency, reliability, and transparency in mega project acquisition, which has earned them a strong reputation of delivering projects on time and cost. This and the immense infrastructure demand amidst inadequate budgetary finance to meet this demand; for instance, Sub-Saharan Africa alone needs over US\$93billion annually over the next ten years (WB, 2010); has forced governments around the world to turn to Public-Private Partnerships (PPPs) to bridge this gap (Reinhardt, 2011).

Further, more and more organizations are adopting procurement risk management practices. 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; by understanding of the five landscapes on which procurement risks occurs: 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. 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).

With advances in information technology, E-procurement has developed, and is increasingly being adopted in both the private and public sectors. Hussain (2012) notes that the concept began in developed nations but has since been increasingly adopted in developing economies. This fast development and proliferation of E-procurement has been attributed to technological advances and the benefits; space collapse, transparency , time and cost reduction; E-procurement offers to the procurement process (Brandon & Carey, 2010) E-procurement, a fast developing supply chain management practice, could thus be viewed as offering efficiency in the procurement process. Mega projects acquisition, often due to their size and nature, are complex and costly, and time consuming and prone to political influence (Flyvbjerg, 2014). In view of its potential, scope and impact, the effective implementation of procurement processes through electronic means or e-procurement, is one avenue to pursue: Increased levels of transparency and efficiency; and Better use of public resources; Cost savings in goods and services purchased and; Technological Integration / interoperability (CIPS, 2015).

1.1.1 Global perspective of Mega Projects Procurement

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, 2012; Mckinsey, 2015) Schlumberger Business Consulting (SBC, 2015) estimates that procurement and contracting process for mega projects explains at least 12% of mega project failure. The global investment in Mega projects is projected to rise to \$13 trillion by 2030 (Mckinsey, 2013) Improvement of the acquisition process of mega projects could portend opportunity for governments

to deliver mega projects on time and on budget. There is growing consensus among industry professionals and academics (Reeves, 2011, KPMG, 2012, & McKinsey, 2015), that improvements in pre project phases such as procurement could lead to improvements in delivery of mega projects. Quest to reverse mega project failure has seen governments worldwide adopting a myriad of supply chain management practices including: PPPs, Risk Management, contract management as well as E-procurement, with much success (Reeves, 2011, CIPS, 2015, & KPMG, 2012).

Largely driven by lack of adequate funds to finance mega projects, and the need for cost efficiency and quality (Meidute & Paliulis, 2011; Cheng, Chan & Kajewski, 2009), governments worldwide are adopting the PPP model of project acquisition in different proportions and propensity, which represents a paradigm shift from the traditional design to bid model of project procurement. In the UK, Partnership UK (2010) reports that more than 700 PPP contract have been implemented successfully in the period 1999-2009, valued at \$98 billion, half of which would have otherwise not have been possible using the traditional procurement model. The United States, a newcomer to PPPs, has turned to PPP model of acquiring projects due to infrastructure finance deficit of \$1.1 trillion over the period 2009-2014. (PWC, 2015) Developing countries in the same period, 1999-2009, have also recorded a remarkable use of PPP. In Sub-Saharan Africa, an estimated \$755 billion in private investment across nearly 2,500 infrastructure projects have been recorded in roads, schools, water reclamation, hospitals, prisons and the provision of health (Capital, 2012). Reeves (2011) advances that PPPs have introduced significant efficiency, reliability and transparency; which has earned them a strong reputation for ability to acquire and deliver projects on time and cost.

Globally, risk management practices are increasingly being adopted to overcome mega project failure (Little, 2011) Procurement risk management is one avenue increasingly being relied on to overcome post contract failures. Jin, (2011) and McKinsey (2013) imply that procurement risk strategy focusing on efficient risk identification and sharing in mega projects has been established to have a significant cost and schedule impact in global mega projects. According to Flyvbjerg (2014) political and economic sublimines that face mega projects often mean that risks are not

properly identified and managed leading to project failure. Analysis of global mega projects intimates that successful acquisition and delivery of Mega projects is dependent on whether the risk allocation strategy was effective (Jin, 2011). Automation of procurement processes is also a key success factor in mega projects (Crosby, 2011). According to Neupane (2014), E-procurement has introduced efficiency and transparency in complex procurement (CIPS, 2013) such as mega project procurement which is often plagued by political interference and myriad of ethical issues often due to size (Flyvbjerg, 2013). Contract management strategies and global sourcing (Crosby, 2011 & Villmo, 2012) are other common practices increasingly being relied on for successful acquisition on mega projects.

1.1.2 Regional Perspective of Mega Project Procurement

After decades of being labeled underdeveloped, Africa is keen on turning the tide of underdevelopment with most governments acquiring and investing heavily in infrastructure mega projects such as; Kenya's KeS327 billion SGR, DRC's \$80 billion grand Inga dam, Mtara, Corridor Development project in Malawi, Mozambique, Tanzania and Zambia, and South Africa's \$12 billion Jasper Power Projects (KPMG, 2013; EIU, 2015; WB, 2011); with a cornucopia of many more churning in the pipeline (EIU, 2015) Similar to global trends, Africa's mega projects also experience failure, partially attributable to a slow ineffective acquisition processes. For instance, the International Finance corporation (IFC, 2016), estimates the rate of failure of their funded mega projects at 50%. The time and cost overrun in African mega projects, as with projects elsewhere in the globe, has also been directly linked to inefficient acquisition process; poor procurement contract management such as having incompetent subcontractor (Kikwasi, 2012); incompetent contractors, poor choice of procurement method, and lack of financing leading to delays in procurement and contractor payment (Ameh & Osegbo, 2011). To improve mega projects delivery, Gaetsewe, Monyone, and Emuze (2014) assert that the public procurement process must be improved.

In bid to improve performance of Africa's mega projects, governments in Africa, just like their global counter parts, are adopting supply chain practices such as PPPs,

global sourcing, contract and risk management. Deloitte (2015) reports that in 2015, Private sector owned 10% of total mega projects representing an increasing from 4% reported in 2013, showing a rise in popularity in PPPs that have been taunted to offer greater effectiveness in acquisition of Mega projects (EIU, 2015; OECD, 2012; WB, 2010) Deloitte (2015) and KPMG (2015), further report a surge in number of foreign firms, from Australia, UAE, India, and china, owning these public mega projects showing a growing propensity towards global sourcing perhaps to improve technical capacity that has been identified as key cause of mega project failure in Africa. Given the technical, political and systemic complexity (Flyvbjerg, 2013), government are paying more attention to procurement contracting and risk management (OECD, 2012), particularly through legislation of various aspects such as PPPs and review of existing procurement frameworks (Osei *et al*, 2014).

1.1.3 Local Perspective of Mega Project Procurement

In Kenya, development of most Mega public projects is envisaged and initiated in ‘The Kenya Vision 2030’ which was developed by the government of Kenya in 2007 to ensure sustained economic growth of about 25% p. a. for 25 years (GOK, 2015). It is based on three pillars: Economic; and social governance, anchored under six foundations: Infrastructure, science and technology and innovation, land reform, human resource development, security, and public service reform. The Energy sector is a key enabler of this initiative under which key Mega projects have been prioritized to reduce cost of energy and increase access to power (GOK, 2013). Recently acquired and planned mega projects include: the KeS327 Billion SGR; \$26 Billion Lapsset projects; \$85Million solar hybrid micro-grid project; and the \$551 million JKIA green fields’ project among others (GOK, 2015; GOK, 2016; PPPU, 2016). The energy sector features heavily in mega projects in Kenya with a projected procurement of \$19.8 billion to produce additional 10,000 Megawatts of power by 2030 (GOK, 2014). The ministry of energy draft national policy, October 2014, shows that the government aspires to deliver additional 5000MW by 2019 and 10,000 additional MW by 2030, in line with the vision 2030, some procured through Independent Power Producers (IPPs) through the PPP Act 2013 (GOK, 2014).

Kenya's Mega projects, just like mega projects across the globe, face challenges, especially at procurement phase, with, many mega projects experiencing protracted or failed procurement. For instance, the KeS24.6 billion laptop tender had been cancelled twice after tender award (NCLR, 2014). The tender for supply of cranes to KPA was stopped after an urgent application by Kocks Krane GMBH, on basis of irregular tender award (NCLR, 2013). The same tender had earlier been repeated in 2004(NCLR, 2004). More recently, the \$551 million JKIA project acquisition was cancelled citing financial challenges (KAA, 2016); financial issues and political risks have been cited for slow implementation of the Lapsset projects (BMI, 2016); the 700MW LNG plant PPP process was unresponsive (PPPU, 2014); while the KeS15 Billion Kinangop power and the 980 MW Lamu coal power plant have faced acquisition failure owing to socio political risks (Rita 2016). The KeS 29 Billion Loyangalani-Suswa transmission has experienced contractor failure during implementation (R. O. K, 2016).

Similar to global practice, the Kenya government seems to be adopting new approaches in a bid to overcome some of these challenges in acquisition and implementation of mega projects in a bid to attain goals of Vision 2030 development blue print. A notable approach has been the adoption of PPPs. The PPP Act 2013 was enacted to stimulate PPP uptake for these projects outlined in vision 2030 (NCLR, 2013). This is cognizant of the fact that Kenya needs \$60 billion for infrastructure investment in the period 2012-2020 (MOF, 2012). However, only \$25 billion can be provided through normal budgetary process. The reform of the Public procurement system, for instance the repeal of the Public Procurement and disposal act 2005, with the current law, public procurement and asset disposal, seeks to entrench the practices of risk management and contract management into the public procurement system to enable a more effective mega project acquisition and implementation environment. (ICPAK, 2016) These practices could portend success in the procurement of Mega projects in Kenya.

1.1.4 Procurement Performance

Kumar and Odzmar (2010) elucidate that procurement performance could be viewed from two perspectives: procurement effectiveness, and procurement efficiency. While effectiveness of the procurement process relates to ability to meet the need, procurement efficiency focuses on how well this need has been met (Gonzalez & Muller, 2010); this implies that the procurement process must strive to meet procurement objectives, with minimum impact to organizational resources. Waruguru (2015) intimates that the level of procurement performance in the public sector is often indicated by quality of services and goods procured, workmanship, lead time variability, comparative price of goods and cycle time. The Kenya public procurement system has often been associated with: poor procurement planning, delays, poor records management, poor compliance to law, and political interference (Okiri & Muturi, 2016). In the realms of mega projects, procurement proceedings have often been associated with appeals, court cases, allegation of malpractices such as tender price manipulation and poor workmanship resulting in delay or suspension of the procurement proceeding, as well as questionable workmanship and delivery.

Procurement performance is dependent on a number of factors. Mady and Mady (2014) intimate that careful supplier selection of local and international supplier, as well as improvement in supplier relationship, is essential to enhance procurement performance. According to Barsemai, Mwangangi, and Asienya (2014), electronic procurement and staff competence in procurement management significantly influence procurement efficiency and effectiveness. Similarly, Okiri and Muturi (2016) opine that integration of ICT and contract management practice, and internal organization are key determinants of procurement efficiency. The Sourcing process and practice, according to Manyega and Okibo (2015) also has a significant bearing on procurement efficiency and effectiveness. Common procurement performance measures are grouped into various dimensions such as cost; quality; cycle time; and process efficiency (Dale, 2010; Migai, 2010; Barsemoi et al., 2014).

1.2 Statement of the Problem

Consensus has grown among experts and scholars, such as Reeves (2011), KPMG (2012) and Mckinsey (2015), that a great opportunity to alleviate mega project failure exists in the project procurement phase (SBC, 2015) Supply chain management practices: PPPs (Reeves, 2011); Risk management practice (Russil, 2010 & Little, 2011); and E-procurement practices (Hussain, 2012; CIPS, 2015), are gaining momentum globally in quest to improve performance of mega projects. For instance, Over 700 projects worth over \$98 billion were procured successfully in United Kingdom between 1999 and 2009, through PPPs with greater cost and time efficiency than the traditional design to procure model (Partnership UK, 2010) In Australia, ACG (2009) reported cost overruns of only \$53 million for \$4.5 billion worth of PPPs compared to \$618 Million for \$4.1 billion of traditional procurement projects. Further, Jin (2011) and Mckinsey (2013) intimate that procurement risk strategy focusing on efficient risk identification and sharing in mega projects has been established to have a significant cost and schedule impact in global mega projects.

In Kenya, Various mega public projects have been envisaged in ‘The Kenya Vision 2030’, to ensure sustained economic growth of about 25% yearly, for 25 years (R. O. K, 2015) Most of the projects including: the KeS24.6 billion school laptop project; KeS200Billion Lamu coal project; KeS15 billion Kinangop power project; KeS700mw LNG 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 R. O. K (2016) 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.

Studies related to mega projects have tended to focus on evaluating performance of Mega projects; Flyvbjerg (2014; Crosby, 2011), while others (Themsen, 2014; Dieguez, Carzola & Luque, 2014; Serpella, Howad & Rubio, 2014) have focused on the concept of risk management in Mega project. Whilst informative to this study, the studies only explain the failure paradox in mega projects. Most of these studies have also been done in developed economies outside Africa. For instance: Crosby (2011) in Australia; Themsen (2014) in Denmark; and Serpella *et al.* (2014) in Spain. Further, these studies have tended to adopt a case study approach. For instance; Themsen (2014) entailed two longitudinal case studies; while Serpella *et al.* (2014) was a case study. Other studies exist as systematic literature review or white papers; (Flyvbjerg, 2014; Dieguez *et al.*, 2014). Little evidence in literature exists of study on emerging supply chain practices influencing procurement of mega projects. This study adopted a descriptive survey research design, to examine emerging supply chain management practices and procurement performance of mega projects in the energy sector in Kenya.

1.3 General Objective

The broad objective of the study was to examine the influence of emerging Supply Chain Management practices on procurement performance of Mega projects in the energy sector in Kenya.

1.3.1 Specific Objectives

This study sought to achieve the following specific objectives,

- i. To establish how PPPs influence procurement performance of Mega projects in the energy sector in Kenya.
- ii. To ascertain how E-Procurement affects procurement performance of Mega projects in the energy sector in Kenya.
- iii. To examine how procurement risk management impacts procurement performance of Mega projects in the energy sector in Kenya.
- iv. To assess how global sourcing influences procurement performance of mega projects in the energy sector in Kenya.

- v. To determine the moderating effect of regulatory framework on procurement performance of Mega projects in the energy sector in Kenya.

1.4 Research Hypotheses.

H₀₁: There is no significant influence of PPPs on procurement performance of Mega projects in the energy sector in Kenya.

H₀₂: There is no significant effect of E-procurement on procurement performance of Mega projects in the energy sector in Kenya.

H₀₃: There is no significant influence of Procurement risk management on procurement performance of Mega projects in the energy sector in Kenya.

H₀₄: There is no significant influence of global sourcing on procurement performance of Mega projects in the energy sector in Kenya.

H₀₅: There is no significant moderating effect of procurement regulatory framework on procurement performance of Mega projects in the energy sector in Kenya.

1.5 Significance of the Study

This study sought to provide information to the key players in the acquisition of mega projects in the energy sector that enables understanding of the role of emerging SCM practices on the procurement performance of mega projects in the energy sector in Kenya. Particularly, the study focused on the emerging supply chain practices: PPPs, E-procurement, Procurement risk management, and global sourcing as well as the moderating role of the procurement regulatory framework on the procurement performance of Mega projects in the energy sector in Kenya. The study is important to the following parties.

1.5.1 Policy Makers

The study appeals to the policy makers involved in the development, procurement and management of mega projects in Kenya. The study is particularly important to

the Public procurement Regulatory Authority (PPRA), charged with monitoring and managing the public procurement legal system, by providing a deeper understanding of how the legal framework impacts the procurement of public mega projects in Kenya, and thus provide a good basis to improve further the legal framework so as to improve the procurement of mega projects. The study also appeals to the National treasury. Mega projects have huge financial and economic implications. Understanding how to improve the procurement of these projects could improve the national financial and economic performance.

The study is also useful to the National Treasury from a policy perspective. The National Treasury has the mandate of directing the procurement system and the policy that guides the public procurement system in Kenya. Further, the study is also useful to the Kenya Vision 2030 Secretariat, the managers of the vision 2030 blue print, under which most mega projects are envisioned, as the study provides evidence on supply chain management practices that could streamline the acquisition process of mega projects in Kenya.

1.5.2 Energy sector management

The energy sector in Kenya is composed of various players, involved in directing and managing various facets of the energy sector. These include: Generation (KenGen and GDC), Transmission (Ketraco, REA & KPLC) and Regulation (MOE&P & ERC). This findings of this study benefits the management of these entities involved in managing different aspects of the energy sector, and procurement professionals in the sector, with a deeper understanding of the various supply chain practices that influence procurement of mega public projects in Kenya and thus provides a platform upon which efforts could be developed to adopt those practices that impact positively the procurement of the energy mega projects aimed at improving energy production and distribution to meet the demand in line with economic growth projections and to support the achievement of the vision 2030.

1.5.3 Scholars and Researchers

The study sought to explore and indicate the significant relationships between the study variables and the procurement performance of mega projects in the energy

sector in Kenya. The study findings enrich analysis on the influence of emerging supply Chain Practices on the procurement of Mega projects, and thus provide academicians and researchers with a deeper understanding of these and related concepts. The findings from the study also add to existing literature which could be used for academic study or for further reference, by other academicians and researchers to understand, and explore better, these relationships in different regions and other setups.

1.6 Scope of Study

The study examined the influence of emerging supply chain management practices on procurement performance of mega projects in the energy sector in Kenya. These mega projects are implemented under various public entities such as KETRACO, KPLC, KenGen, GDC and the Ministry of energy and petroleum (MoE&P). The study had a national outlook, and entailed a survey of 47 mega projects in the energy sector in Kenya. The study was cognizant of the possibility of existence of other practices that could influence performance of mega projects such as; Project Planning, social political factors, and changes in the global economic environment. However, this study limited itself to four emerging and developing supply chain practices: PPPs, E-Procurement, Procurement Risk Management, and Global sourcing, as well as the moderating role of Regulatory framework, on the procurement performance of Mega projects in the Energy sector in Kenya.

1.7 Limitations of the Study

This study examined the influence of four supply chain management practices: Public Private Partnership, Electronic procurement, Procurement Risk management, and Global sourcing; on procurement performance of mega projects in the energy sector in Kenya. This provides opportunity for other researchers and scholars to explore the relationship between other supply chain management practices, such as supplier selection and management practices, and procurement performance of mega projects in the energy sector in Kenya.

The study further faced a challenge of resistance by respondents to answer questions relating to procurement performance, occasioned by confidentiality policy, of most Procuring Entities in the energy sector. This was however alleviated by the introduction letter provided by the university that indicated that the data sought in the survey was for academic purpose only, and would be treated with utmost confidentiality. This enabled respondents to freely avail requested information, towards the success of this study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents the conceptual framework, theoretical and empirical review of literature related to phenomena under study. This chapter also outlines the methodological, contextual and conceptual research gap.

2.2 Theoretical Review

According to Trochim (2010), a theoretical framework provides theories, or a set of theories, which guide social science research, and explains in general context, the construct of the study. Sutton, Robert and Barry (2010) and Kerlinger (1986) define a theory as a set of interrelated principles and explanations that present a systematic view of phenomenon by specifying relationships between identifiable variables, and include basic assumptions and axioms forming the basis for such relationship, which can be empirically examined. As such, theories provide researchers deeper understanding and basis for studying natural phenomenon. By virtue of application, a theory in social science is valuable as it fulfills an important purpose; of explaining the meaning and nature of phenomenon under research (Asher, 2013). This study relies on the Bensaou Relationship portfolio model, Resource Based View, Agency Theory, and the Porter Value Chain Analysis model; to understand the nature of supply chain management practices.

2.2.1 Bensaou Relationship Portfolio Model

According to Sanderson, Lonsdale and Mannion (2015), the Bensaou relationship portfolio model, classified among other purchasing portfolio models such as Krajlic (1983) was fronted by Bensaou (1999), for use in analyzing and proposing different types of buyer-supplier relationship. The model makes significant contribution to the area of supplier relationship management by explaining the practical factors that determine the nature of the buyer supplier relationship (Caniels, Gelderman & Ulijn, 2010). The model explains that it's the level and balance of relation-specific investment that determine the nature of relationship between buyer and supplier. Gelderman, Caniels, and Fluere (2011) describe these specific investments as "expensive and difficult to transfer investments" and they include buildings, tooling, equipment, expertise. According to Lonsdale, Kirkpatrick, Hoque and Ruyter (2010), Bensaou (1999) identified four types of buyer supplier relationships: strategic partnership, captive buyer, captive seller, and market exchange; and explain that when the specific investments are high for both buyer and seller in a specific procurement, then a strategic partnership would be adopted, and when low for both parties, the opposite extreme, market exchange, relationship would be adopted.

The Bensaou model provides adequate lens to view and understand the rationale and elements of public private partnerships in Public procurement of Mega projects. In the Bensaous Model, Lee and Drake (2010) outline that strategic partnership have a high level of relational specific investment. PPPs are a developing model of acquiring and implementing public projects that involve a significant level of private entity finance, design and implementation, usually over multi year periods of financing (EIU, 2014; WB, 2011). From this perspective, PPPs could be seen as a form of advanced strategic partnership between the public procuring entity and the private sector. The key characteristics of the strategic partnership type of relationship in the Bensaou (1999) model, as explained in Lee and Drake (2010): rich and frequent information exchange, high commitment and trust, extensive joint action, cooperation, and early supplier involvement; mirror the characteristics of a public private partnership. This emerging and developing form of supplier (contractor) relationship is being seen as a supplier relationship strategy to overcome

inefficiencies in mega projects acquisition in Reeves (2011). The strategic partnership (PPPs), portends opportunity to improve procurement performance of mega projects through; assuring project finance, early supplier involvement especially in design, and cooperation by bundling multiple aspects where cost and payback have a direct relationship (Siemiatycki, 2015; Reeves, 2011; EIU, 2014).

2.2.2 Resource Based View (RBV) Theory

Seshadri (2010) attributes the origin of the resource based view (RBV) to the resource based theory of Barney (1991) and Wernerfert (1984). The RBV suggests that an organization derives competencies, and therefore competitive advantage, and success, out of combining, and using its tangible and intangible resources to improve its performance (Chirchir, Ngeno, & Chepkwony, 2015) RBV further classifies these resources into: Physical resources (such as buildings, land); Human capital resources (such as training, experience, intelligence, relationships and workers); and Organizational capital resources. Organizations can thus be seen, according to RBV, be seen to derive competitive advantage out of certain capabilities, competencies, and efficiencies from technology, such as E-procurement, which can be viewed as part of physical resources (Seshadri, 2010).

Literature, (Delloite, 2010; Walker & Brammer, 2012; Tassabehji, 2010), intimates that organizations that adopt E-procurement to conduct the procurement process achieve: cost reduction, greater contract compliance, price and procurement process visibility, wider market access, structured evaluation and more effective negotiation. The procurement of Mega projects, often due to their size and nature, is complex and costly, and time consuming and prone to political influence (Flyvbjerg, 2014). In view of RBV, E-procurement could portend success in procuring mega projects by introducing in the procurement process the above listed efficiencies; such as procurement process visibility, effective negotiation and evaluation, wider market access, reduced process time and cost; in the acquisition of mega projects. In view of the fact that procurement and contracting process of mega projects explains at least 12% of mega project failure (SBC, 2015), E-procurement, is one avenue to pursue successful mega projects.

2.2.3 Agency Theory

The development of the Agency theory, according to Lan (2010), can be traced to an article “theory of the firm: managerial behavior, agency costs and ownership structure “by Jensen and Meckling. According to Jensen and Meckling (1976) agency relationship is the “contract under which one or more persons (the *principal(s)*) engage another person (the *agent*) to perform some service on their behalf which involves delegating some decision-making authority to the agent”. 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) point 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.* (2013) 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; 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. Efficient procurement risk hinges on; ex-ante risk identification (feasibility and market study to identify risks early); Risk reduction (accuracy of information in all procurement process for instance cost forecasts); risk allocation (risk sharing depending on negotiation power and ability to handle risk); and risk monitoring, considering the dynamic environment of public procurement process. (EU, 2010) Agency theory has been applied in understanding risk management in supply chain processes (Halldórsson & Skjøtt-Larsen, 2006; Ritchie *et al.*, 2008; Norrman, 2008; Shook *et al.*, 2009), while Zsidisin and Smith (2005) show how compliance strategy such as ESI, have been used to gather information on suppliers in order to mitigate risk towards strengthening the principal and agent relationship.

2.2.4 The Porter Value Chain Analysis Model

The value chain analysis model is often attributed to the work of Michael porter (1985) on creating and sustaining competitive advantage by sustaining superior performance. It adopts a process view of an organization; and analysis an organization as a system made of subsystems, each with inputs, transformation process, output; that deliver a valuable offering in form of products and service to a consumer (Mitchel, Coles & Keane, 2009) In Sturgeon (2013), the value chain is more simply defined as the full range of sequential activities; inbound logistics, outbound logistics, manufacturing, and operations management; and their support activities; management, human resource services, procurement, infrastructure maintenance; required to produce the product or service. The support service cut across all sequential activities. According to Gurria (2012) globalization now

portends that these activities and support services expand beyond borders as business networks expand to various corners of the world, in the emerging and developing era of global value chains.

Value chain analysis model provides the study a heuristics tool for studying the emerging supply chain practice of global sourcing; the sourcing of goods and services beyond geopolitical boundaries (Kanemoto *et al.*, 2011) Gurria (2012) asserts that globalized value chains widens the sourcing scope for organization to include global sourcing. According CIPS (2013), global sourcing is often driven by desire for organizations to exploit global efficiencies (price, technology advances, quality, expertise) while acquiring requirements. Governments being service providers to citizenry (OECD, 2010), could benefit from these global efficiencies through global sourcing. In context of mega project procurement, these benefits could accrue to the procurement process by practicing global sourcing: global competition could result in lower contract prices; technology transfer in mega projects; higher quality attributed to international standards; and more qualified contractors (Roshana, 2008; Crosby, 2011; EIU, 2015).

2.1.6 Hypothesis development

The Bensaou Relationship Portfolio Model makes significant contribution to this study by providing an important tool for analyzing and proposing different types of buyer-supplier relationships. The model identifies and proposes strategic partnerships, among four types of supplier relationships, in procurement characterized by high relation-specific investment, by both buyer and seller. This type of relationship is characterized by high commitment, early supplier involvement, extensive joint action, and rich, frequent information exchange. This mirrors the scenario of public private partnerships that have a growing popularity in acquisition of Mega projects. This informs the first hypothesis, *HO₁: There is no significant influence of PPP on procurement performance of mega projects in the energy sector in Kenya*, to test the influence of PPP on procurement of mega projects.

Adoption of the resource based view of an organizations performance, that performance of an organization is borne out of its resources enables the study interrogate the adoption of e-procurement in acquisition of mega projects. E-procurement forms part of the organizational resources, and enables the organization to derive efficiency in the procurement process such as: procurement process visibility, wider market access, efficient evaluation and negotiation, and greater contract compliance; and hence contribute to overall organizational efficiency. This informs the second hypothesis; *HO₂: There is no significant effect of E-Procurement on procurement performance of mega projects in the energy sector in Kenya.*

Further the agency theory examines the relationship between principal and agent, in this case, the supplier/contractors and public procuring entity, and illuminates two issues in the relationship; the differing objectives and risk attitudes; and thereby gives prominence to information and risk identification mechanisms to manage risk. In the procurement process, this calls for ex ante risk identification, risk pricing and negotiation, risk allocation and monitoring to effectively reduce or eliminate procurement risk. This informs the third hypothesis: *HO₃: There is no significant influence of Procurement risk management on procurement performance of Mega projects in the energy sector in Kenya,* to examine this theoretical explanation.

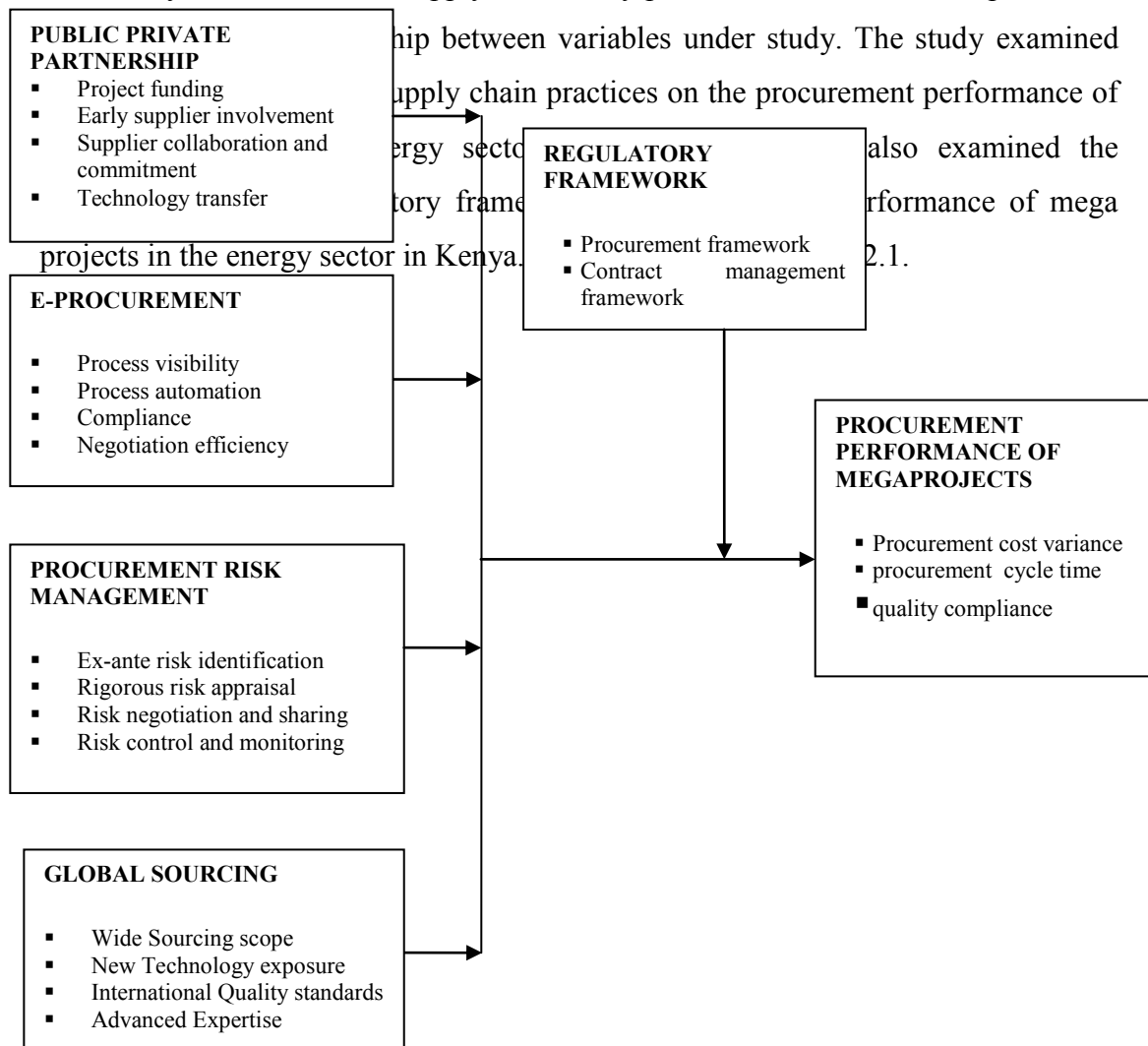
Value chain analysis model provides the study a heuristics tool for studying the emerging supply chain practice of global sourcing; the sourcing of goods and services beyond geopolitical boundaries. Globalized value chains widens the sourcing scope for organization to include global sourcing to exploit global efficiencies (price, technology advances, quality, expertise) in delivering products and services to consumers. Governments being service providers to citizenry could benefit from these global efficiencies through global sourcing. This informs the fourth hypothesis: *HO₄: There is no significant impact of Global Sourcing on the procurement performance of mega projects in the energy sector in Kenya.*

The procurement environment in Kenya is regulated by various laws including the PPAD (2015), and the PPP act (2013). It is deemed that the regulatory environment has an impact on the procurement performance of mega projects. This is the basis of

the fifth hypothesis: *HO₅: There is no significant moderating effect of regulatory framework on procurement of mega projects in the energy sector in Kenya.*

2.3 Conceptual Framework

Ravitch and Riggan (2012) define conceptual framework as a basic structure that represents the observational and analytical aspects of a system, laying out the conceived interconnection of variables. Relevant fields of enquiry, broad ideas and principles, are used to structure a visual representation showing the expected relationship between variables where the dependent variable responds to the independent variable (Bogdan & Biklen, 2003) According Shields, Patricia and Rangarjan (2013), strong conceptual framework captures something real in a way that is easy to remember and apply. This study presents first, the visual depiction, in



Independent variables

Moderating Variable Dependent variable

Figure 2.1: Conceptual framework

2.3.1 Public Private Partnerships

Public Private Partnership (PPP), a developing model of acquiring and implementing public projects, involves a significant level of private entity finance, design and implementation, usually over multi year periods of financing (EIU, 2014; WB, 2011), as shown in figure 2.2 Procuring entities wishing to engage the private sector in a PPP arrangement, according to Neupane law (2012) must enter in to a PPP contract; an arrangement that provides for compensation of the private party from proceeds of the investment which typically involves: Sponsor- equity investors, either a party or consortium and may include Government in PPP projects; Procurer- in PPP these include procuring entities responsible for the procurement process; Government- To provide support to Procurer especially in respect to payment obligation usually in form of concession agreements; Contractors- involved in Engineering, procurement and construction (EPC) and operations and maintenance (O&M) Contracts; and other including feedstock providers, and financial, legal and technical advisors for lenders and government (Gardner & Wright, 2014; Bitsch, 2010; Delmon, 2015) as shown in figure 2.2.

This paradigm shift from the traditional design to bid procurement practice, often plagued by inefficiencies, to PPPs in acquisition of mega projects around the world has been driven by efficiencies attributed to the developing model. Reeves (2011) advances that PPPs have introduced significant efficiency, reliability and transparency; earning PPPs a strong reputation for ability to deliver projects on time

and cost. PPPs portends opportunity to improve procurement performance of mega projects through; assuring project finance, early supplier involvement especially in design, and cooperation by bundling multiple aspects where cost and payback have a direct relationship (Siemiatycki, 2015; Reeves, 2011; EIU, 2015).

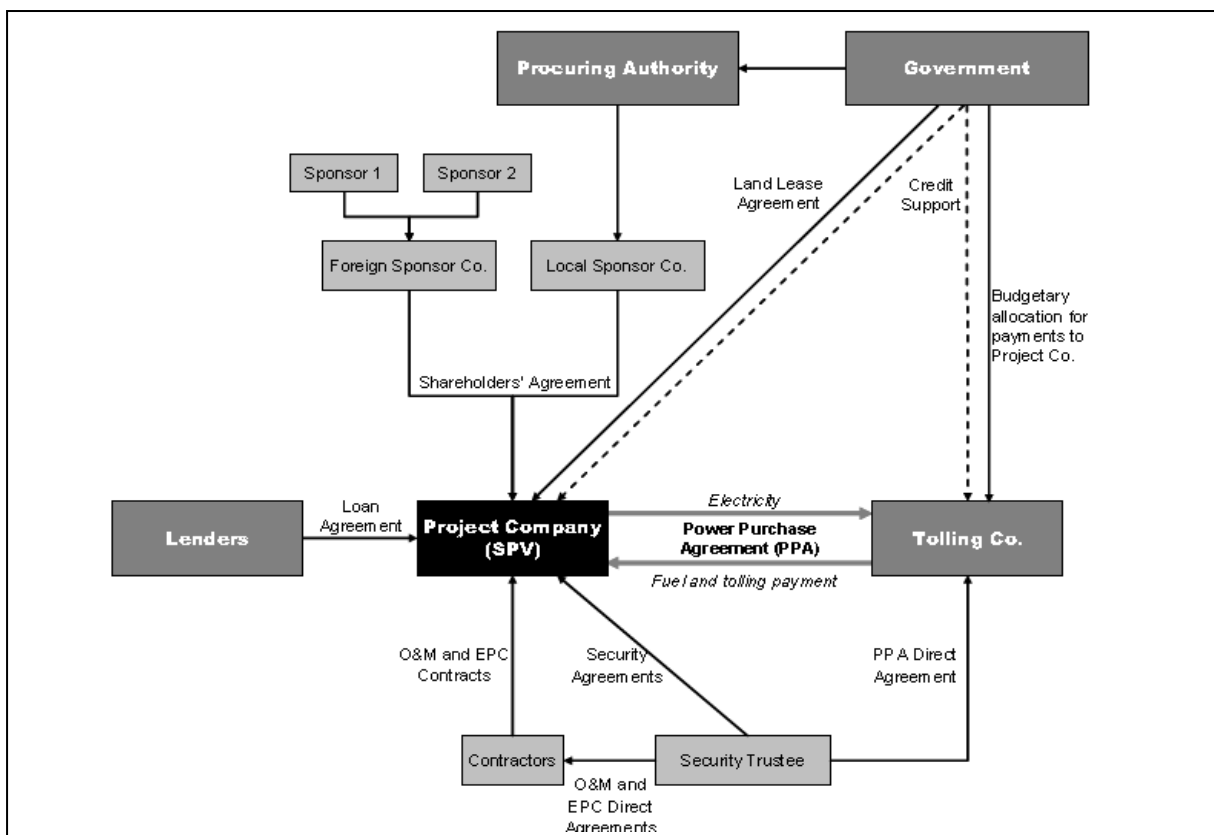


Figure 2.2: Typical PPP Agreement, Source: Gardner and Wright (2014)

2.3.2 Electronic Procurement

E-procurement, the practice of undertaking the procurement process over web based applications to enable e-tendering, e-auctioning, vendor management, purchase order

integration, e-invoicing, e-payment, and contract management (Gruenen *et al.*, 2010), such as IFMIS use in public procurement system in Kenya (Odago, 2013), has been rising and literature shows various benefits that could be derived from e-procurement adoption leading to enhanced organizational and supply chain performance. In Chirchir *et al.* (2015), e-procurement is seen as providing enhanced information sharing, integration of supply chains thereby improving supply chain performance. Odago and Mwajuma (2013) portend that E-procurement offers enhanced transparency, compliance, and transactional efficiency by eliminating non value adding activities and improving supply chain visibility leading to improved procurement performance.

These efficiencies could be viewed from two fronts: the strategic dimension and the tactical dimension. Smart (2010); Tao, Ho and Wu (2010) argue that at the strategic dimension; e-procurement enhances supply strategy, for instances sourcing from a wider more competitive markets, and enhancing supplier relationship management: at the tactical dimension; e procurement improves operational efficiency in supplier performance management, process integration, process automation, and buyer performance management. Hung, Tai, Lin and Jin (2014) additionally argue that e-procurement improves overall organizational efficiency and also inter-organizational efficiency by enhancing quality of supplier relationships. E-procurement could thus portend success in procuring mega projects by introducing in the procurement process efficiencies such as enhanced transparency, compliance, negotiation and evaluation efficiency, procurement process visibility, wider market access (competition), elimination of non-value adding steps (reduces process time and cost); in the acquisition of mega projects.

2.3.3 Procurement Risk Management

Risk Management has been defined by (Tohidi, 2011) as the proactive process of anticipating and assessing risk; and applying various methods aimed at significantly reducing risk to acceptable levels. Applied to projects, of varying size, even Mega projects, the risk management process aims at understanding risks clearly to enable effective management by various parties involved in project delivery (Seyed *et al.*,

2010). The process varies in practice but is embedded in the following steps: planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk response planning, and risk monitoring and control. According to Picard and Andrieu (2012) 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. Following this thought, Little (2011) postulates that even though the concept of risk management is important in all projects, it is particularly important to Mega projects procurement where the ‘issues are a reality’, because of the complex nature and value as well as conflicting shareholder interests. This is highlighted in the Agency theory on the problem in relationship between the agents and principal: the potentially differing objectives and risk attitudes (Lan *et al.*, 2010)

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; by understanding of the five landscapes on which procurement risks occurs: 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. Efficient procurement risk management hinges on; ex-ante risk identification (feasibility and market study to identify risks early); Risk reduction (accuracy of information in all procurement process for instance cost forecasts); risk allocation (risk sharing depending on negotiation power and ability to handle risk); and risk monitoring, considering the dynamic environment of public procurement process. (EU, 2010), as shown on figure 2.3.

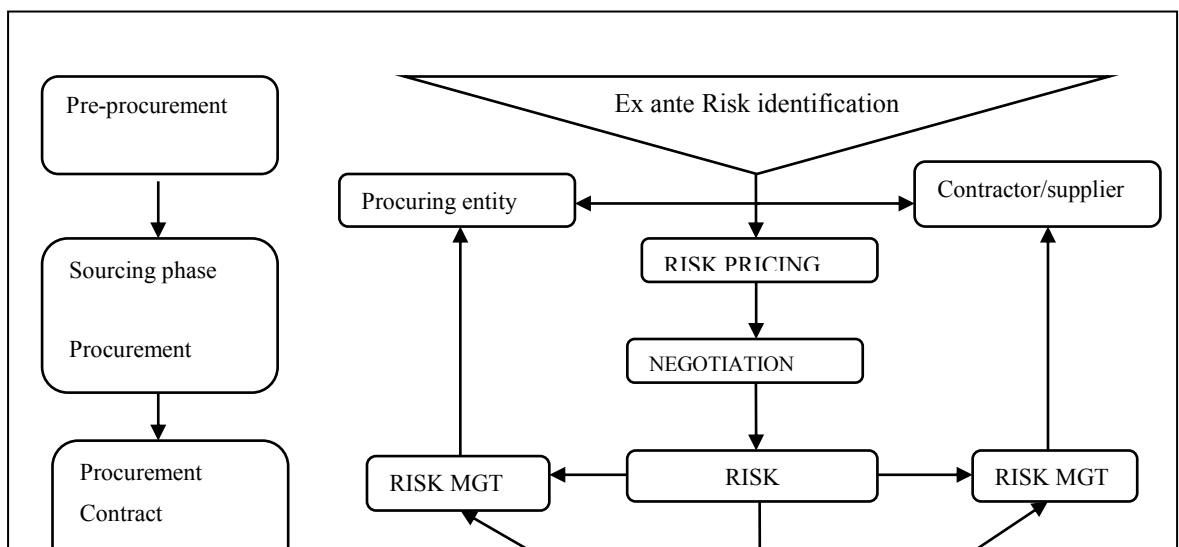


Figure 2.3: Procurement risk management framework, Source: Adapted from Li *et al* (2005)

2.3.4 Global Sourcing

Global sourcing is increasingly being considered a strategic sourcing option by organizations worldwide (Loppascher, Cagliano, & Milano, 2011) and can be seen as an extremely effective strategy to achieve operational and strategic efficiency by leveraging on global capabilities (PWC, 2010). Its is often driven by desire for organizations to exploit global efficiencies (price, technology advances, quality, expertise) while acquiring requirements (CIPS, 2013) In comparison to local sourcing, which has a smaller scope, that global sourcing could result in increased benefits for procuring entities on adoption of a global strategy, due to the widening purchasing scope that results in certain efficiencies and benefits as described above. Governments being service providers to citizenry (OECD, 2010), could benefit from these global efficiencies, while procuring for works, goods and services, through global sourcing.

In context of mega project procurement, the following benefits of global sourcing could accrue to the procurement process: global competition could result in lower contract prices; technology transfer in mega projects (contractors from developing nations could be seen to have more experience and expertise, as well as advancement in level of technology (Roshana, 2008)); higher quality due to accessing international standards (such as compliance to ISO standards by contractors) (Crosby, 2011; EIU, 2015). A major issue affecting mega projects is lack of adequate technical capacity

of contractor (Ameh & Osegbo, 2011). This could be solved by adopting a global sourcing strategy. When sourcing globally for contractors to undertake mega projects, there is opportunity to acquire qualified and experienced contractors from developed nations thereby deriving benefits such as: higher technical expertise and experience and technology transfer among other benefits. It can thus be argued that global sourcing practice in acquisition of mega projects could result in better performance of the procurement of mega projects.

2.3.5 Regulatory Framework

The public procurement system in Kenya is primarily guided by the Public Procurement and Asset Disposal Act (PPAD) of 2015, and related regulations. According to ICPAK (2016), the intent of the procurement legislative framework is to provide procurement guiding principles to procuring entities to maximize value for money; and procurement governance in accordance with international best practices. The legislative framework, which has undergone myriad of changes since independence, seeks to enhance competition, accountability, transparency, and ethical standards in the public procurement system in Kenya (PPOA, 2016) In Kenya, an emerging PPP market (EIU, 2014) the procurement framework for mega projects, inform of PPPs, is further provided in the Public Private Partnerships Acts 2013, enacted and enacted in January 2013, in line with Vision 2030 to stimulate private sector participation in development projects (NCL, 2013).

With the enactment, there is already indication of excitement in the PPP market with over 56 Multimillion PPP projects prioritized, with some already at various levels of implementation (PPPU, 2016) According to EPPPL (2010) and WB (2009), a PPP enabling law, provided in a PPP framework, is a prerequisite for adoption and success of PPP endeavors, by outlining; the institutional responsibilities, rules, and procedures that guide public entities when developing and implementing PPPS. According to EPPPR (2010), the objectives of a PPP framework must provide for; prioritizing PPPs supporting national interests, developing projects, with a bias of Value for Money (VFM) by providing structures that coordinate between

government procuring entities and private entities and contract management (PPIRC, 2016).

2.3.6 Operationalization of Variables

Shields and Rangarajan (2013) define operationalization of variables as the act of describing how study variables will be defined and measured. This is essential because most variables in social research are not directly measurable; therefore, their measurement requires development constructs derived from indicators of the phenomenon under study. leggett (2013) asserts that this provides a clear and objective definition of complex variables. The independent, moderating and dependent variables in this study have been operationalized as shown in Appendix VII.

2.4 Empirical Review

This section lays out the empirical review of the study. Empirical review, an important aspect of social science research process, is the review of recent studies and literature (Saunders, Lewis & Thornhill, 2009). Shields (2013) postulates that this is important for a number of reasons including: to safeguard against replication of research; to justify context of research; to outline research gap; and to enable the researcher learn from previous theory. This section reviews existing recent studies and literature on the study variables.

2.4.1 Public Private Partnerships

Most of research efforts in PPPs have been inclined towards understanding the drivers of PPP adoption. Literature portends that Project financing, was and is still a pertinent issue in any discussion of PPP adoption with different and informing studies across the globe. For instance, Karikari (2015) examines the benefits of Public private partnerships in infrastructure development, in Ghana, with an objective of establishing the extent to which private entities partake in finance of infrastructure in the Ghanaian public. The study compares the non- extensive use of PPP arrangements in Ghana's road infrastructure to the Rest of the world and

acclaims the non- recourse nature of project finance as a key driver of PPP arrangements worldwide. This acclaim of PPPs enhancing success of Mega projects through provision of finances was a key object of another study investigating the driving forces leading to PPP adoption. The study by Malek and Akalkotar (2016), which provides perspectives from India, Hong Kong and Australia's practitioners, ranks financial elements as a key driver leading to PPP adoption among the three nations. Malek and Akalkotkar (2016) further established that the private sector can add value to public sector projects through their expertise and innovation.

Similarly, Osei *et al.* (2014) investigates the reasons for adopting PPP for construction projects in Ghana. The study explores the key reasons for adopting PPPs. Adopting a questionnaire survey approach, the study empirically identifies five most important reasons including 'private sector has ability to raise funds for projects' and 'reduces the problem of public sector budget constraint'. A related study has been done in Nigeria to take stock of development of PPP in Nigeria in the last decade by Dominic *et al.* (2015). The review of PPP on some development projects in Nigeria provides PPP experiences from Nigeria's key economic sectors such as Housing and transportation and reiterates that success in major projects have been achieved through attracting private finance, by adoption of PPPs, in the face of declining government funding majorly due to dropping oil revenues. In a closely related study on factors attracting the use of PPPs in Malaysia, Ismail (2013) sought to examine these factors in the private and public sector. Using a questionnaire survey, the study found that among the top attractive factors was "it solved public budget constraint", and provided the public sector with creative and innovative approaches and integrated solutions to public sector problems, attributable to multiple private sector experts in a competitive environment of private sector.

Medda *et al.* (2012) study on Public Private Partnerships in Transportation in Europe examines how the scope of PPP in Europe is based on the flexibility and adaptability of the contract to the features of the project and to the economic and institutional environment. The study observes that the market for PPP is developing a European dimension and attracting resources from variety of private players. The study further notes that PPPs are important tools to attract additional resources for high priority

investment sectors of an economy. In a somewhat different study in Europe, Benkovic *et al.* (2011) did a study on impact of Legislation on Infrastructure financing by PPP concept. The study sought to elucidate the potential opportunities and guidelines that should be incorporated into PPP law which are expected to provide the financial resources for infrastructure projects in Serbia. Though biased towards legal framework for PPP adoption, the paper postulates that implementation of Mega projects needs alignment of PPPs to attract project finance from the private sector.

A study by Dieguez and Alfonso (2012) examines the models of PPP in Mega projects in Spain. The study analyzes various PPP models in order to establish the gains that could be realized from the implementation of these models in Mega projects. The study established that various PPP models fits specific Megaprojects and concludes that use of PPPs could result in efficiencies attributable to higher technology advancements in the private sector. In a study investigating drivers and obstacles for adopting Public Private Partnerships in Newzealand, Tingting and Suzzane (2011) relied on semi-structured interviews and roundtable discussion with industry players and established, among other things, that PPP contracts provides opportunity for public sector to benefit from private sector innovation throughout the life of project and beyond by embedding in the projects innovative techniques and managerial skills, which ultimately results in improved quality.

A white paper on implication for adopting PPP for infrastructure development in Nigeria by Kadiri, odo and jagboro (2015) opines that PPPs have increasingly become attractive to the public sector because they allow for transfer of improved technology from the private sector, among other reasons. In a similar literature; ‘guidebook on PPP in infrastructure’ Quium (2011) elucidates that PPPs are attractive to developing nations as they enable transfer of technology and managerial skills which may be lacking in developing countries to ensure success of such endeavors .

2.4.2 E-Procurement

Research interest in E-procurement has developed spontaneously since the onset and development of electronic commerce concept. There is a growing body of literature from recent research efforts focusing on impact of e-procurement. For instance, Gonzalez, Marvin, James and Rene (2010) examined the impact of e-procurement on procurement practices and performance. The study investigating the impact of e-procurement technologies, at operational level, established a positive relationship between e-procurement and procurement performance, implying that e-procurement enhances the procurement performance. Similar findings were established in Smart (2010) study on e-procurement and its impacts on supply chain management. The study, based on four multinational firms, sought to examine the impact of e-procurement on the approach to the supply market. Findings indicate that e-procurement led to a clear supply market strategy. The study intimates that e-procurement leads to: higher compliance, enhanced communication, integration, and relationship with the suppliers. King'ori (2013), in a similar study in Kenya, sought to examine the effect of E-procurement on Supply chain management at Teachers Service Commission and found that E-Procurement enhances supply chain efficiency.

Chirchil *et al.* (2015) interrogated the relationship between e-procurement and supply chain practices in Tea firms. The main object of the study was to establish the influence of E-procurement adoption on SCM practices. The exploratory study on 12 tea firms found that E-procurement enhanced supply chain integration, information sharing, and supply chain partnership, thereby leading to improved supply chain performance. In another study on the role of E-procurement strategy in enhancing procurement performance in state corporations in Kenya, Shalle, Wario, and Wario (2013) found that procurement automation through adoption of e-procurement strategy leads to; time and cost saving, reduced paper work, increased staff productivity and increased customer service level.

Other recent studies on e-procurement have tended to focus on adoption. Odago and Mwajuma (2013) examine the factors affecting the effective implementation of E-

Procurement in county governments. The case study of Kajiado County in Kenya revealed that top management, budgetary support, and staff competence were critical factors influencing E-procurement implementation. Maniam, Murali and Magiswary (2010), in a somewhat different study on E-procurement adoption in the Malaysian Public sector analyzed four main constructs: organization leadership, perceived usefulness and ease, and facilitators; and found that these organization perspectives were important in ensuring E-procurement adoption.

2.4.3 Procurement Risk Management

While abundant literature exists on risk management, review shows that merging the terms risk management with procurement, this literature narrows. Most recent literature related to procurement risk management includes a study on risk indicators for managing the energy procurement process. The study by Crema (2015) adopts a case study approach to analyze and evaluate price and volume risks in the energy procurement process and establishes that price risks are most intense, and originates from bilateral contracts and proposes that these be managed through hedging. Tumuhairwe and Ahimbisibwe (2016) perform a cross sectional survey study to establish the relationship between procurement records compliance, effective risk management and records management performance among Ugandan procuring entities. The study establishes a positive relationship between these constructs and recommends a stronger procurement records policy. The paper on assessing and managing risks using the Supply chain risk management process by Tummala and Schoenherr (2011) seeks to propose a comprehensive and coherent approach for managing risks in supply chains. The study identifies key steps: risk identification, measurement, evaluation, mitigation, and risk control and monitoring using data management systems; while suggesting specific techniques for this process. Similar findings and suggestions exists in Kumar, Himes and Kritzer (2014) study on risk assessment and operational approaches to managing risks in Global supply chains.

A white paper by CIPS (2013) authored by Dockeary and Lacy, seeks to guide organizations and practioners on procurement risk management. The paper Titled “Risky Business: An introduction to Procurement Risk Management” identifies key

steps in Procurement risk management to include: Risk Identification; Risk Assessment; Risks Treatment (risk transfer/sharing/avoidance/or reduction); and risk monitoring. Though scanty recent literature exists on Procurement Risk Management, there is growing interest in Risk Management in Mega projects in the recent past. For instance, Dieguez, Carzola and Luque (2014), did a study on risk management in mega projects. The study involves an in-depth systematic literature review on the issue of risk management in mega projects with the aims of: modeling the art of risk management in Mega projects; systemizing the risks identified in literature; and to identify research gaps. The study identifies various risk categorizations for mega projects useful in risk identification and systemization in Mega projects and calls for more research in subsequent steps in the risk management process.

A somewhat different study, case study, by Serpella, Howad and Rubio (2014), while recognizing the importance of risk management in big projects, proposes knowledge based approach to risk management in mega projects. The study, risk management in construction projects-knowledge based approach, asserts that an efficient risk management approach requires a proper and systematic methodology, and most importantly, knowledge and experience. Serpella *et al.* (2014) further assert that a major cause of ineffective risk management is lack of knowledge and propose development of project risk management function based on best practices.

Perhaps the most notable literature initially linking risk management and mega projects is the book by Flyvbjerg, Bruzelius and Rothengatter (2003) titled “Mega projects and Risk: an anatomy of ambition”. The authors note that performance paradox of mega projects (failure) is often due to inadequate; cost benefit, financial analysis and environmental social assessments and assumption that infrastructure policy and projects exist in a predictable Newtonian world of cause and effect which is rarely the case, where risk is not prioritized. The book also notes that promoters often violate established practices of good governance, transparency and participation in a political and administrative decision making process, as these are deemed counterproductive to getting the project started. In terms of risk control, Flyvbjerg *et al.* (2003) proposes a departure from the convectional approach to mega

project development processes, to a more current institutionalistic approach centred on practices and rules that comprise risk and accountability in project processes. This approach is based on actual experience from concrete projects.

2.4.4 Global Sourcing

Crosby (2011) literature on Procurement strategies enabling success in high technology mega projects is perhaps the most notable literature linking procurement performance to Mega projects success. In the paper, Crosby (2011) seeks to provide procurement strategies for the SKA mega projects. Global sourcing is variously mentioned as a practice that could enhance competition, technology and cost benefits to mega projects. In a somewhat different study; Estimating Cost saving potential from international sourcing; Schiele, Horn and Vos (2011) seek to analyze the expected financial impact of international sourcing. The study indicates that combined with other strategies, global sourcing could result in cost saving. Christopher, Mena and Yurt (2011) study on Approaches to managing global risk adopts a multi-case study approach to assess risk management in global supply chains. The study points out that the many benefits accruing to global supply chain players could be eroded by risks associated with global sourcing and proposes a multi-disciplinary approach to manage risks associated with global sourcing.

Other studies related to global sourcing have adopted different perspectives. For instance, Haartman and Bengtsson (2015) adopt a product innovation perspective. The study on impact of Global purchasing and supplier integration on product innovation found that global sourcing has no direct impact on product innovation. Additionally the study established that supplier integration is more strongly linked to product innovation performance for firms engaged in global purchasing as compared to local and regional purchasing. Golini and Kalchschmidt (2011) study the moderating impact of global sourcing on inventories through supply chain management. The study reveals that companies can limit the negative effects of global sourcing on inventories, such as longer lead time, through specific investments in the supply chain and in their relationship with suppliers. Oshri, Kotlarsky, Rottman and Willcocks (2009) studied the global sourcing trends and

issues and predicted a rise in practices such as global outsourcing and multi-sourcing as companies seek to leverage on global capabilities and benefits.

2.4.5 Regulatory Framework

A study by Jaafar, Aziz, and Ramli (2016) examines the roles of compliance with Government Procurement policy. The study focuses sharply on investigating the moderating impact of compliance with government procurement policy between explanatory factors and sustainable public procurement practices. On analysis of the 117 responses from a questionnaire survey, the study by Jaafar *et al.* (2016) reveals that compliance with government procurement policy has a moderating effect between professionalism and sustainable supply chain practices. Marendi (2015) in a study on public procurement legal framework implementation and performance of state corporations in Kenya sought to determine the effect of implementation of procurement regulation including: public procurement and disposal act (2005); and related regulations; on organization performance. Using a cross sectional survey design, the study by Marendi (2015) established a significant effect of public procurement legal framework on organization performance.

In a similar study, Ogot, Mulinge and Muriuki (2010) did a study on impact of Procurement law in profit generating public corporations in Kenya and established that public procurement regulation significantly improves the procurement process, particularly through enhancing transparency, quality, and value for money. Literature review on the importance of project governing framework in project procurement in Malaysia by Aliza, Kajewski and Bambang (2011) indicates that a legal framework is indispensable in project procurement environment to overcome accountability and ethical issues, as well as guiding decision making in such processes that attract a myriad of ethical issues.

2.4.6 Procurement Performance

A study by Chimwani, Iravo, and Tirimba (2014) on factors influencing procurement performance in the Kenya public sector sought to assess the influence of records management, procurement procedures, ICT, and staff qualification on procurement

performance at State law Office. The study established a significant influence on these factors. A similar study examined the factors affecting procurement performance in Kenyan public schools in Gatundu South, in Kenya. The study by Wahu, Namusonge, Mungai, and Chillion (2015) established that the factors that most significantly influence procurement performance include: competitive bidding and the legal framework. Another study by Tarek, Sarah, and Mady (2014) examines the relationship between procurement performance and manufacturer-supplier relationship in Kuwait manufacturing companies. The study focuses on supplier selection and supplier relationships and their effect on procurement performance of these firms. The study indicates that stronger and closer relationship with suppliers could enhance procurement performance.

A somewhat different study by Barsemai, Mwangangi and Asienya (2014) assess the factors influencing procurement performance in private sector. The study adopting a descriptive research design determined that application of IT in the procurement process at Henkel limited, Kenya, was the most significant factor influencing procurement performance. Comparably, the study established that other factors: Staff competence and organization had little but significant effect. Mutai and Okello (2016) study the impact of supplier evaluation on procurement performance in Kenyan public universities and determined that supplier quality commitment, financial capacity and supplier competence have significant impact on procurement performance in Kenyan universities.

2.5 Critique of literature

Most studies have focused only on exploring the drivers of PPP adoption. For instance Malek and Akalkotar (2016) study focuses on examining the driving force of PPP adoption in Hongkong, and Australia; while Osei *et al* (2014) explores the reasons behind adopting PPP in construction projects in Ghana, inform of a questionnaire survey. Ismail (2013) adopts a similar approach, questionnaire survey, to interrogate the factors attracting the use of PPPs in Malaysia. In somewhat related studies, Tingting and Suzzane (2011), studies the drivers and obstacles of PPP adoption in New Zealand, while Karikari (2015) explores the benefits of PPP

adoption in Ghana. These studies identify: project financing, technology transfer, and project economies, as key factors attracting the use of PPP. Medda *et al.* (2012) studies impact of PPPs in European transport system while Dieguez and Alfonso (2012) provides insight on PPP models in Spain's mega projects. These studies have also been done outside Kenya, mostly in transportation sectors. Similar studies could be done in Kenya. Whilst informative to the PPP aspect of this study, these study fall short of enriching analysis on impact of PPPs on procurement performance of mega projects.

On e-procurement, recent literature has attempted to provide empirical analysis on e-procurement influence on supply chain performance. For instance, Gonzalez, Marvin, James, and Rene (2010), Smart (2010) (case study), King'ori (2013), and Chirchir *et al.* (2015) (tea firms in Kenya), catechize the influence of e-procurement on supply chain performance, while Shalle *et al.* (2013) (state corporations in Kenya) examines the role of e-procurement on procurement performance. These study give plausible evidence that e-procurement enhances compliance, communication, supplier relationships and cost saving among other elements. However, they do not illuminate the influence of e-procurement on the concept under study, Mega project procurement. Further, some of these studies are case studies (for instance Smart, 2010) opportunity exists to examine the role of e-procurement on Procurement performance of mega projects in the energy sector in Kenya. Other studies, Odago and Mwajuma (2013) and Maniam *et al.* (2010) are only remotely linked to this study in context and concept, as they only analyze the implementation of E procurement in County governments in Kenya and Malaysian public sector respectively.

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 (2033). 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 studies 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.

On global sourcing various studies enlighten this study on various fronts. Schiele *et al.* (2011) evaluates the financial impact of global sourcing, while Christopher *et al.* (2011) adopts a multi-case study approach to study global sourcing risk management. On the other hand, Haartman and Bengtsson (2015) study the impact of global sourcing on supplier integration and product innovation and establish unique relationships. Crosby (2011) white paper provides plausible procurement strategies for mega projects. Golini and Kalschmidt (2011) studies the moderating impact of global sourcing on inventories through supply chain management, while Oshri *et al.* (2009) examines the global sourcing issues and trends. These studies only illuminate and inform fragmented aspects of this study. They fail to answer the question: what is the influence of global sourcing on procurement performance of mega projects in Kenya? An empirical survey could be done in Kenya to examine the relationship between global sourcing and procurement performance of mega projects.

2.5 Summary of literature

Reviewed literature, shown appendix VI, shows growing robust interest, from academicians, researchers and policy groups, in mega projects and supply chain practices. Literature reveals that there is a growing trend in adoption of PPPs in developing and developed countries in acquisition of mega projects. This has been driven by growing demand for infrastructure against dwindling public funds and budgetary support to meet this demand. The adoption of PPPs, a new procurement model, according to literature has been driven by need to change the paradox of

failure experienced in traditional model of Mega project delivery. Literature is also abounding with studies and white papers offering insight on other supply chain practices, (on E-procurement, procurement risk management and global sourcing), that have been conceptualized to have influence on procurement performance of mega projects.

E-procurement is seen as improving supply chain visibility, simplifying operations, improving supplier relation, enhancing communication; while Procurement Risk management (Risk identification, control and monitoring) is seen as a precursor for success of the procurement process. Global sourcing is seen to relay global efficiencies (cost, technology advances, quality and expertise) while acquiring requirements. A white paper by EPPPL (2010) notes that a PPP enabling law provides the requisite framework for coordinating between government procuring entities, private entities, and contract management for adoption and success of PPP endeavors, by outlining; the institutional responsibilities, rules, and procedures that guide public entities when developing and implementing PPPS.

2.7 Research Gap

Review of literature shows that huge part of recent existing research effort; Malek and Akalkotar (2016), Osei *et al.* (2014), Ismail (2013), Tingting and Suzzane (2011), and Babatunde *et al.* (2015); has focused on drivers of PPP adoption. On E-procurement, Gonzalez *et al.* (2010), Smart (2010), King'ori (2013), and Shalle *et al.* (2013) have examined influence of electronic procurement on Supply chain and procurement performance. Crema (2015) and Tumahairwe and Ahambisibwe (2016) examine procurement risk management from a risk indicator and procurement record compliance perspectives; while Schiele *et al.* (2011) and Christopher *et al.* (2011) examine global sourcing from financial impact and risk management perspectives respectively. They give plausible explanation to the aspect of supply chain practices influence on procurement performance but are inadequate to answer the research questions, as they do not examine, empirically, the influence of these practices on procurement of mega projects.

Other existing literature exists as fragmented studies focusing remotely on aspects of this study, for instance; Karikari (2015), Dieguez (2014), Serpella (2014) and Oshiri *et al.* (2009). These studies are only partially informative to some aspects of this study. Other reviewed studies have adopted case study approach (Serpella *et al.*, 2014; Crema 2015; Christopher *et al.*, 2011; Smart, 2010) that limit the generalization of findings to inform this study. Other literature exists as systematic literature reviews: Dieguez and Alfonso (2012), Dieguez *et al.* (2014) and white Papers (CIPS, 2013, Flyvbjerg, 2014); whilst informative, this qualitative literature does not enrich academic analysis adequately. Little or no evidence has been seen in the review of the influence of supply chain practices on procurement of mega projects. There is therefore need to examine the influence of emerging supply chain management practice on procurement performance of mega projects in Kenya.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the practical procedures for carrying out the proposed study. It gives detail of the research philosophy and research design that was adopted, population of study, the sample and sampling procedure, data collection instruments and procedure, and the data analysis techniques used.

3.2 Research Design

Sekaran (2010) notes the development and execution of an efficient research strategy is a central part of research. Research design, as postulated by Mkansi and Achiampong (2012), is a functional plan outlining and linking research methods and procedures requisite for acquisition of reliable and valid data capable of empirical analysis. A research design is applied to guide application of appropriate research methods towards attainment of research objectives set out in chapter 1. This section gives an analysis of research paradigms and the rationale for adoption of a pragmatic position for this study; and additionally, describes the selected research design.

3.2.1 Research Philosophy

A research philosophy, according to Tsoukas and Chia (2011) describes the belief system, assumption and process of knowledge development. Saunders (2009) postulates that a research philosophy “underpins methodological choice, research strategy and data collection and data analysis techniques that allow design of a coherent research project in which all elements fit together” According to Saunders (2010), there exists 5 major research philosophies: positivism, critical realism, interpretivism, post modernism, and pragmatism. These could be further grouped widely into positivism, antipositivism and pragmatism (Frankie & Weber, 2012).

Buddharaksa (2010) notes that positivism, one of the dominant approaches in social research, presupposes unity of sciences through application of scientific methods relying on objective enquiry. On the other hand, Anti-positivism emphasizes subjectivity, where the researcher interacts, understands, and interprets phenomena and makes meaning out of it. A pragmatic approach views concept as only useful where they support action (Frankie & Weber, 2012). Hamati (2012) postulates that pragmatism reconciles the extremes of Positivism and anti-positivism, as shown in figure 3.1, in regard to objectivism and subjectivism and related concepts, by considering theories, concepts, hypothesis, and research findings not in abstract form (Positivist/anti-positivist approach), but as instruments of thought to permit practical application of ideas and knowledge generated by research.

According to Elkjaer and Simpson (2011), pragmatist are more interested in practical outcomes than abstract distinctions and thus place emphasis on practical outcome to inform practice. In this regard, Niglas (2010) asserts that pragmatism allows use of multi-methods or a method that enables well founded data, relevant data, to be collected that enables the researcher to satisfy study objectives. Further, pragmatism recognizes the renegotiation of truth. This implies that current theory, such as the one used in this study, or the one to be created by this study, and truths may one day become of little use, false, or obsolete in light of new unpredictable situations (Franke & Weber 2012) This study examined the influence of emerging supply chain management practices on procurement performance of mega projects, with a view of providing practical knowledge to improve procurement performance towards more efficient delivery of Mega projects of Kenya's vision 2030. Due to the practical emphasis required of this study's outcome, a pragmatic philosophy subscription was most appropriate.

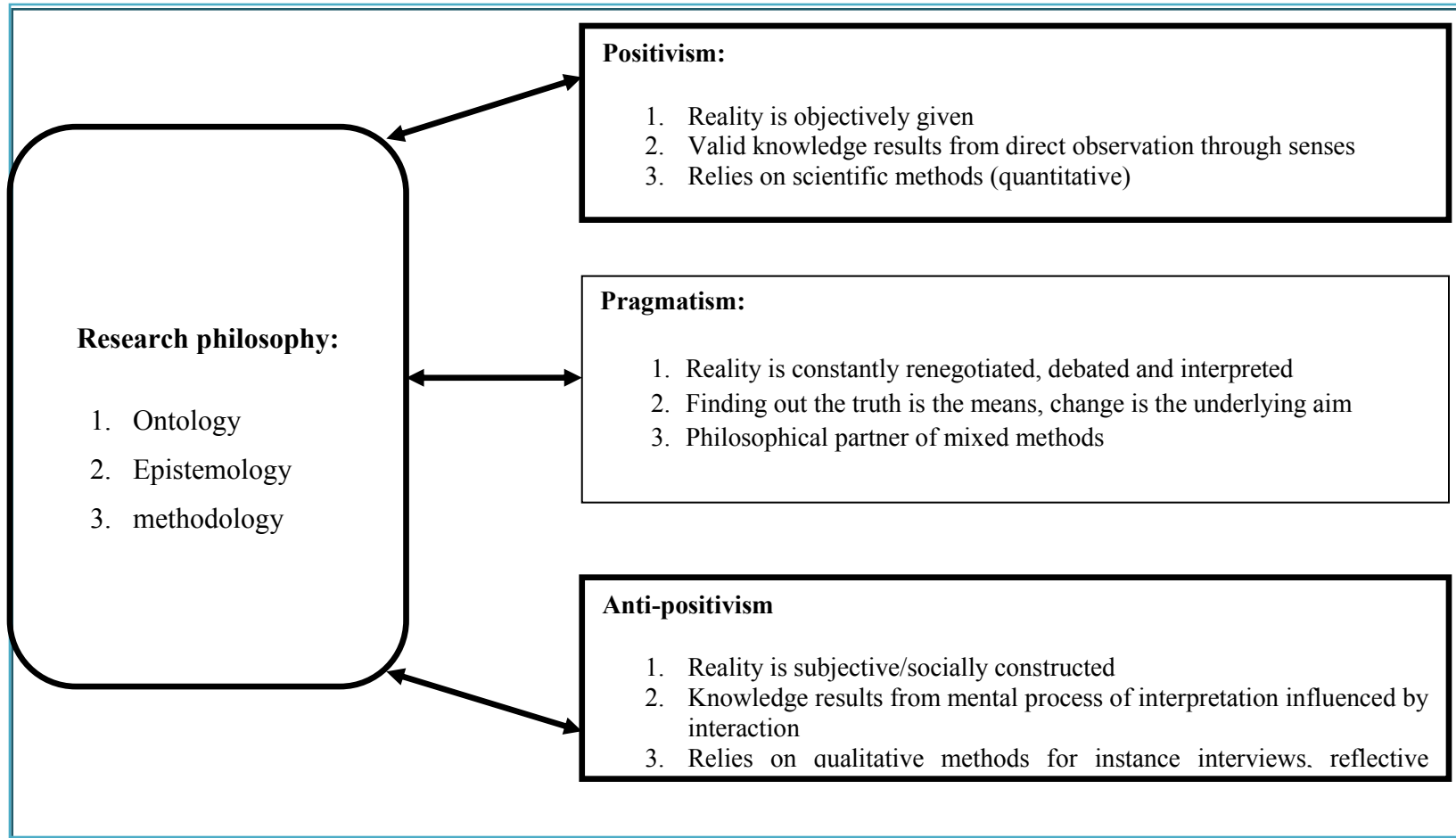


Figure 3.1: Research Philosophy

3.2.2 Selected Research Design

Research design, according to Niglas (2010) is the arrangement of conditions for data collection and analysis in a way that aims to combine relevance to the research purpose with economy in the procedure. This study adopted a descriptive approach using a cross sectional survey design. A cross sectional survey design enables analysis, often multiple characteristics at once, of a population, or its subset at a specific point in time (Dag & Petter, 2015) It provides information about the current status of a population (Gill & Johnson, 2010) Descriptive survey research seeks to obtain information that describes existing phenomena (Sekaran, 2010) Descriptive research portrays an accurate profile of persons, events, or situations (Cresswell, 2009) in their current state. Inferential statistics was used to map the relationship between variables in the study. These two approaches are vital to enable an inquest on the influence of supply chain management practices on procurement of mega projects in the energy sector in Kenya.

3.3 Target Population

Weathington, Cuttingham and Pittenger (2010) describe population as the entire group of individuals or items under consideration in any field of inquiry and has a common attribute; or the group of individual the researcher wishes to study (Sekaran, 2010) This study sought collect data on influence of emerging supply chain management practices on procurement of Mega projects in the energy sector in Kenya. 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. According to Maina (2012), the target population can be defined as all the items, or people with characteristics one wishes to study. Bhattacharjee (2012) more simply defines a target population as composing all the units of analysis, and further explains that these are the items from which one seeks to collect data. The unit of observation was the procurement managers in the procuring entities in the energy sector.

The study sought factual data on the mega projects procurement, which was satisfactorily provided by the procurement managers of these entities.

Table 3.1: Study Population

Procuring entity Projects	
KenGen	5
MoE&P	10
GDC	16
KPLC	10
KETRACO	5
KENYA	1
PIPELINE	
Total	47

3.4 Sample frame

A sample frame is the list of all members of the population from which a sample is to be taken; it is the complete list containing all the sampling units of the population (Kothari, 2004; Zikmund & Babin, 2012). The population of the study was all the mega projects in the energy sector in Kenya. Therefore, the sampling frame of the study was made of a list of the mega projects in the energy sector.

3.5 Sample and Sampling technique

Bhattacharjee (2012) defines sampling as the statistical process of selecting a subset (sample) of the population of interest in a study for the purpose of drawing statistical inference about that population. This study sought data on the influence of emerging supply chain practices on procurement of mega projects in the energy sector in Kenya. The study surveyed all the mega projects in the energy sector. The study thus entailed a

census of all the 47 mega projects identified in the energy sector in Kenya. A census according to Banarjee and Suprakash (2020), is the total enumeration of the study subjects. According to Bhattacharjee (2012), a census is preferred when the universe (study population) is small, and is advantageous in that it offers opportunity to undertake intense study of population, and offers a higher degree of accuracy.

3.6 Data collection instrument

This study used primary data for statistical analysis. According to Kothari (2009) Primary data is data which is collected afresh and for the first time, and thus happens to be original in character. Various methods could be used to collect primary data. These include questionnaires and interview methods (Cooper, 2011). Questionnaires, as discussed in; Kothari (2009), cooper, (2011) and Palinkas (2010), are most preferred over interviews as they provide a more effective and efficient way of collecting data where respondents are spread widely. Compared to interviews, they also provide less pressure on respondents. Semi structured questionnaires will be used. Questionnaires are used to obtain important information about the population (Maina, 2012). The questionnaire was developed to address each specific objective/ hypothesis of the study.

3.7 Data collection procedure

According to Bhattacharjee (2012), various procedures exist on which a researcher can rely on to administer the data collection tool including: personal delivery and administration, telephone aided administration, postage as well as drop and pick-up method. Whist personal administration, and telephone aided administration affords a researcher opportunity to seek more information, it may not be efficient to cover wide coverage and suffers high rate of non-response (Shaughnessy, Zechmeister & Jeanne, 2011) On the other hand, drop and pick methods results in significantly higher response rate and is an effective method to reduce non response bias as compared to above procedures. (Allred & Davis, 2010) Questionnaires, together with the university

introduction letter, explaining the purpose of the questionnaire, were administered to selected respondents through interview and, drop and pick up method.

3.8 Pilot study

Cooper and Schindler (2011) assert that a pilot study is done to detect and review weakness of the data collection instrument. 10% of the sample should constitute the pilot test (Cooper & Schindler, 2011). For the purpose of the pilot study, questionnaires were first issued for 4 select projects in the energy sector. This translated to 10% of the total population. The questionnaires were administered to procurement managers in the procuring entities involved with the acquisition of mega projects in the energy sector in Kenya. This pretesting was done to enhance clarity of the items in the questionnaire by eliminating inconsistencies and inadequacies as recommended by Maina (2012), as the accuracy of data to be collected largely depended on the data collection instruments in terms of validity and reliability. Items that were found to be inadequate or inconsistent were removed or redefined to enhance the validity of the instrument. In this process, input from discussion with three experts in supply chain research was used to enhance content and construct validity. Data collected during the pilot study was not used in the final data analysis.

3.8.1 Validity of the Research Instrument

Validity is the degree to which result obtained from the analysis of the data actually represents the phenomenon under study (Maina, 2012). Dikko (2016) argues that testing for validity is a necessary step to ensure that data collected in the a study is suitable for the research objectives, and asserts that validity aims at ensuring that the data collection tool measures the concepts it was designed to measure and includes: content and construct validity. Validity is ensured by having objective questions included in the questionnaire and by pre-testing the instrument to be used through a pilot study in order to identify and change any ambiguous, awkward, or offensive questions and technique as emphasized by Cooper and Schindler (2011). To ensure construct validity, the

questionnaire was developed in line with the study objectives by having distinct sections, each assessing distinct objectives, as outlined in the conceptual framework. Content validity was tested by subjecting the questionnaire to scrutiny by three supply chain experts in the energy sector. Their recommendations were considered to improve the instrument.

3.8.2 Reliability

Reliability refers to a measure of the degree to which research instruments yield consistent results (Maina, 2012). Reliability, according to Dikko (2016), is achieved when research tool measures “consistently, and without Bias” the concepts intended in the study. In this study, reliability was ensured by pre-testing the questionnaire on a selected sample from select respondents. To this end, the study relied on the Cronbach’s alpha (α). It indicates the extent to which a set of test items can be treated as measuring a single latent variable (Cronbach, 1951). The recommended value of 0.7 was used as a cut-off of reliabilities (Ritter, 2010).

3.9 Diagnostic Testing

Diagnostic tests were done to check the fitness of data for analysis. The study tested normality, homoscedasticity, Multicollinearity, and linearity.

3.9.1 Test of Normality

According to Garson (2012), a normal distribution is assumed in many statistical procedures. Ghasemi and Zahediasl (2012) postulate that to eliminate statistical errors, estimated to exist in about 50% of published statistics, it’s prerequisite to test the goodness of fit of data; normality. Ghasemi *et al.* (2010) catechizes that, should this assumption of normality fail to hold, then it becomes impossible to draw accurate and reliable conclusions. Various tests of normality exist. These include: Kurtosis, Shapiro Wilk’s W test, Kolmogorov-Smirnov D test, and the Q-Q graphical plot (Westfall & Henning, 2014; Katz, Elmore & Lucan, 2013; Garson, 2012).

Kurtosis, according to Westfall and Henning (2014), is a test used to measure heavy tails, tailless, of the probability distribution, that is based on a scaled version of the fourth moment of the data population. According to Garson (2012), the kurtosis of a normal, univariate distribution is 3. Distributions with Kurtosis less than 3, platykurtic distributions, reflects that the distribution produces fewer and less extremes than the normal distribution while the opposite is true for distributions with Kurtosis higher than 3 (Leptokurtic distributions). The test statistics according to Westfall *et al.* (2010) is given by:

$$\text{Kurt}[x] = \frac{\mu_4}{\sigma^4} = \frac{E[(X-\mu)^4]}{(E[(X-\mu)^2])^2}$$

Where: μ_4 is the fourth moment about mean, and σ , is the standard deviation.

On the other hand, the Shapiro-Wilks, W, test, of Shapiro and Wilks (1965), utilizes the null hypothesis principle to check whether a sample came from a normally distributed population (Razali & Wah, 2011) Garson (2012) asserts that for a given variable distribution, W, should not be significant if the variables' distribution is not significantly different from normal. Garson (2012) postulates that W is the correlation between given data and its corresponding normal scores, where if significantly lesser than 1, the assumption of normality is not met. Razali and Wah (2011) indicate that the Shapiro-Wilks test is most preferred for sample size upto 2000 (n=2000).

When the sample is larger than 2000, Garson (2012) recommends the use of the Kolmogorov-Smirnov D test. This test can test the goodness of fit against any theoretical distribution. According to Anorl and Emerson (2011), it's normally used to test normality of distribution where the sample is standardized and compared to the standard normal distribution. The test is however less powerful than the Shapiro-Wilk test (Garson, 2012). These tests are mostly non graphical. A test of fitness/normality, offering graphical presentation, is the Quantile by Quantile Plot, often referred to as the

Q-Q plot (Anorld & Emerson, 2011). The Q-Q plot forms a 45 degree line when the observed values are in conformity with the hypothetical distribution if normal (Garson, 2012) According to Ghasemi and Zahediasl (2012) , cases in the detrended Q-Q plot normally lie on the horizontal 0 line representing 0 standard deviation from the 45 degree line, on the line indicating correlation. This study relied on the Shapiro-Wilks test which is most preferred for sample size upto 2000.

3.9.2 Test of Homoscedasticity

McDonald (2014) postulates that Homoscedasticity is one of the major assumptions underlying statistical analysis (McDonald, 2014) This study thus conducted the test of heteroskedasticity to establish whether the variance of the error term is constant (Homoscedastic) as recommended by Williams (2015) Mcdonald (2014) and Neil (2010) offer that non homogeneity of variance, referred to as heteroscedasticity, increases chances of type 1 error; it leads to bias in test statistics and confidence intervals. Various test of homoscedasticity exist such as: Levene's test; Park Test, White Test and; Breusch Pagan test (Greene, 2012). This study relied on the Breusch- Pagan Godfrey's Test for heteroskedasticity. According to Cameron (2010), when using the Bresuch Pagan test, constant variance is established when P-value of the test is greater than the critical value.

3.9.3 Test of Multicollinearity

Multicollinearity, a situation where one or more independent variable is explained by other predictor variables (Kock & Lynn, 2012), with a high degree of accuracy, may lead to type II error in hypothesis testing. It can cause inaccurate estimates of coefficient values, which may lead to model over fitting in statistical analysis, thus causing out of sample predictions being imprecise (O'Brien, 2007). The study performed the test of multi collinearity by calculating the Variance Inflation Factor values (VIF) and Tolerance as recommended by Collis and Hussey (2014). Non-multicollinearity is

established if VIFs of all variables of study is less than 10 while Tolerance greater than 0.1.

3.9.4 Test of Linearity

The study also undertook a test of linearity, using Correlation analysis, to establish whether further analysis would yield desired relationships (Fields, 2009). Kothari (2009) notes that correlation analysis is useful as it could indicate a predictive relationship between variables that can further be explored using other statistical tools. The study relied on the most common measure of correlation; the Pearson Product Moment Correlation Coefficient, r . (Fields, 2009). According to Cooper (2011) a correlation coefficient, $r=0$, indicates that variables are independent; while a correlation coefficient, $r=1$, indicates a strong relationship between the variables. This relationship could; be positive (+), indicating a direct linear relationship or negative (-), indicating an inverse relationship, between variables (Kothari, 2009).

3.10 Data analysis and presentation

To enable the researcher assign meaning to the resulting data and statistics, an analysis of data was done to summarize the essential features and relationships of data in order to generalize and determine patterns of behavior and particular outcomes. Qualitative data analysis; using content analysis, and quantitative data analysis; using regression analysis, were used to produce descriptive and inferential statistics which were used to examine the hypothesis under study.

3.10.1 Descriptive Statistics

Descriptive statistics, according to Kothari (2008), enables description of research data, by analyzing the central tendency and dispersion characteristics of the data. This was done by establishing the means, standard deviation, percentages and frequencies, from the descriptive analysis of the emerging supply chain practices and their influence on procurement performance of mega projects in the energy sector in Kenya. This enabled

the study to describe the data, trends and assign meaning to the data collected on the study variables. The study used SPSS v21 in this analysis, while data was presented in tables. Content analysis was also used to describe data collected from open ended questions in the questionnaire.

3.10.2 Inferential Analysis

This study hypothesized that there is no significant relationship between the study variables; public private partnership, e-procurement, procurement risk management global sourcing, and the moderating influence of regulatory framework; on procurement performance of mega projects in the energy sector in Kenya. To test the hypotheses of this study, it was requisite to establish the significance of the relationship between the independent variables and procurement performance. Multiple regression analysis was used. Mishra (2010) notes that regression analysis is widely used in social sciences to predict the dependent variable from a known value of independent variable(s) The study used the following regression model: $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 M + \epsilon$; Where; Y = Procurement Performance of Mega projects; β_0 = constant (coefficient of intercept); X_1 , X_2 , X_3 , X_4 , and X_5 are independent variables: PPP, E-Procurement, Procurement risk management, and Global Sourcing; M=Regulatory Framework; and β_1 , β_2 , β_3 , β_4 , β_5 , and β_6 are regression coefficient of six variables.

To test the significance of the regulatory framework in the relationship between emerging supply chain practice and procurement performance of mega projects, the study performed the moderating regression using the process macro for SPSS, which was developed by Hayes (2017). This analysis establishes the coefficient of the product of the independent variable, and the moderator, and tests the significance (Field, 2013).

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

The broad objective of the study was to examine the influence of emerging Supply Chain Management practices on procurement performance of Mega projects in the energy sector in Kenya. The specific objectives were to examine the influence of: public private partnership, e-procurement, global sourcing, and the moderating influence of regulatory framework; on procurement performance of mega projects in the energy sector in Kenya. A survey of 47 identified mega projects in the energy sector was carried out. This chapter presents the results of: the pilot study; descriptive statistics of each variable; diagnostics tests results and; results of the test of hypothesis which have been reported in line with study objectives.

4.2 Results of the Pilot study

To detect and review weakness of the data collection instrument, a pilot study was conducted in line with recommendation by Cooper and Schindler (2011) A sample of 4 projects in the energy sector was selected for the pretest of the research instrument. To test reliability, the study relied on the Cronbach's alpha (α). The cut-off point for reliabilities was 0.7 as recommended by Ritter (2010). Therefore, items with Chronbach's alphas less than 0.7 were to be dropped. The analysis shows that Electronic Procurement had the highest alpha value of 0.956 while Public Private Partnership had the lowest alpha score of 0.878 All variables, as shown in table 4.1, achieved an alpha score above 0.7 as recommended by Ritter (2010), therefore no item was dropped. The instrument, as postulated in Maina (2012), and Dikko (2016), was thus deemed to be reliable for data collection.

Table 4.1: Chronbach's Alpha for Emerging Supply Chain Practices

Variable	Number of Items	Chronbach's Alpha
Public	12	.878
Private		
Partnership		
Electronic	12	.956
procurement		
Procurement	10	.892
risk		
management		
Global	10	.899
sourcing		
Regulatory	9	.905
Framework		

4.3 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. Table 4.2 shows the study response rate.

Table 4.2: Response rate

	Distributed questionnaires	Responsive Questionnaires	Non- Responsive
Frequencies	47	31	16
Percentage	100	65.9	34.1

4.4 Position and Years of Experience of Respondents

Analysis of demographic information shows that 45%, and 55% of respondents were senior supply chain managers and assistant supply chain managers or equivalent. Further analysis indicates that 18% of the respondents had served in the organizations for a period shorter than 5yrs, while 52% and 15% had served between 6-10 years and 11-15 years respectively. 15% had served for over 15 years. This indicates that that majority of respondents were positioned at senior positions in supply chain management and well experienced to provide adequate and accurate data on the mega projects. This conclusion aligns with Germain and Tejeda (2012) assertion that the years of experience in a particular task or organization, is an important factor to consider in determining the level of expertise and knowledge of an organization’s processes. This analysis is summarized on table 4.3.

Table 4.3: Years of experience of Respondents

Period	Percentage
5 Years and Below	18
6-10 Years	52
11-15 Years	15
15 Years and above	15

4.5 Value of the Projects

The study asked respondents to indicate the estimated value of each project surveyed, in order to ascertain whether the projects under study met the threshold of mega projects. 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 (2013), 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. Thus the projects surveyed qualify to be Mega projects and are thus fit the theme of the study.

4.6 Descriptive analysis

Descriptive statistics, according to Kothari (2008), enables description of research data, by analyzing the central tendency and dispersion characteristics of the data in order to be able to assign meaning to data. This section presents findings from the descriptive analysis of data collected in the survey of mega projects in the energy sector in Kenya.

This section presents the results, by reporting the means, standard deviation, percentages and frequencies, from the descriptive analysis of the emerging supply chain practices and their influence on procurement performance of mega projects in the energy sector in Kenya. The descriptive findings, in order, on PPP, E-Procurement, Procurement Risk Management, Global Sourcing, and Regulatory framework are presented below.

4.6.1 PPP and Procurement Performance.

The study sought to examine the influence of PPP on procurement performance of mega projects in the energy sector in Kenya. To better understand the nature and form of PPPs, Respondents were asked to identify the various characteristics and benefits of PPPs in the various mega projects in the energy sector in Kenya. Analysis of the feedback indicated that Independent Power Production under Build, Own, Operate, and Maintain (BOOM) model, and private financing were most prominent characteristics at 56% and 20% respectively. Collaboration in design was also a key feature. This indicates that PPPs in the energy sector in Kenya have similar characteristics as PPPs across the globe such as private entity financing, collaboration in design, early supplier involvement (EIU, 2014; WB, 2011; Siemiatycki, 2015; Reeves, 2011) The results on characteristic of PPPs in the energy sector in Kenya are shown in Table 4.4.

Further, the study sought to find out the benefits that accrue to mega projects through adoption of PPP. Analyzed feedback on Benefits of PPPs over the traditional bid to design Model of project acquisition revealed that PPPs offer efficiencies such as faster delivery and assured project funding which is reported in 36% and 46% of the projects surveyed. This implies that mega projects in the energy sector acquired through PPP are completed faster and are better funded. It also implies that risk and contract management is more efficient for projects procured through public private partnership. These findings agree with Reeves (2011) that PPP often provide opportunity to deliver projects faster, assure project financing and present an innovative way to deal with risk associated with mega projects globally (Delmon, 2015) These results are presented in Table 4.5.

To further understand the impact of various aspects of PPP on procurement performance of mega projects, propositions were made about aspects of PPP and procurement performance and 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. Results of the analysis shows that all aspects of PPP had mean scores above 3.000. This implies that aspects of PPP in this study: ESI; collaboration between public and private entities; rich information exchange; contract bundling; and private financing; characterize mega projects in the energy sector moderately. This further implies that the level of PPP adoption is moderate in procurement of Mega projects in the energy sector. This finding agrees with an EIU (2014) report that labeled Kenya an Emerging PPP market. PPP adoption is not optimal; it is still a developing model of acquiring and implementing public projects.

The analysis also reveals that: ESI in design ensures more realistic specifications thus improving quality compliance; ESI enhances contractor entity relationship thus reducing conflicts; supplier collaboration enhances risk identification and risk sharing; supplier commitment ensures availability of projects financing; collaborative environment enhances innovation; contract bundling motivates compliance to quality; and collaborative environment enhances technology transfer process. These had an overall score of: Mean 3.29, SD 1.006; Mean 3.39, SD 1.174; Mean 3.80 SD 1.136; Mean 3.42 SD 1.025; Mean 3.39 SD 0.882; Mean 3.23 SD 1.023; and Mean 3.63 SD 0.809, respectively. This means that the components of PPP: ESI; collaboration between public and private entities; rich information exchange; contract bundling; and private financing characterize and impact the procurement of mega projects in the energy sector in Kenya. This indicates that adoption of PPP has an influence on the acquisition of mega Projects. These findings support the assertions and findings of Reeves (2011) and Siemiatycki (2015) that PPPs portends opportunity to improve procurement performance of mega projects through; assuring project finance, early supplier involvement especially in design, and cooperation by bundling multiple aspects where cost and payback have a direct relationship. The results of this analysis are presented in table 4.4.

Table 4.4: Characteristic of PPPs in Mega Projects in Kenya

	Characteristic	Frequency	Percentage
1	Build, own, operate and maintain IPPs under a 20yrs PPA	18	56
2	Private financing	6	20
3	Plant development	5	15
4	Public Private collaboration in design	3	9
	Total	32	100

Table 4.5: Benefits of PPP in Mega projects in Kenya

	Benefits	Frequency	Percentage
1	Assured Project Funding	23	46
2	Faster delivery	18	36
3	Efficiency in risk and contract management	6	12
4	Innovation	3	6
	Total	50	100

4.6.2 E-procurement and Procurement Performance

This study sought to examine the influence of E-Procurement on procurement performance of Mega projects in the energy sector in Kenya. In order to understand the nature of E-procurement practice in procurement of Mega projects, respondents were asked to identify the E-procurement tools employed in the procurement of the various Mega projects, as well as the benefits accruing to the projects from the adoption of E-

procurement. Analysis of the feedback, as shown on Table 4.6, shows that online advertisement, websites, and emails were the most common forms of E-Procurement at 44%. Use of ERP systems such as SAP, and supplier relationship management systems followed closely at 41% and 12% respectively. Teleconferencing was used in negotiations in 3% of the projects. This indicates that most firms in the energy sector have adopted only a narrow aspect E-procurement, when compared to other firms worldwide, as established in Gruenen *et al.* (2010) and Odago (2013), with online advertisement, websites and emails being the most applied tools.

Further, from the feedback, the study gathered that the Integrated Financial Management Information System (IFMIS), envisaged for use in all public procurement entities in Kenya (Odago, 2013), was not used in the acquisition process of any of the mega projects. This compounds the indication of narrow adoption of E-procurement and indicates that there exists an opportunity, or challenges, towards the adoption of E-procurement practice in procurement of Mega projects in the energy sector in Kenya. The study further sought to find out the benefits that accrue to the procurement of mega projects from the adoption of E-Procurement tools. Respondents were asked to identify the benefits accruing to the mega project procurement. The results are as follows: Easier information capture, processing and communication (55%); transparency (29%); wider sourcing scope (9%); and process visibility (7%), were the benefits identified from adoption of E-procurement in procurement process of Mega projects in the energy sector in Kenya. as shown on Table 4.8. This means that adoption of E-procurement in the procurement of mega projects in the energy sector in Kenya led to easier information processing, and communication; improved transparency of the process; and increased the sourcing scope.

Thus entities were able to: efficiently handle and exchange procurement related information; and were able to reach wider source markets, including the global market. These findings agree with chirchir *et al.* (2015), and Mwajuma (2013), who postulate that e-procurement leads to enhanced information sharing, enhanced transparency, compliance, transactional efficiency, and improving supply chain visibility leading to

improved procurement performance. Further, the study sought to examine the influence of various aspects of E-procurement on Procurement Performance of Mega projects in the energy sector in Kenya. 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 on aspects of E-procurement and procurement performance characterize the mega projects. Analysis of the feedback revealed that all propositions had a mean score above 3.000, out of the possible maximum score of 5.000. This shows that aspects of E-procurement characterize acquisition of mega projects in the energy sector moderately.

This is indicative of a moderate adoption of E-Procurement in the procurement of mega projects in the energy sector in Kenya. This relates well with this study's earlier finding of narrow E-procurement adoption. Gruenen *et al.* (2010) and, Brandon and Carey (2010), view E-procurement as entailing undertaking most part, or all part of the procurement process, over web based application enable e-tendering, e-auctioning, vendor management, purchase order integration, e-invoicing, e-payment, and contract management. Thus opportunity exists to enhance the adoption of E-procurement in the acquisition of mega projects in the energy sector.

Analysis reveals high scores; Mean 3.48, SD 1.004; Mean 3.42, SD 0.867; and Mean 3.39, SD 1.059; respectively, on propositions that: E-procurement enhances access to information for procurement process audit; process visibility enhances procurement contract management; and E-procurement enhances sourcing scope leading to wider participation by suppliers which improves competitiveness in procurement. This provides evidence that adoption of E-procurement in acquisition of mega projects influences procurement performance by improving process visibility, contract management, access to information, and increasing sourcing scope as catechized in Hung *et al.* (2014) In the analysis, the lowest score (Mean 3.03, SD 1.132) was recorded on the proposition that "E-enabled supplier relationships enhance negotiation", thereby implying that in most projects, this aspect of E-procurement was relatively low. This is perhaps occasioned by the narrow application of e-procurement, established earlier in this study. CIPS (2015) intimates that effective implementation of procurement

processes through electronic means could enhance supplier relationship through technological integration.

A relatively low score, (Mean3.21, SD 1.139), was also recorded on the proposition that E-procurement enables Real time tracking of cost and payments. This implies that to a considerable extent, it was not possible to track costs and payments in real time in the acquisition of many of the mega projects. This could also be resultant of the narrow adoption of E-procurement tools. For instance, the use of the Integrated Financial Management Information system, IFMIS, as succinctly described in Odago (2013), would have enabled entities involved in acquisition of mega projects to have real time view of costs and payments. The results of this analysis are summarized in table 4.6.

Table 4.6: Responses on E-Procurement Tools Used

E- Procurement Tool	Frequency	Percentage
Online advertisement, website portals, emails	15	44
Enterprise resource systems (SAP)	14	41
Supplier relationship management system (SRM)	4	12
Teleconferencing	1	3
Total	34	100

Table 4.7: Benefits from Adoption of E-Procurement

Benefits	Frequency	percentage
Easier Data management (capture, processing and communication)	24	55
Process transparency	13	29
Wider sourcing scope	4	9
Process Visibility	3	7
Total	44	100

4.6.3 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 and socio-political risks as most prominent in the acquisition of mega projects at 27% and 24% as shown in Table 4.8. land and way leave acquisition risks; drilling and off take risks; technology and supply side risks (contractor failure) were other risks that were identified in the procurement of mega projects. The study also sought to find out 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 4.8. The following also made up the procurement risk management framework: feasibility study to ensure viability; multiple contracting sourcing to mitigate risk of contractor failure; Monitoring and evaluation of the risk landscape; at 13%, 6%, 13%, and 3% respectively

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). Further, other risks were project specific. For instance, drilling risks was found to face projects involving drilling, while way-leave acquisition faced projects involving electricity off take and transmission. From the analysis, various tools have been employed. The most popular tools employed were government guarantees, stakeholder involvement, risk sharing, multiple sourcing, and monitoring and evaluation. This finding is in agreement with Xu *et al.* (2011), Jin (2011) and EU (2010) that risk management often entails risk identification, reduction, allocation and monitoring.

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. 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 reveals that: Environmental impact assessment (EIA) enables identification of risks related to the environment; Rigorous risk appraisal process enables proactive risk management; and procurement contract management has adaptive risk control mechanisms. These had high scores of: Mean 4.39 SD 0.559; Mean 4.12 SD 0.600; and Mean 4.15 SD 0.834 respectively. This implies that in acquisition of most projects, mechanisms of risk identification, appraisal and management exists, and have a great impact, in procurement performance of the mega projects in the energy sector in Kenya. This means that procurement risk management, composed of aspects such as risk identification, appraisal and management was explicit in acquisition of most of the mega

projects in the energy sector in Kenya. This finding agrees with the findings and recommendations of Russil (2010), Little (2011), and Flyvbjerg *et al.* (2003), that efficient risk management in mega projects relies on institutionalistic approach centered on practice that leads to efficient risk identification, appraisal, sharing, and management in mega project processes.

The analysis further reveals 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 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 acquisition, often due to their size, nature, and value, are prone to political influence. The summary of this analysis is on table 4.8.

Table 4.8: Responses on Risks in procurement of Mega Projects

Procurement Risks	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

Table 4.9: Responses on Procurement Risk Management framework

PRM 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

4.6.4 Global Sourcing and Procurement Performance

The study sought to understand the extent of global sourcing in the procurement of mega projects. Respondents were asked to indicate the extent to which global sourcing was adopted in procurement of various mega projects. Analysis shows that global sourcing was practiced to a great extent with 94% of the projects reporting the contracting of an international EPC. This finding agrees with Deloitte (2015) and KPMG (2015) reports, that cite surge in number of foreign firms being involved in public mega projects perhaps out of need to improve technical capacity that has been identified as key cause of mega project failure in Africa. The study also sought to find out the benefits that accrued to the projects as a result of global sourcing practice. The analysis, as show on table 4.11, shows that global sourcing resulted in: conformance to international quality standards (32%); advanced technology (27%); global expertise and experience (21%);

and knowledge transfer (7%). This means adoption of global sourcing in procurement of mega projects portends various efficiencies such as: better quality, faster project cycle, and cost savings. This is in agreement with the assertion of Roshana (2008) and Crosby (2011).

The study further sought to understand how various aspects of global sourcing influence procurement of mega projects. Propositions about global sourcing and procurement of the mega projects were made to respondents who were asked to indicate 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. Analysis reveals that all propositions on global sourcing and procurement performance had a mean score above 3.73, which indicates that aspects of global sourcing characterize and influence procurement performance of mega projects greatly. This means that in acquisition of most of the mega projects in the energy sector in Kenya, Global sourcing is a key practice. This finding is in line with the report by KPMG (2015), which found a surge in number of foreign firms, from Australia, UAE, India, and china, undertaking mega projects in the region. It seems to support Villmo (2012) proposition that global sourcing is a key strategy in improving mega project fortunes.

Analysis further reveals high scores (Mean 3.94, SD 0.899; Mean 3.91, SD 0.981; and Mean 3.91, SD 0.723), on aspects of global sourcing, which indicates a great extent level of characterization, that: it exposes the procurement process of mega projects to international standards resulting in better quality; it provides opportunity to select more qualified mega project contractors; and that it exposes the entity to wider purchasing scope which improves competitiveness. This implies that, as a result of adopting the global sourcing practice, the procurement of mega projects benefited from the wide sourcing scope, more qualified contractors, and international quality standards. The resultant benefits for the mega projects in the energy sector could be: lead time benefits; cost benefits; as well as quality compliance improvements. These findings are in agreement with propositions of Ameh and Osegbo (2011), and Crosby (2011), who assert that global sourcing could result in lower contract prices; technology transfer in

mega projects; higher quality due to accessing international standards; and improved technical capacity. The summary of this analysis is presented in table 4.10.

Table 4.10: Responses on Benefits of Global sourcing

Benefits	Frequency	percentage
Advanced technology	15	27
International quality standards	18	32
Global expertise and experience	12	21
Knowledge transfer	4	7
Competitive pricing	6	11
Opportunity for partnership	1	2
Total	56	100

4.6.5 Findings on Regulatory Framework

The study sought to examine the moderating effect of regulatory framework on procurement performance of mega projects in the energy sector in Kenya. In order to understand the nature of regulatory framework governing acquisition of mega projects, the study asked respondents to indicate the various laws that influenced procurement of the mega projects. Analysis of the data shows that in acquisition of 31% of the surveyed mega projects, the Public Procurement and Asset Disposal Act 2015 referred to, while in procurement of 16% of mega projects, the Public procurement and disposal act 2005 was the point of reference. In 22%, of the projects surveyed, the Energy Act 2006 was referred to. The Feed-in-Tariff Policy 2012, World Bank procurement Regulations, and The African Development Bank Procurement regulations affected procurement of 9%, 11%, and 11% respectively. The results are presented in table 4.11. These results indicate that the most influential law was the public procurement legal framework. In this study, the public private partnership act, 2013, and related legislation, have not been

mentioned. This indicates that the framework on PPPs has not produced any PPP, despite having numerous projects having characteristics of PPP. Notably the PPP Act 2013 was enacted in line with Vision 2030 to stimulate private sector participation in development projects (NCL, 2013). Most PPPs in this study appear to have been developed under the Energy Act 2006.

Further, respondents were asked to indicate how the Regulatory framework mentioned above influences the procurement of Mega projects in the energy sector in Kenya. The results of the analysis are as follows: The law defined contract management practice (37%); enhanced accountability (14%); improved funds management (11%); and directed process management (6%). The results of the analysis are shown on table 4.11. This implies that the law was seen to influence process and funds management in the acquisition process of mega projects in the energy sector in Kenya. Thus the legal framework, for most part, is achieving its objective of providing guiding principles to procuring entities to maximize value for money; and procurement governance in accordance with international best practices (ICPAK, 2016). However there is evidence in the results that is contrary to these findings; that in 11% of the mega projects, the law contributed to delay in contract award and implementation.

The study further sought to understand the relationship between various aspects of the regulatory framework, and the procurement of mega projects. Propositions about the regulatory framework and procurement of mega projects and respondents were asked to indicate 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 procurement of the mega projects. The results of the analysis shows that all propositions have mean scores above 3.52 (SD 0.755). This implies that the procurement of mega projects in the energy sector is moderately characterized by the regulatory framework. This finding implies that the legal framework is operating within its intent of enhancing competition, accountability, transparency, and ethical standards in the public procurement system in Kenya (PPOA, 2016), and prudent management of financial resources (NLC, 2015).

The analysis further reveals that in most projects, the legal framework is seen to: provide legal capacity for procuring entities to enter into viable contracts; and provides a clear mechanism for dispute resolution. These propositions had the highest scores: Mean 3.94, SD 0.704; and Mean 3.85, SD 0.834 respectively. This finding supports Aliza *et al.* (2011) assertion that a legal framework is indispensable in project procurement environment to overcome accountability and ethical issues, as well as guiding decision making in such processes that attract a myriad of ethical issues. Further, the results reveal that the law, to a relatively lower extent, indicated by: Mean 3.52, SD 0.755; and Mean 3.64 SD 0.783; provides mechanism for risk identification and management; and provides a clear process for screening and prioritization of bankable national interests.

This means that to some considerable extent, in the procurement of mega projects, the law could be seen as not providing the mechanism for risk identification, and screening and prioritization of bankable national interests. This means that opportunity exists to improve the regulatory framework on these fronts. These findings are in line with recommendation of EPPL (2010), WB (2009), and PPIRC (2016) that intimate that an efficient regulatory framework (outlining institutional responsibilities, rules, and procedures that guide public entities when developing megaprojects), are a prerequisite for efficient acquisition and of mega projects. Summary of this analysis is shown on table 4.11. These finding further agree with the study findings on inquest on areas of improvement. Analysis of feedback indicated that the procurement of Mega projects could benefit from improving the regulatory framework in the following areas: contract management framework; procurement risk management mechanism; contractor evaluation, and alignment of the PPP law with existing laws. These improvement recommendations were cited in: 6, 8, and 8 projects respectively.

Table 4.11: Response on laws affecting Procurement of Mega projects

Laws	Frequency	Percentage
PPAD 2015	18	31
ENERGY ACT 2006	12	22
PPDA 2005	9	16
FIT POLICY 2012	5	9
WB, Proc Regulations	6	11
AFDB, Proc Regulations	6	11
Total	56	100

Table 4.12: Responses on Influence of Regulatory framework

Benefits	Frequency	percentage
Improves funds management	4	11
Improves process control	2	6
Accountability	5	14
Leads to VFM	4	11
Improves Contract Management	13	37
Innovation	3	9
Delays contract award and implementation	4	11
Total		

4.6.6 Findings on Procurement Performance

The study further sought to measure the quantitative influence of the various procurement practices on procurement performance of the mega projects. Respondents were asked to indicate the percentage improvement, {1 (0-10%), 2 (11-20%), 3 (21-30), 4 (31-40%), and 5 (41%-above)}, on indicators of procurement performance: procurement cost, procurement cycle time, and on quality compliance, over a four year period between 2013/2014 financial year and 2016/2017 financial years. This was informed by the fact that acquisition of mega projects often takes more than one year. These indicators have been successfully used to measure procurement performance in Mutai and Okelo (2016), Barsemai *et al.* (2014), and Wahu *et al.* (2015). The overall mean, for different procurement cost indicators, over four year period are as follows: Reduction in procurement process cost (2.865); reduction in contract management cost (2.915); and reduction in non- value adding costs such as litigation and redesign cost (2.9425).

This means that on these aspects of procurement cost, the adoption of the various emerging supply chain practices led to a reduction in procurement cost of between 11% and 20%. This could imply that firms that adopt these supply chain practices in procurement of mega projects in the energy sector could experience a reduction in procurement process cost of between 11% and 20%. This finding is in agreement with the assertion of Karimi and Rafiee (2014) and Abdallah (2013) that emerging supply chain practices offer opportunity to improve supply chain efficiency and effectiveness. The highest individual mean was on the reduction of contract management cost in the financial year 2016/2017, which had a mean score of 3.38, and SD 0.921. In all other aspects, a general trend is evident, that in the financial years 2015/2016, and 2016/2017, there was improved performance when compared to the financial years 2013/2014 and 2014/2015. This could perhaps be indicative that ongoing reforms of the procurement

system, for instance the repeal of the Procurement Act in 2015 (ICPAK, 2016), are bearing results.

This study also sought to measure the improvement in procurement cycle time, an indicator of procurement performance, by measuring the improvement in procurement lead time, time to solution in case of conflict, and reduction in average delay time; over the four year period between 2013 and 2017. The results are as follows: Improvement in Procurement lead time (3.26); improvement in time to solution in case of conflict or challenge (3.12); and reduction in average delay time (3.165). This means that there was an average improvement of between 21% and 30% on these indicators of procurement cycle time. This implies that adoption of these supply chain practices in the acquisition of mega projects could lead to improvement in procurement cycle time of between 21-30%. This finding is also in agreement with assertion of Karimi and Rafiee (2014) and Abdallah (2013) that emerging supply chain practices offer opportunity to improve supply chain efficiency and effectiveness. From the results, it is also notable that on all aspects, improvements in cycle time were highest in the final year of study. This could be the effects of the learning curve, as postulated in Malyusz (2016), that the learning curve effect could result in shorter project durations. The results of the analysis are provided in Table 4.13.

This study further sought to measure the improvement in procurement cycle time, an indicator of procurement performance, by measuring the reduction in defect rate, reduction in customer complaints, and improvement in project specification compliance index, over the four year period between 2013 and 2017. The mean results are as follows: Reduction in defect rate (3.1325); reduction in customer complaint (3.1225); and Improvement in project specification compliance index (3.185). This means that there was an improvement on quality compliance of about 21-30% on adoption of emerging supply chain practices. Therefore, this means that adoption of these practices in procurement of mega projects in the energy sector could lead to a 21-30% improvement on quality compliance.

This agrees with Meidute and Paliulis (2011) who argue that one of the reasons for the increased propensity towards these emerging supply chain practices is the pressure to deliver quality projects on time and within cost. The results also reveal a general trend where the means of the aspects of quality compliance are seen to marginally increase over the four years of study. This could also be attributed to the learning effect as postulated in Malysusz (2016) Meaning that over the years of projects implementation, contractor and procuring entities learn and improve their quality processes leading to improvements in the quality compliance index. The results of the analysis are shown on table 4.13.

Table 4.13: Reduction in Procurement cost

Indicator					Frequency	Mean	Std. D.
Reduction in Procurement process cost 2013/2014	7.7	57.7	23.1	3.8	7.7	2.46	0.989
Reduction in Procurement process cost 2014/2015	7.1	42.9	35.7	7.1	7.1	2.46	0.989
Reduction in Procurement process cost 2015/2016	4.2	33.3	29.2	25	8.3	3	1.063
Reduction in Procurement process cost 2016/2017	9.1	13.6	31.8	22.7	22.7	3.36	1.255
Mean							2.865
Reduction in contract management cost 2013/2014	15.4	46.2	15.4	19.2	3.8	2.5	1.105
Reduction in contract management cost 2014/2015	7.4	25.9	51.9	11.1	3.7	2.78	0.892
Reduction in contract management cost 2015/2016	39.1	30.4	21.7	8.7	3	1	
Reduction in contract management cost 2016/2017		19	33.3	38.1	9.5	3.38	0.921
Mean							2.915
Reduction in non value adding cost 2013/2014	7.7	38.5	19.2	15.4	19.2	3	1.296
Reduction in non value adding costs 2014/2015	7.1	21.4	50	17.9	3.6	2.89	0.916
Reduction in non value adding costs 2015/2016		41.7	37.5	12.5	8.3	2.88	0.947
Reduction in non value adding	13.6	13.6	40.9	22.7	9.1	3	1.155

cost 2016/2017	
Mean	2.9425

Table 4.14: Improvement in Procurement Cycle Time

Indicator	Frequency				Mean		Std D.
Improvement in							
project procurement lead time 2013/2014	3.8	38.5	34.6	15.4	7.7	2.85	1.008
project procurement lead time 2014/2015	3.6	32.1	39.3	17.9	7.1	2.93	0.979
project procurement lead time 2015/2016		25	33.3	25	16.7	3.33	1.049
project procurement lead time 2016/2017		22.7	22.7	31.8	22.7	3.55	1.101
Mean							3.165
Improvement in							
Time to solution in case of conflict 2013/2014	3.8	26.9	38.5	23.1	7.7	3.04	0.999
Time to solution in case of conflict 2014/2015	3.6	21.4	50	17.9	7.1	3.04	0.922
Time to solution in case of conflict 2015/2016		37.5	25	29.2	8.3	3.08	1.018
Time to solution in case of conflict 2016/2017		22.7	36.4	27.3	13.6	3.32	0.995
Mean							3.12
Reduction of average delay time 2013/2014		26.9	34.6	30.8	7.7	3.19	0.939
Reduction of average delay time 2014/2015	3.6	17.9	39.3	35.7	3.6	3.18	0.905
Reduction of average delay time 2015/2016		33.3	29.2	25	12.5	3.17	1.049
Reduction of average delay time 2016/2017		18.2	36.4	22.7	22.7	3.5	1.058
Mean							3.26

Table 4.15: Improvement in Quality compliance

Indicator	Frequency				Mean	Std D.
Reduction in defect rate in projects 2013/2014	46.2	34.6	15.4	3.8	2.77	0.863
Reduction in defect rate in projects 2014/2015	28.6	46.4	17.9	7.1	3.04	0.881
Reduction in defect rate in projects 2015/2016	29.2	33.3	29.2	8.3	3.17	0.963
Reduction in defect rate in projects 2016/2017	22.7	13.6	50	13.6	3.55	1.011
Mean						3.1325
Reduction in customer complaint 2013/2014	3.8	30.8	57.7	3.8	3.8	2.73 0.778
Reduction in customer complaint 2014/2015	25	46.4	17.9	10.7	3.14	0.932
Reduction in customer complaint 2015/2016	29.2	33.3	29.2	8.3	3.17	0.963
Reduction in customer complaint 2016/2017	4.5	18.2	18.2	45.5	13.6	3.45 1.101
Mean						3.1225
Improvement in Project specification compliance index						
2013/2014	7.7	42.3	23.1	19.2	7.7	2.77 1.107
2014/2015	3.6	28.6	25	28.6	14.3	3.21 1.134
2015/2016	4.2	33.3	16.7	33.3	12.5	3.17 1.167
2016/2017	4.5	18.2	13.6	40.9	22.7	3.59 1.182
Mean						3.185

4.7 Requisite Analysis

4.7.1 Test of Normality

Data collected on PPP, E-procurement, Procurement Risk Management, Regulatory Framework, 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 should be seen to be normal. Whilst many test of normality exists, this study relied on the Shapiro-Wilks', W, test; that is most preferred for sample sizes lower than 2000. According to Razali and Wah (2011), the test uses the null hypothesis principle to establish whether a sample came from a normally distributed population. Garson (2012)

asserts that for a given variable distribution, W, should not be significant if the variables' distribution is not significantly different from normal. The test results are as follows: Public Private Partnership (P=0.121); E-Procurement (P=0.780); Procurement Risk Management (P=0.270); Global Sourcing (P=0.212); and Regulatory Framework (P=0.027). P value of the data on emerging supply chain Practices is greater than 0.05. Shapiro (1965) intimated that P-values above the chosen alpha indicate normality. Therefore it can be concluded that the assumption of normality has been met. The results of the test are shown on table 4.16.

Table 4.16: Shapiro Wilk Test of Normality

Item	Observations	P-value
Public Private Partnership	31	.121
E-Procurement	31	.780
Procurement Risk Management	31	.270
Global Sourcing	31	.212
Regulatory Framework	31	.047

4.7.2. Test of Homoscedasticity

Homoscedasticity, a situation where the error term is the same for all values of the independent variables (Willians, 2015), is one of the major assumptions underlying statistical analysis (McDonald, 2014) This study thus conducted the test of heteroskedasticity to establish whether the variance of the error term is constant (Homoscedastic). Mcdonald (2014) and Neil (2010) offer that non homogeneity of variance, referred to as heteroscedasticity, increases chances of type 1 error; it leads to bias in test statistics and confidence intervals. According to Fields (2009), homoscedasticity is thus a major requirement for statistical tests such as correlation and

regression analysis. This study relied on the Breusch- Pagan Godfrey’s Test for heteroskedasticity.

According to Cameron (2010), when using the Bresuch Pagan test, constant variance is established when P-value of the test is greater than the critical value. In this study, the P-value is 0.28, which is greater than the Alpha (0.05). This means that the error term is the same across all values of independents variables. This indicates homoscedasticity, and thus the assumption of constant variance of the error term has been met, thereby permitting further statistical analysis such as correlation and multiple linear regression analysis as recommended by McDonald (2014). The test results are presented in table 4.17.

Table 4.17: Breusch Pagan test for Heteroscedasticity

Item	Lagrange Multiplier	P-value
Fitted Values of Performance	6.28	0.28

4.7.3 Test of Multicollinearity

Multicollinearity, a situation where one or more independent variable is explained by other predictor variables (Kock & Lynn, 2012), with a high degree of accuracy, may lead to type II error in hypothesis testing. It can cause inaccurate estimates of coefficient values, which may lead to model over fitting in statistical analysis, thus causing out of sample predictions being imprecise (O’Brien, 2007). The study performed the test of multi collinearity by calculating the Variance Inflation Factor values (VIF) and Tolerance as recommended by Collis and Hussey (2014). The results show that VIFs of all variables of study were less than 10 while Tolerance greater than 0.1. The highest VIF value was 1.387, while the lowest was 1.269. This indicates non multi collinearity as recommended in Collis and Hussey (2014). This means that predictor variables do not linearly explain each other. The summary of this analysis is shown on table 4.18.

Table 4.18: Result for test of Multicollinearity

Model Collinearity Statistics	Tolerance	VIF
Partner Private Partnership	.731	1.369
E-Procurement	.727	1.375
Procurement Risk Management	.788	1.269
Global Sourcing	.721	1.387
Regulatory Framework	.839	1.193

4.7.4 Linearity Test

Further to the diagnostics tests described above, the study undertook a test of linearity, using Correlation analysis, to establish whether further analysis will yield desired relationships (Fields, 2009). Kothari (2009) notes that correlation analysis is useful as it could indicate a predictive relationship between variables that can further be explored using other statistical tools. The study relied on the most common measure of correlation; the Pearson Product Moment Correlation Coefficient, r . (Fields, 2009). According to Cooper (2011) a correlation coefficient, $r=0$, indicates that variables are independent; while a correlation coefficient, $r=1$, indicates a strong relationship between the variables. This relationship could; be positive (+), indicating a direct linear relationship or negative (-), indicating an inverse relationship, between variables (Kothari, 2009).

The Correlation analysis between independent variables and Procurement performance show that the highest correlation coefficient was 0.646 while the lowest Correlation coefficient was 0.415. P values were below 0.05 at 95% confidence interval, which implies that the predictor variables have a significant and positive linear relationship with procurement performance. The results of the correlation analysis are summarized in table 4.19.

Table 4.19: Results of Correlation Analysis

Reference:	Procurement	correlation coefficient	p value
Performance			
PPP		.575	.001
E-Procurement		.602	.000
Procurement Risk Management		.415	.016
Global Sourcing		.646	.000

4.8 Regression Analysis

The test the hypotheses of this research, required the study to establish the significance of the relationship between the independent variables and procurement performance. This study relied on Regression analysis to test the significance of the influence of the study variables on Procurement performance of Mega Projects in the energy sector in Kenya. Whilst many methods exist, this study relied on Regression analysis. Mishra (2010) explains that regression analysis is widely used in social sciences to predict the dependent variable from known value of independent variable(s).

4.8.1 PPP and Procurement Performance

Diagnostic analysis on PPP data indicates that the data is from a normal distribution, and that there is a significant relationship between PPP and Procurement performance. This permits inferential analysis to explain the relationship between PPPs and Procurement performance of Mega Projects in the energy sector in Kenya. This research was guided by the null and alternative hypotheses: H_0 : *There is no significant influence of PPPs on procurement performance of Mega projects in the energy sector in Kenya.* H_a : *There is significant influence of PPPs of PPPs on Procurement performance of mega projects in the energy sector in Kenya.*

A regression of influence of procurement performance and PPP 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 (PPP). The findings, as shown on table 4.20, indicate that the calculated p-value is 0.001, which is less than 0.05, at 95% confidence interval. This means that PPP has a significant influence on Procurement performance of mega projects. Therefore, H_0 : *There is no significant influence of PPPs on procurement performance of Mega projects in the energy sector in Kenya*, is rejected and H_a : *There is significant influence of PPPs of PPPs on Procurement performance of mega projects in the energy sector in Kenya*, is accepted. The regression analysis further indicates variances (R^2) as 0.331 which shows that 33.1% of Procurement performance of Mega projects is influenced by PPP practice. From this analysis the regression model could be written as: Procurement performance = 1.349 + 0.046 (PPP practice). This means that an increase in mean index of PPP will increase Procurement performance of mega projects by a mean index value of 0.046.

Table 4.20: Regression of Procurement performance and PPP

R	R²	ADJ R²	Std. Error
.575	.331	.307	.59190

F=14.317, Sig=.001, Constant (B=1.349, t=2.962, sig=.006), PPP (B=.046, t=3.784, sig= .001)

4.8.2 E-procurement and Procurement Performance

When requisite analysis was performed on data on E-procurement, it showed that it yielded the desired relationship to permit inferential analysis to explain the relationship between E-procurement and Procurement performance of Mega Projects in the energy sector in Kenya. This research on the electronic procurement and Procurement performance of mega projects in the energy sector was guided by the null and alternative

hypotheses: H_0 : There is no significant effect of E-procurement on procurement performance of Mega projects in the energy sector in Kenya. H_a : There is significant effect of E-procurement on Procurement performance of mega projects in the energy sector in Kenya.

To test the hypothesis, regression of procurement performance of mega projects in the energy in Kenya on E-procurement 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 (E-procurement). The findings, as shown on table 4.21, indicate that the calculated p-value is 0.000, which is less than 0.05, at 95% confidence interval. This means that Electronic Procurement has a significant influence on Procurement performance of mega projects. This indicates that H_0 : There is no significant effect of E-procurement on procurement performance of Mega projects in the energy sector in Kenya is rejected and H_a : There is significant effect of E-procurement on Procurement performance of mega projects in the energy sector in Kenya, is accepted. The regression analysis further indicates variances (R^2) as 0.363 which shows that 36.3% of Procurement performance of Mega projects is influenced by Electronic procurement practice. From this analysis the regression model could be written as: Procurement performance = 1.639 + 0.030 (E-procurement practice). This means that an increase in mean index of E-procurement practice will increase Procurement performance of mega projects by a mean index value of 0.030.

Table 4.21: Regression of Procurement performance on E-procurement

R	R²	ADJ R²	Std Error
.602	.363	.342	.56490

F=17.645, Sig=.000, Coefficients: Constant (B=1.639, t=4.758, sig=.000), E.P (B=.036, t=4.201, sig= .000)

4.8.3 Procurement Risk Management and Procurement Performance

The requisite analysis above on Data on Procurement Risk management and Procurement performance shows that the data met the assumptions necessary to permits inferential analysis to explain the relationship between PRM and Procurement performance of Mega Projects in the energy sector in Kenya. This research was guided by the null and alternative hypotheses: H_0 : *There is no significant influence of Procurement risk management on procurement performance of Mega projects in the energy sector in Kenya;* and H_a : *There is significant influence of Procurement Risk Management on Procurement performance of mega projects in the energy sector in Kenya.*

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, as shown on table 4.22, show that the calculated p-value is 0.016, which is less than 0.05, at 95% confidence interval. This means that Procurement Risk Management has a significant influence on Procurement performance of mega projects. Therefore H_0 : *There is no significant influence of Procurement risk management on procurement performance of Mega projects in the energy sector in Kenya* is rejected and H_a : *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.

Table 4.22: 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 (B=.722, t=.790, sig=.435), PRM (B=.063, t=2.539, sig=.016)

4.8.4 Global sourcing and Procurement Performance

Requisite test results on Data collected Global sourcing indicated a significant relationship between global sourcing and Procurement of Mega Projects in the Energy sector in Kenya. This permitted the study to perform inferential analysis to explain the relationship between global sourcing and Procurement performance of Mega Projects in the energy sector in Kenya. This research was guided by the null and alternative hypotheses: *H₀: There is no significant influence of global sourcing on procurement performance of Mega projects in the energy sector in Kenya;* and *H_a: There is significant influence of global sourcing on Procurement performance of mega projects in the energy sector in Kenya.*

A regression of procurement performance of mega projects in the energy sector in Kenya on Global sourcing 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 (global sourcing). The findings, as shown on table 4.23, show that the calculated p-value is 0.000, which is less than 0.05, at 95% confidence interval. This means that Global Sourcing has a significant influence on Procurement performance of mega projects. Therefore, *H₀: There is no significant influence of global sourcing on procurement performance of Mega projects in the energy sector in Kenya* is rejected and *H_a: There is significant influence of global*

sourcing on procurement performance of Mega projects in the energy sector in Kenya, is accepted. The regression analysis further indicates variances (R^2) as 0.418 which shows that 41.8% of Procurement performance of Mega projects is influenced by global sourcing practice. From this analysis the regression model could be written as: Procurement performance=0.827+0.057 (global sourcing practice). This means that an increase in mean index of Global sourcing practice will increase Procurement performance of mega projects by a mean index value of 0.057.

Table 4.23: Regression of Procurement performance on Global Sourcing

R	R²	ADJ R²	Std. Error
.646	.418	.399	.53994

F=22.246, Sig=.000, Coefficients: Constant (B=.827, t=1.740, sig=.092), GS (B=.057, t=4.717, sig= .000)

4.8.5 Moderating Effect of Regulatory Framework

The study further sought to establish the moderating effect of regulatory framework on the relationship between emerging supply chain practices and Procurement Performance of mega projects in the energy sector. The study was guided by the null and alternative hypotheses: *H₀: There is no significant moderating effect of procurement regulatory framework on procurement performance of Mega projects in the energy sector in Kenya.* *H_a: There is no significant moderating effect of procurement regulatory framework on procurement performance of Mega projects in the energy sector in Kenya.* To test the hypothesis, the study performed the moderating regression using the process macro for SPSS, which was developed by Hayes (2017). The most important areas to consider in the moderation model are the coefficient of the product of the independent variable, and the moderator, and its test of significance. (Field, 2013).

The Process Macro analysis, as shown in table 4.24, reveal P-values above 0.05, at 95% confidence interval. This means that regulatory framework in this study, is not a significant moderator. Therefore, the null hypothesis, *There is no significant moderating effect of procurement regulatory framework on procurement performance of Mega projects in the energy sector in Kenya*, is rejected, and the alternative hypothesis, *There is no significant moderating effect of procurement regulatory framework on procurement performance of Mega projects in the energy sector in Kenya*, accepted.

Table 4.24: Moderation Regression using Process Macro

Item	Coefficient	SE	t	p
Constant	-0.362	0.7989	-0.4532	0.6545
Total PP	0.02	0.0102	1.9544	0.0624
Total EP	0.0212	0.0076	2.7827	0.0103
Total PRM	0.0224	0.0225	0.9969	0.3288
Total GB	0.0352	0.0148	0.4971	0.6237
Total RF	0.0167	0.0167	1.0004	0.3254
Int_1	-0.0004	0.002	-0.1965	0.8459
Int_2	0.0015	0.0012	1.277	0.2138
Int_3	0.0039	0.0037	1.0701	0.2952
Int_4	-0.0004	0.002	-0.2081	0.8369

Where: Int_1 =Total PP*Total RF, Int_2 =Total EP*Total RF, Int_3 =Total PRM*Total RF, Int_4=Total GB*Total RF

4.9 Optimal Model

To establish the optimal model for the study, the regression analysis was performed using variables with significant values using the following model: $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon$; Where; Y = Implementation of mega projects; β_0 = constant (coefficient of intercept); X_1 , X_2 , X_3 , and X_4 are independent variables: PPPs, E-Procurement, Procurement risk management, and Global Sourcing; and β_1 , β_2 , β_3 , and β_4 are regression coefficient of variables. The results of the analysis are as follows: $R^2 = 0.709$, $F = 15.848$, $P\text{-value} = 0.000$. This implies that emerging supply chain practices have a significant influence on the procurement performance of mega projects in the energy sector in Kenya. This study has established that they influence 70.9% of procurement performance of mega projects in the energy sector in Kenya. The optimal model could be written as: Procurement Performance = $0.021PPP + 0.020EP + 0.038PRM + 0.032GB$. The Regression analysis is summarized in Table 4.25, Table 4.26, and figure 4.1.

Table 4.25: Optimal model Regression

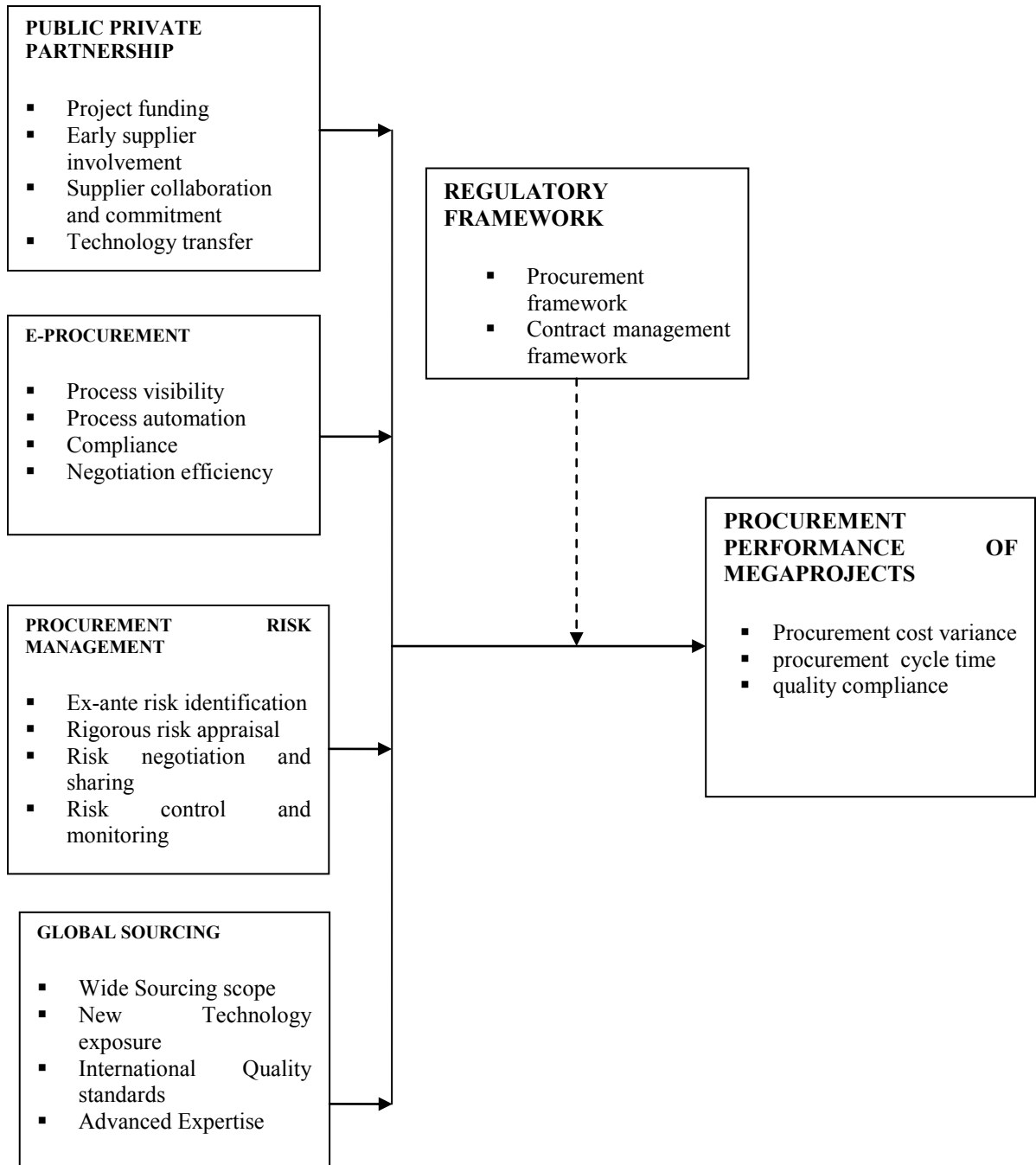
R	R ²	ADJ R ²	Std Error	F	P value
.842	.709	.664	.41203	15.848	.000

Predictors: PPP, E-procurement, Procurement Risk management, and Global Sourcing

Table 4.26: Coefficients of Determination

Performance	Coefficient	Std. Error	t	P value
Constant	-1.153	.684	1.686	.104
PPP	.021	.010	2.217	.036
E-procurement	.020	.007	2.619	.015

PRM	.038	.018	2.091	.046
Global Sourcing	.032	.011	2.973	.006



Key: **Significant** **Not significant**

Figure 4.1: Optimal Model

4.10 Discussion

This study was conducted to examine the influence of emerging supply chain practices: Public Private Partnership (PPP), Electronic Procurement, Procurement Risk Management, and Global sourcing, on procurement performance of Mega projects in the energy sector in Kenya. This section provides a discussion of the analysis of the survey of influence of emerging supply chain practices on procurement of mega projects in the energy sector in Kenya.

4.10.1 Global sourcing and Procurement Performance.

The study on influence of global sourcing and procurement performance was guided by the null hypothesis, H_0 : *There is no significant influence of global sourcing on procurement performance of Mega projects in the energy sector in Kenya*. Regression analysis yielded a P-value of 0.000, and Variance $R^2 = 0.418$. This indicates that global sourcing significantly predictive power of 41.8% on the procurement performance of mega projects in the energy sector in Kenya. Therefore, the null hypothesis was rejected and the alternative hypothesis, H_a : *There is significant influence of global sourcing on procurement performance of Mega projects in the energy sector in Kenya* was accepted. This means that adoption of global sourcing in the procurement of mega projects has a positive influence on Procurement cycle time, cost and quality. In this study, Global sourcing has the most predictive power of procurement performance.

This study found that adoption of global sourcing leads to: global competition could result in lower contract prices; technology transfer in mega projects; higher quality attributed to international standards; and more qualified contractors as posited by Roshana (2008), Crosby (2011) and EIU (2015). The findings also auger well with findings of Oshri *et al.* (2009) who predicted rise in practices such as global outsourcing

as companies seek to leverage on global capabilities and benefits. These findings also agree with assertions of Gurria (2012) on the Porters value chain and global sourcing, that a widened value chain results in price, technology advances, quality, expertise (CIPS, 2013).

4.10.2 E-Procurement and Procurement Performance.

The study on influence of E-Procurement on Procurement performance of mega projects in the energy sector in Kenya was guided by the null hypothesis, H_0 : *There is no significant effect of E-procurement on procurement performance of Mega projects in the energy sector in Kenya.* Regression analysis Procurement performance of E-procurement yielded a P value of 0.000, which indicated that E-procurement significantly influences, by 36.3% the procurement performance of mega projects. Therefore, the alternative hypothesis, H_0 : *There is significant effect of E-procurement on procurement performance of Mega projects in the energy sector in Kenya,* was accepted. These findings agree with the study by Rene (2010) who established a positive relationship between e-procurement and procurement performance. This study also established that, in the procurement of Mega projects, various E-procurement tools are employed. These include: Online advertisement, emails, and website portals; ERP systems such as SAP, SRM; and Teleconferencing. These are the indicators of E-procurement adoption as catechized in Hung *et al* (2014).

The study however established that the depth of E-procurement adoption was narrow; with online communication of invitations to bid being the most explicit; which was evident in high scores on aspects of access to information, but low score on aspects that require process integrative E-procurement, as recommended in Brandon and Carey (2010); such as E-enabled supplier relationships, and Real time tracking of costs and payments, which recorded very low score. The study further observed that the Integrated Financial Management information System (IFMIS), as described and recommended for use by Odago (2013), was not used in the acquisition process of any mega project. The use of the IFMIS offers opportunity to track payments and costs in real time. This

indicates that opportunity, or challenges, exist in the adoption of E-procurement in the adoption of Mega Projects.

Though narrow adoption exists, it accrued various benefits to the procurement process of mega projects in the energy sector such as: efficiency in data capture and processing, transparency, wider sourcing scope and process visibility, efficiency in process and contract management, enhanced risk awareness and easy process audit, and competitive pricing. This agrees with Gruenen *et al.* (2010), that adoption of part or whole of the procurement process over online applications portends opportunity to improve the efficiency of the procurement process. These findings are in line with observations about the Resource Based View on E-procurement that organizations can derive competitive advantage out of certain capabilities, competencies, and efficiencies from technology, such as E-procurement, which can be viewed as part of physical resources (Seshadri, 2010).

4.10.3 Public Private Partnership and Procurement Performance

The study on Influence of PPP on Procurement performance of mega projects in the Energy sector in Kenya was guided by the null hypothesis, H_0 : *There is no significant influence of PPPs on procurement performance of Mega projects in the energy sector in Kenya.* Analysis of data revealed that public private partnerships significantly, (P value=0.001), influence procurement performance of Mega projects in the energy sector. PPP explains 33.1% of procurement Performance. Therefore the null hypothesis was rejected. This implies that adoption of PPP in the energy sector could enhance the procurement performance in acquisition of mega projects. This finding agrees with Reeves (2011), who posits that PPPs, offer opportunity to improve efficiency in delivery of mega projects, and thereby earning them a reputation to deliver projects on time and cost; a reversal of the perennial time and cost overruns that plagues mega projects (Flyvbjerg, 2014). The study further established that PPPs in the energy sector have characteristics similar to other PPPs worldwide, as postulated in Siemiatycki (2015) such: Early Supplier involvement, Collaboration, private financing, contract bundling.

They are normally established as Build Own Operate, Maintain projects, normally under a Power Purchase Agreement.

Further, the study established that the aspects of PPP; ESI, collaboration, and contract bundling, technology transfer; moderately characterize mega projects in the energy sector, which supports EIU (2014) assertion that Kenya is still an emerging PPP market. This means therefore, that there exists opportunity, to improve adoption of PPPs in the energy sector. These findings compare with the study by Ismael (2013) who found that PPP provides public sector with creative, innovative solution to public projects. The PPP aspects: Early supplier involvement, Joint action, collaborative environment, Enhanced information sharing, project financing; though moderately characterizing the procurement of mega projects, were explicit in most mega projects in the energy sector in Kenya; and contributed to improvement in Procurement performance of the Mega projects. These findings also agree with Newzealand *et al.* (2011) and Quium (2011) who succinctly describe how PPPs offer opportunity for public sector to benefit from innovation, managerial skill of private sector, and technology transfer which results in cost and quality benefits in large projects. These findings exemplify the recommendations of the Bensaou relationship portfolio model that on high value investments, such as mega projects, firms should adopt strategic partnerships, such as PPP, which leads to: rich information exchange, high commitment among partners, and joint action (Lee & Drake, 2010).

4.10.4 Procurement Risk Management and Procurement Performance.

The study investigating the influence of procurement risk management and procurement performance was guided by the null hypothesis, H_0 : *There is no significant influence of Procurement risk management on procurement performance of Mega projects in the energy sector in Kenya.* Regression analysis of PRM and procurement performance yielded a P-value of 0.016, at 95% confidence interval, indicating that the relationship between procurement performance and PRM was significant. Therefore the alternative hypothesis, H_a : *There is significant influence of Procurement risk management on*

procurement performance of Mega projects in the energy sector in Kenya, was accepted. Further the regression analysis revealed that 17.2% of procurement performance was influenced by Procurement risk management. This finding on Procurement risk management augers well with literature of Picard and Andrieu (2012) 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.

Aspects of risk identification: feasibility study, EIA, and Market study; characterize the mega projects to a great extent and they enable identification of: procurement; environmental; and supply side, risks. These Risks are similar to risks facing mega projects worldwide (Flyvbjerg, 2003; Jin, 2011; Cosby, 2011; Flyvbjerg, 2014). The study further established a procurement risk management framework (on risk identifications, appraisal, allocation and monitoring) exists as recommended in Xu *et al.* (2011), Jin (2011) and EU (2010). The ability of procurement process to collect accurate data for supplier evaluation and risk pricing being free of political interference, were found to have low scores, implying that: the risk pricing mechanism is to some extent affected by political forces; and that opportunity exists for the procurement process to pick non -qualified contractors for the mega projects as the procurement process may not collect accurate and adequate data necessary for efficient supplier evaluation.

This compounds the ROK (2016) audit report in the energy sector that implied challenges in supplier evaluation as a cause of contractor failure after contract award, and 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). This means that procuring entities in the energy sector need to realign their procurement processes by devising a mechanism that can reliably collect information from potential contractors, to ensure that only qualified contractors are awarded contracts after supplier evaluation. This would be in line with the proposition by Flyvbjerg *et al.* (2003) that efficient risk management in mega projects

relies on institutionalistic approach centered on practice that leads to efficient risk identification and management.

4.10.5 Moderating Role of Regulatory Framework.

The study on the moderating role of Regulatory framework on Procurement performance of mega projects in the energy sector was guided by the null hypothesis: H_{05} : *There is no significant moderating effect of procurement regulatory framework on procurement performance of Mega projects in the energy sector in Kenya.* Regression analysis using Process Macro developed by Hayes (2013) for testing moderation, the study established P-values above 0.05. This indicates that Regulatory framework is not a moderator in this study. Therefore, the null hypothesis H_0 : *There is no significant moderating effect of procurement regulatory framework on procurement performance of Mega projects in the energy sector in Kenya,* was not rejected. These findings are contrary to findings of the study Marendi (2015) who established a significant effect of public procurement legal framework on organization performance. They also disagree with Ogot, *et al.* (2010) who established that public procurement regulation significantly improves the procurement process, particularly through enhancing transparency, quality, and value for money.

The study has established that the legal framework made of: Public Procurement and Asset Disposal act (2015), the Public Procurement and Disposal act (2005), the energy act 2006, WB and AFDB procurement regulations, and the FIT policy 2006; moderately characterize procurement of mega projects in the energy sector in Kenya. Thus it implies that to some extent, the regulatory framework is achieving its objectives of guiding processes and safeguarding public resources (NLC, 2016). However, the study further observed that the regulatory framework has been implicated as a factor in the delay of contract award and project implication. This implies that there exists an opportunity for improving the regulatory framework, particularly in the following areas identified in this study: contract management framework; procurement risk management mechanism; contractor evaluation, and alignment of the PPP law with existing laws.

Further the study observes that the PPP act 2013, which was enacted to spur private sector involvement in public projects (NLC, 2013), has not produced any PPP in the energy sector. This indicates that the PPP framework is not achieving its objectives of: prioritizing PPPs supporting national interests, developing projects, with a bias of Value for Money (VFM) by providing structures that coordinate between government procuring entities and private entities and contract management as recommended by PPIRC (2016). This compounds the need to review the regulatory framework to enhance its regulatory effect on the procurement performance of mega projects in the energy sector.

4.10.6 Multiple Regression Analysis

To examine the influence of emerging supply chain practices on procurement performance of mega projects in the energy sector in Kenya, a multiple regression analysis was done using PPP, electronic procurement, procurement risk management, and global sourcing; as the predictors of procurement performance. The regression analysis indicated that emerging supply chain practices influence 70.9% of procurement performance of mega projects in the energy sector in Kenya. This finding agrees with Karimi and Rafiee (2014) who argues that modern supply chain practices: Risk and award sharing; cooperation; process integration; and information sharing, are meant at improving the supply chain's capability of delivering value to its customers. Abdallah (2013) also posits that supply chain practices have a significant influence on supply chain processes effectiveness.

These findings are in line with numerous other studies that have linked emerging supply chain practices to procurement performance. For instance, Barsemai *et al.* (2014), and Chimwani *et al.* (2014) have linked adoption of information technology to improved procurement performance. Tarek *et al.* (2014) has posited that stronger relationships, such as PPPs, with suppliers could enhance procurement performance. Reeves (2011) postulates that adoption of PPPs enhances efficiency in delivery of mega projects, while Flyvbjerg *et al.* (2003) Flyvbjerg *et al.* (2003) catechize the impact of risk in mega

projects and proposes a departure from the conventional approach to mega project development processes, to a more current institutionalistic approach centred on practices and rules that comprise risk and accountability in project processes.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The core objective of this study was to examine the influence of emerging supply chain practices on procurement performance of mega projects in the energy sector in Kenya. This chapter presents the summary of the findings, conclusions thereof, and the recommendations of the study.

5.2 Summary

This study set out to examine the influence of emerging supply chain management practices: public private partnerships (PPPs), E-procurement, procurement risk management, and global sourcing; and the moderating effect of regulatory framework; on the procurement performance of Mega projects in the energy sector in Kenya. The study reviewed literature on the study variables and various models and theories: the Bensaou relationship model, the resource based view theory, Agency theory, and the Porter's value chain analysis model; and discussed them in line with the study variables. The study entailed a census of all the 47 mega projects under the various public procuring entities in the energy sector. Data was obtained using objectively prepared questionnaires. The data collected was edited, coded and entered for analysis using a computer statistical package (SPSS). Descriptive, requisite and inferential statistics: linear regression and Multiple Linear regression; were applied in the analysis and presented tables for clarity. The study found that emerging supply chain practices influence procurement performance of mega projects in the energy sector. The summary of the findings is presented below.

5.2.1 Global sourcing and Procurement Performance.

This study established that Global sourcing has a significant influence on procurement performance of mega projects in the energy sector in Kenya. The study established a very great extent of global sourcing with most projects having a foreign or international project partner (EPC, Funding, quality processes), which, the study observed, exposed the procurement of mega projects in the energy sector in Kenya to a wider sourcing scope, more experienced and qualified international contractors, international quality standards, more advanced technology; which led to a more competitive process, delivery and cost benefits, knowledge transfer, and better quality. This implies that adoption of global sourcing practice enhances procurement performance of mega projects in the energy sector in Kenya by requiring conformance to international quality standards, attracting and accessing highly qualified contractors, enhancing technical transfer, and promoting completion which would result in cost, cycle time and quality benefits in the acquisition of mega projects which would in turn alleviate the failure in mega projects in Kenya.

5.2.2 E-procurement and Procurement Performance

The study found that E-procurement significantly influences the procurement performance of Mega projects in the energy sector. The study established that in procurement of mega process, E-procurement tools were employed. These included: web based advertising, website portals, and ERP systems such as SAP and SRM systems. The study further observed that compared to international practice, E-procurement adoption was explicit in the acquisition of mega projects in the energy sector, but the depth of adoption was shallow. E-communication tools were most popular which led to related benefits such as: efficiencies in data capture and communication; wider sourcing scope; improved process visibility. These resulted in effective process, and stakeholder management, enhanced risk awareness, easy process audit, competitive pricing which led to enhanced procurement of mega projects. However, more integrative adoption of e-procurement such as: e-auctioning, vendor

management, purchase order integration, e-invoicing, e-payment, and e-contract management, were not observed. For instance the use of the Integrated Financial Management Information System (IFMIS) was not observed. Therefore, related benefits such as e-enabled relationships, and real time tracking of cost and payments, had relatively lower scores.

5.2.3 PPP and Procurement performance.

The study established that PPP has a significant influence on the procurement performance of mega projects in the energy sector in Kenya. In the energy sector in Kenya, it was found that Public Private Partnerships exist as Independent Power Producers, modeled as “Build, Own, Operate, Maintain” initiatives, that are characterized by significant level of private sector financing, early supplier (contractors) involvement, collaborations, contract bundling (enabled by a power purchase agreement, and the plant installation and steam sale agreement, among players in the energy sector), and technology transfer which contribute on procurement performance of mega projects in the energy sector by: improving design feasibility, improving relationships thus reducing conflict, enhancing information sharing, and enabling innovation and technology transfer; which reduces the total cost of ownership, project cycle time and enhance quality compliance. The study asserts that PPPs have introduced significant efficiency, in the acquisition of mega projects in the energy sector in Kenya; however the level of adoption of PPP in acquisition of mega projects is still low. This implies that there opportunity for increased adoption of PPP in the acquisition of mega projects in the energy sector in Kenya.

5.2.4 Procurement Risk Management and Procurement Performance

On the influence of Procurement risk management on Procurement performance; this study established that there is a significant influence on procurement performance of mega projects in the energy sector by procurement risk management practice. The study also established that the procurement risks included: financing risks, socio-political

risks, risk of contractor failure, land and way leave acquisition, as well as technology risks. These risks are similar to risks facing mega projects worldwide. The study further observed that some risks are specific to certain types of projects. For instance, drilling risks exists only in projects that entail drilling. To deal with these risks, the following tools were employed: partial risk guarantees, stake holder involvement, multiple sourcing, feasibility study, risk appraisal and risk sharing. The study further established that the risk pricing mechanism is to some extent influenced by political forces. Therefore, this may influence procurement costs and timelines thereby affecting the attainment of value for money. The study also established that the procurement process, to a significant extent, may not be able to collect accurate and adequate information necessary for supplier evaluation. This intimates that the process may pick unqualified contractors which may result into contractual failure after award leading to delays, procurement cost escalation and quality issues.

5.2.5 Moderating role of Regulatory Framework

The study established that various laws affected the procurement of mega projects. These include the Public Procurement and disposal act 2005, Public Procurement and Asset Disposal act 2015, Energy act 2006, FIT policy 2012, WB and AFDB procurement regulations. The study found that these characterized the procurement process of mega projects in the energy sector moderatley. The study further observed that the PPP framework established in 2013, had not led to any of the mega projects under survey. This study further observed that, in some projects, the legal framework was responsible for delay in contract award and project implementation. In the procurement of mega projects, the following recommendations for improving the legal framework were made: improvement of the provisions relating to contract management, procurement risk management, evaluation process, and to align the existing PPP framework with other existing laws. On whether there was a moderating effect of the regulatory framework on procurement performance, the study established that there was no significant moderating effect. This is contrary to the objective of the legal framework

which according to PPOA (2016) seeks to enhance competition, accountability, transparency, and ethical standards in the public procurement system in Kenya.

5.3 Conclusion

This study concludes that emerging supply chain practices: PPP, E-procurement, procurement risk management, and global sourcing have significant influence on the procurement performance of mega projects in the energy sector; with 70.9% of procurement performance of mega projects in the energy sector being influenced by the emerging supply chain practices.

5.3.1 Public Private Partnership and Procurement Performance

On PPP, the study concludes that adoption of PPP in acquisition of mega projects in the energy sector, could result in various benefits including faster acquisition, improvement in quality compliance, and reduced total cost of ownership. These benefits are often resultant of the following aspects of PPPs: early supplier (contractors) involvement, collaborations, contract bundling, and technology transfer. For instance, the early involvement of contractors enhances design feasibility which avoids costly design changes, while collaborations enhance information sharing and reduces costly conflicts. Contract bundling on the other hand enhances compliance to contract terms on cost, quality and delivery time.

5.3.2 E-Procurement and Procurement Performance

On electronic procurement, the study concludes that use of E-procurement in the procurement of mega projects in the energy sector improves process visibility, data capture, processing and communication, wider sourcing scope; which result in accountability, better process management, better risk awareness, improved stakeholder management, and easier audit, thereby leading to enhanced procurement performance. The study also concludes that even with these benefits, there is a shallow adoption of e-procurement practice in the procurement of mega projects. Most organizations involved

in mega projects only adopt web based advertisement, which is a very narrow aspect of E-procurement. Improved use of E-procurement, to encompass integrative e-procurement tools such as IFMIS, could portend increased benefits in the procurement of mega projects in the energy sector such as E-enabled contractor relationship, real time tracking of cost and payments, which could portend even more benefits in the acquisition process of mega projects.

5.3.3 Procurement Risk Management and Procurement Performance

On Procurement Risk management, the study concludes that procurement risk management has a significant influence on procurement performance. Adoption of various 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. evaluation process, to some 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 reduces opportunity for political interference in risk pricing.

5.3.4 Global Sourcing and Procurement Performance

The study concludes that global sourcing practice has a significant influence on the procurement performance of mega projects in the energy sector. Aspects such as wider sourcing scope, exposure to international standards, exposure to more qualified and experienced contractors, and competitiveness of the global markets contribute in enhancing the procurement performance of mega projects in the energy sector in Kenya.

These aspect; wide scope, exposure to international standards, and equipped contractors; contribute positively in the procurement of mega projects.

5.3.5 Moderating role of Regulatory Framework

The study concludes that in the procurement of mega projects, there is insignificant influence by regulatory framework. This is contrary to the objectives of the existing laws. The study also concludes that the PPP legal framework hasn't achieved the expected outcome of stimulating the private sector to take up PPPs. The study also concludes that while the regulatory framework has some moderate positive effect on procurement of mega projects such as enhancing accountability and process management, it to some extent has contributed to delays in contract award and project implementation. Based on the findings, the study concludes that there is opportunity to improve the legal framework in areas of contract management, procurement risk management, and evaluation process, and aligning the PPP framework to existing laws.

5.4 Recommendations

The study sought to examine the influence of emerging supply chain practices on procurement performance of mega projects in the energy sector in Kenya, with a view of making recommendations to scholars, researchers, energy sector management, and policy makers. Based on the findings, and conclusions, the study makes the following recommendations.

5.4.1. PPP and Procurement Performance

The study established a significant influence of PPP on procurement performance of mega projects in the energy sector. The study also established a moderate adoption of PPP in the acquisition of mega projects in the energy sector in Kenya. Therefore this study recommends to the energy sector management, to adopt enhance adoption of PPP practice in the acquisition of mega projects in the energy sector. This would be a faster and less costly means of achieving of the energy plan aimed at increasing energy

production to 10,000MW in line with the Kenya vision 2030. Whilst adoption of PPPs portends benefits of reduced cycle time, cost and improved quality of mega projects; it would be insightful to establish the models of PPP that would be most suitable for different aspects: exploration (drilling), plant development, and power evacuation in the energy sector.

5.4.2 E-procurement and Procurement Performance

On E-procurement, the study established that E-procurement has a significant influence on procurement performance of mega projects in the energy sector in Kenya. The study also established explicit but shallow adoption of e-procurement. This study therefore recommends to the energy sector management, to increase level of adoption of E-procurement tools to include such aspects as e-tendering, e-auctioning, vendor management, purchase order integration, e-invoicing, e-payment, and contract management. This would lead to better management of the Procurement process, and thus portend increased benefits in the acquisition of mega projects in the energy sector. For instance, the adoption of IFMIS in the acquisition process of mega projects, would portend various benefits such as real time tracking of cost and payments

5.4.3 Procurement Risk Management and procurement Performance.

On Procurement risk management, the study established a significant influence of procurement risk management on procurement performance of mega projects in the energy sector in Kenya. This study thus recommends continued adoption of Procurement risk management practice towards improved 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.

5.4.4 Global sourcing and Procurement performance

The study established that global sourcing has a significant influence on procurement performance of mega projects in the energy sector in Kenya. This study therefore recommends further enhancement in adoption of global sourcing in the acquisition of mega projects in the implementation of the energy plan. This would lead to quality, cost, and time benefits. The aspects of international quality standards, more qualified contractors, technology transfer, wider sourcing scope; would have a positive impact on the procurement performance of mega projects in the energy sector in Kenya.

5.4.5 Moderating effect of Regulatory framework

The study established a non-significant influence of the regulatory framework on procurement performance of mega projects in the energy sector in Kenya. The study also observed that in some projects, the law was responsible for contract implementation. Further the study observed that the PPP Act, 2013, has not produced any PPP projects in the energy sector. This study thus recommends to policy makers and managers in the energy sector, improvements in the following areas: contract management, procurement risk management, contractor evaluation, and alignment of the PPP framework with existing laws.

5.4.6 Further Research

The study model predicts 70.9% of the procurement performance of mega projects in the energy sector. This study recommends, to scholars and researchers, to undertake further research on other factors that influence procurement performance of mega projects in the energy sector. Further, this study observed a moderate adoption of PPP practice and a narrow adoption of E-procurement in the acquisition of mega projects in the energy sector. It would be insightful to establish the challenges, and opportunities, of enhancing adoption of PPP and E-procurement practice in the acquisition of mega projects in the energy sector in Kenya. The study also recommends further study on the influence of the

regulatory framework in the procurement of mega projects to establish: level, benefits, and challenges of implementation of the various laws in the procurement of mega projects in the energy sector in Kenya. It would also be very informative to study the interplay between various laws in the procurement process.

This study adopted a descriptive research design to examine the influence of emerging supply chain practices on procurement performance of mega projects in the energy sector. This study recommends extension of this study to other sectors, such as transport and infrastructure that undertake similarly huge projects, to establish the impact of these supply chain practices on procurement performance of mega projects in those sectors. Further a different research approach, such as case study design on procurement of various projects could provide further insight on emerging supply chain practices.

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APPENDICES

Appendix I: Specimen Letter to Respondents

Dear Respondent,

I am a student at Jomo Kenyatta University of Agriculture and Technology pursuing a doctorate Degree of Supply Chain Management. As part of the requirements for the Degree, Its requisite that I carry out research in an area related to my area of study. As such, I have selected the energy sector in a survey on the influence of emerging supply chain practices on procurement of mega projects in Kenya. I have therefore considered you as one of the respondents in the study and the information you will give will not be used for any purpose other than academics.

Your cooperation is highly appreciated.

Yours Faithfully,

Kamoni Peter

Appendix 11: Questionnaire

This questionnaire is aimed at collecting data required for a study titled “*emerging supply chain practices and procurement of mega projects in the energy sector in Kenya*”. Your participation in completing the questionnaire is essential to this study and respondents are kindly requested to complete the questionnaire and give any additional information they might feel is necessary for the study. The information you provide will be used for academic purposes and will be treated with utmost confidentiality.

SECTION A: DEMOGRAPHIC INFORMATION

1. What organization in the energy sector do you work for?

2. How long have you worked in the organization?

Less than 5 years []

6-10 Years []

11-15 years []

Above 15 years []

3. What is your position in this organization?

-
4. **Kindly complete the remaining part of the questionnaire in reference to a specific mega project associated with your Entity.**

Project: _____

Estimated Value: _____

Project Status: _____

SECTION B: STUDY VARIABLES

A) Public Private Partnerships.

1. Describe the PPP characteristic exhibited by this mega project.

2. What benefits would accrue to this mega project through use of the PPP procurement model than would accrue through the traditional design to bid model.

The following are statements on aspects of **Public Private Partnerships**. Please use the five-point scale where: 1= Not at all; 2 = To a little extent; 3 = To a moderate extent; 4 = To a great extent; 5 = to a very great extent: to indicate the extent to which each of these statements characterize the procurement of the mega project.

Public Private Partnerships (PPPs)	Not at all	To a little extent	Moderate extent	Great extent	Very great
3. Early Supplier involvement in design reduces risk of costly design changes after contract award					
4. Early Supplier involvement in Design of projects ensures realistic specifications thus improves compliance					

5. Early Supplier Involvement enhances design Feasibility which reduces chances of project failure.					
6. Early Supplier involvement enhances contractor-Entity relationship thus reduces conflicts					
7. Supplier collaborations enhances risk identification and sharing					
8. Provides optimum environment for rich information exchange which enhances cost forecast, risk identification, and monitoring.					
9. Collaborative nature enhances joint action in risk management and problem solving and negotiation					
10. The joint action and collaborative environment enhances innovation.					
11. Contract bundling motivates compliance to quality					
12. Supplier commitment assures availability of project financing					
13. Collaborative negotiation ensures a more realistic risk management framework and					

contract terms					
14. Enhances the technology transfer process resulting in quality, reduced time cycles and total cost of ownership					

B) Electronic Procurement

1. What e-procurement tools were employed in the procurement process of this mega project?

2. What benefits accrue to the procurement process of this mega project from adopting e-procurement practices?

The following are statements on aspects of **Electronic Procurement**. Please use the five-point scale where: 1= Not at all; 2 = To a little extent; 3 = To a moderate extent; 4 = To a great extent; 5 = to a very great extent: to indicate the extent to which each of these statements characterize the procurement of this mega project.

Electronic Procurement	Not at all	To a little	Moderate extent	Great extent	Very great
3. High visibility of supplier performance					

enhances supplier management					
4. Process visibility enhances ethics and transparency in the process					
5. Process visibility enhances procurement contract management					
6. E-procurement enhances control of procurement process through approval procedures embedded in system					
7. Ease of access to information enhances procurement process audit					
8. Accuracy of data capture and processing enhances cost, and risk monitoring over procurement process					
9. E-intelligence enhances contract monitoring and adaptive management					
10. Enables global sourcing access resulting in competitive related price/cost benefits					
11. Enables wider participation by suppliers resulting in improved competitiveness in procurement					
12. Non value adding processes are eliminated resulting in improved procurement cycle time and total cost of ownership					

13. Enables real time tracking of cost and payments in the procurement process					
14. E-enabled supplier relationships enhance procurement procedures such as negotiation.					

C). Procurement Risk Management

1. What risks exist in the procurement process of this mega project and how do they impact the procurement of the mega project?

2. What is the procurement risk management framework adopted in the procurement of this mega project?

The following are statements on aspects of **Procurement Risk Management**. Please use the five-point scale where: 1= Not at all; 2 = To a little extent; 3 = To a moderate extent; 4 = To a great extent; 5 = to a very great extent: to indicate the extent to which each of these statements characterize the procurement of this mega project.

Procurement risk management	Not at all	To a little	Moderate extent	Great extent	Very great
3. Feasibility study enables identification of					

procurement risks					
4. Environmental impact assessment enables identification and management of risks related to environment					
5. rigorous risk appraisal process enables proactive risk management					
6. A market study identifies supply side risks related to the procurement of mega projects					
7. Accurate information in procurement processes enables proper forecast of costs					
8. The procurement process has mechanisms to collect accurate data for supplier evaluation					
9. Procurement negotiation lead to a risk sharing mechanism embedded into procurement contract					
10. The procurement contract enforcement and management has adaptive risk control mechanisms					
11. The entity has mechanism to reduce impact of unavoidable risks such as “force majeure”					
12. Risk pricing mechanism is free of political					

interference					
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D) Global Sourcing

1. To what extent has global sourcing practice been adopted in procurement of this mega project?

2. What benefits does the mega project derive from global sourcing and how does it impact the procurement performance?

The following are statements on aspects of **Global Sourcing Practice**. Please use the five-point scale where: 1= Not at all; 2 = To a little extent; 3 = To a moderate extent; 4 = To a great extent; 5 = to a very great extent: to indicate the extent to which each of these statements characterize the procurement of this mega project.

Global Sourcing	Not at all	To a little	Moderate extent	Great extent	Very great
3. Global sourcing exposes entity to wider purchasing scope which improves					

competitiveness in procurement of mega projects					
4. Global competition results in comparative price and cost benefits of mega projects					
5. Global sourcing provides opportunity to select more qualified mega project contractors					
6. Global sourcing exposes the procurement of mega projects to advanced technology resulting in lead time and Total Cost of Ownership benefits					
7. Exposes the process to International standards resulting in better quality					
8. Global sourcing exposes the procurement process to contractors with higher expertise that may be lacking in the local context.					
9. Global sourcing provides opportunity to select contractors with wider experience					
10. Global sourcing owing to access to experienced contractors enhances delivery time.					
11. Global sourcing enhances opportunity for partnership in mega projects					

12. Global sourcing provides opportunity for entity to acquire projects at better purchasing terms.					
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F). Regulatory Framework

1. What laws impact the procurement process of this mega projects in Kenya?

2. In what ways does the regulatory framework mentioned above influence procurement of this mega projects?

The following are statements on aspects of **Regulatory Framework**. Please use the five-point scale where: 1= Not at all; 2 = To a little extent; 3 = To a moderate extent; 4 = To a great extent; 5 = to a very great extent: to indicate the extent to which each of these statements characterize the procurement of this mega project.

PPP Regulatory framework	Not at all	To a little extent	Moderate	Great	Very great
3. Provides mechanism for risk identification and management					
4. Provides a clear process for screening, prioritization of bankable national interests					

5. Provides a clear procedure for selection and contracting for mega projects					
6. Provides legal capacity for procuring entities to enter into viable contracts					
7. Provides a clear operational framework for contract management					
8. Provide a clear and efficient mechanism for dispute resolution					
9. Provides a clear monitoring mechanism by establishing a clear reporting framework					
10. Provides a clear performance measurement mechanism					
11. Provides an efficient risk management mechanism					

12. What opportunity exists for improving the regulatory framework in order to enhance procurement performance of mega projects?

Dependent Variable

G). Procurement Performance of Mega Projects.

1. Which emerging SCM practices have the most influence on procurement performance of Mega projects in your Organization?

A. Procurement process cost

Adoption of SCM practices such as PPPs, E-procurement, global sourcing, and Procurement Risk management have led to reduction of **Procurement cost**. Indicate the percentage improvement in the following aspects of Procurement process cost associated with the mega project procurement over the years.

2. The following are statements on aspects of procurement performance on adoption of emerging Supply Chain Management practices. Please use the scale provided to indicate the level to which each of these statements characterizes procurement of mega projects in your organization.

	FINANCIAL YEAR	00-10 %	11-20 %	21-30 %	31-40 %	41 % & ABOVE
1. Reduction in procurement process cost	2013/2014					
	2014/2015					
	2015/2016					
	2016/2017					
2. Reduction in contract management cost	2013/2014					
	2014/2015					
	2015/2016					
	2016/2017					
3. Reduction in non value adding cost such as litigation and redesign costs.	2013/2014					
	2014/2015					
	2015/2016					
	2016/2017					

B. procurement cycle time.

Adoption of SCM practices such as PPPs, E-procurement, global sourcing, and Procurement Risk management have led to improvement in **procurement cycle time**. Indicate the percentage improvement in the following aspects of Procurement cycle time, associated with the mega project procurement over the years.

	FINANCIAL YEAR	00-10 %	11-20 %	21-30 %	31-40 %	41 % & ABOVE
1. Improvement in project procurement	2013/2014					
	2014/2015					

lead time	2015/2016					
	2016/2017					
2. Improvement in time to solution in case of conflict or challenges.	2013/2014					
	2014/2015					
	2015/2016					
	2016/2017					
3. Reduction of average delay time.	2013/2014					
	2014/2015					
	2015/2016					
	2016/2017					
C. Quality compliance						
Adoption of SCM practices such as PPPs, E-procurement, global sourcing, and Procurement Risk management have led to improvement on quality compliance . Indicate the percentage improvement in the following aspects of Quality Compliance, associated with the mega project procurement over the years.						
	FINANCIAL YEAR	00-10 %	11-20 %	21-30 %	31-40%	41 % & ABOVE
1. Reduction in defect rate in projects	2013/2014					
	2014/2015					
	2015/2016					
	2016/2017					
2. Reduction in customer complaint.	2013/2014					
	2014/2015					
	2015/2016					
	2016/2017					
3. Improvement in	2013/2014					

project specification compliance index	2014/2015					
	2015/2016					
	2016/2017					

Appendix III: Budget

ITEM	ESTIMATED	TOTAL
COST (KES)		
Thesis preparation		180, 000
Field Work		100,000
TOTAL		280,000

Appendix IV: List of Mega Projects in the Energy Sector

Description	PE Estimated Value	Dollars
1. 980MW coal power plant in lamu	MOE&P	1.2 Billion
2. 800MW LNG power plant at Dongo Kundu	MOE&P	1.8 Billion
3. 40MW solar power plant at Muhoroni	MOE&P	10 Million
4. 960MW Kitui Coal plant	MOE&P	
5. 560MW Olkaria vi	KENGEN	
6. 400MW wind power at Meru/Isiolo	KENGEN	
7. 460MW Menengai Phase 1, (6 IPPs)	GDC	1598 Million
13. 800MW Menengai Phase II	GDC	
14. 800MW Bogoria Silali Phase 1, (7 projects)	GDC	1062 Million
22. 300MW geothermal plant at Suswa	GDC	850 Million
23. 46MW West mount		
24. 56MW and 53MW Iberafrica- Thermal plant	KPLC	
25. 74MW Tsavo/Kipevu Thermal power plant	KPLC	
26. 100MW Orpower Geothermal Power plant	GDC	

27. 34MW Mumia Baggasse power plant	KPLC	
28. 90MW Rabai Thermal power plant	KPLC	
29. 87MW Thika Thermal power plant	KPLC	
30. 83MW Triumph Thermal power plant	KPLC	
31. 80MW Gulf Athi River Thermal power plant	KPLC	
32. 60MW Aerolus Kinagop wind park	KPLC	150 Million
33. 140MW Agil Longonot Geothermal	MOE&P	600 Million
34. 23 Solar hybrid micro-grid systems	MOE&P	85 Million
35. 300,000 ltrs Bioethanol projects	MOE&P	7 Million
36. 40MW Witu Solar project	MOE&P	160 Million
37. 300MW Lake Turkana wind power	MOE&P	1,100 Million
38. 100MW Kipeto wind power	MOE&P	300 Million
KETRACO PROJECTS		1,300 Million
39.1500Km, 132Kv Line	KETRACO	
40. 700Km, 220Kv line	KETRACO	
41. 1000Km, 400Kv Line	KETRACO	
42. 700Km, 500Kv Line	KETRACO	

43. 450Km, 20” pipeline Million	Kenya Pipeline	500
44. Meru Wind Faze, 80Mw	KENGEN	
45. Geothermal WHs, 50Mw	KENGEN	
46. NGONG III, windpower	KENGEN	
47. HIGH GRAND FALL, 500Mw Billion	KPLC	KeS150

Source: PPPU (2016); KPLC (2016); USAID (2014); MOE&P (2015)

Appendix V: Summary of Literature

Study	scope and methodology
Karikari (2005), Benefits of a Project Finance Approach to Infrastructure Development in Ghana: The Need to Adopt a Public Private Partnership Model	Literature survey of Benefits of project finance in infrastructure in Ghana.
Malek & Akalkotar (2016) Driving Forces to the PPP adoption- Perspective from Gujarat, Hongkong and Australian Practioners	Exploratory survey of drivers of PPP adoption in Hongkong/Australia
Osei <i>et al</i> (2014) Reasons for adopting PPP for construction projects in Ghana.	Questionnaire survey of reasons for adopting PPP in construction sector. Analysis using one way Anova.
Dominic <i>et al</i> (2015) A Review of Public Private Partnership on some Development Projects in Nigeria	Literature survey reviewing PPP on development projects in Nigeria
Ismail (2013) Factors affecting the use of Public Private Partnership in Malaysia	Questionnaire survey on factors attracting use of PPPs in Malaysia.
Medda <i>et al</i> (2012) Public private partnersips in transportation: some insights from the European experience.	Literature survey on Use of private finance in public projects in Europe.
Dieguez & Alfonso (2012) Models of PPPs in Mega projects: the Spanish case; Organisation, technology and Management in Construction	Systematic literature review of PPP models in Spain.
Tingting & Suzzane (2011) Adopting innovative procurement techniques	Semi structured interviews employed in study of drivers of

	PPP adoption in New Zealand
Gonzalez <i>et al</i> (2010) Impact of e-procurement on procurement practices and performance	Impact of e-procurement on procurement practices and performance
Smart (2010) E-procurement and its impact on supply management; evidence from industrial case studies	Case study on impact of E-procurement on SCM
King'ori (2013) The Effect of E-Procurement On Supply Chain Management At Teachers' Service Commission	Case study on e-procurement on SCM
Shalle <i>et al</i> (2013) Role of E-Procurement Strategy in Enhancing Procurement Performance in State Corporations in Kenya	Survey on e-procurement influence on procurement performance in state corporations
Odago and mwajuma (2013) and Maniam <i>et al</i> (2010) Factors Affecting Implementation of E-Procurement in County Governments: A Case Study of Kajiado County, Kenya	e-procurement adoption in Kenya and Malaysia respectively
Crema (2015), Tumuhairwe and Ahimbisibwe (2016) Risk Indicators for Managing the Energy Procurement Process.	Case study and cross sectional survey on Risk indicators and procurement records compliance and effective risk management
Procurement Records Compliance, Effective Risk Management and Records Management Performance CIPS, Dieguz <i>et al</i> (2014), Serpella <i>et al</i> (2014) and Flyvbjerg <i>et al</i> (2003)	Systematic literature review, case study, and book on Risk management in mega project processes
Risk management in construction projects: a knowledge-based approach.; <i>Megaprojects and risk: an anatomy of ambition.</i>	
Schieke <i>et al</i> (2011) Estimating the Potential from	Financial impact of global

International Sourcing and Other Sourcing Levers.	sourcing
Christopher <i>et al</i> (2011) Approaches To Managing Global Sourcing Risks.	Multicase study on global sourcing risk management
Haartman and Bengtsson (2015) The Impact of Global Purchasing and Supplier Integration On Product Innovation	Global sourcing from a product innovation perspective
Golini and Kalschmidt (2011) Moderating the impact of global sourcing on inventories through supply chain management	Global sourcing moderating impact on inventories via scm
Oshiri <i>et al</i> (2009) Global Sourcing: Recent Trends and Issues.	Gobal sourcing Trends and issues
Crosby (2011) Key Success Factors in Mega-Science Projects: Preparatory Work For SKA.	White paper on procurement strategies for success in mega projects

Appendix VI: Operationalization of Variables

Variable	Theoretical Definition	Operational Definition	Measuring Tool
Public Private Partnerships	The undertaking by private sector to undertake public projects (Gardner & Wright, 2014), normally involves private financing (investment of private equity) on non/limited recourse basis, with payments being arranged after satisfactory completion of project	The extent to which PPPs assure adequate finances, collaboration in project design, risk management, negotiation in the procurement of mega projects (WB, 2011; Bitsch, 2010, Gardner & Wright, 2014, KPMG, 2014)	Likert scale
E-Procurement	The practice of undertaking the procurement process over web based applications to enable e-tendering, e-auctioning, vendor management, purchase order integration, e-invoicing, e-payment, and contract management (Gruenen <i>et al</i> , 2010),	The extent to which E-Procurement enhances process visibility, transparency, information sharing, compliance, negotiation and evaluation efficiency, , wider market access (competition), and elimination of non value adding step (chirchir <i>et al</i> 2015; Odago and Mwajuma, 2013)	Likert scale

Procurement Risk Management	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 (Russil, 2010)	Extent to which Procurement risk management ensures: ex-ante risk identification (feasibility and market study to identify risks early); Risk reduction (accuracy of information in all procurement process for instance cost forecasts); risk allocation (risk sharing depending on negotiation power and ability to handle risk); and risk monitoring.	Likert scale
Global Sourcing	The practice of sourcing across geo political boundaries to achieve operational and strategic efficiency by leveraging on global capabilities (PWC, 2010)	The extent to which global sourcing relays benefits and efficiencies (price, technology advances, quality, expertise) while acquiring requirements (CIPS, 2013)	Likert scale
Regulatory framework	Legal framework, comprising policies and laws that determine how to undertake procurement in Kenya, and any law related to procurement of mega projects.	Extent to which legal framework Influences procurement performance of mega projects by enhancing value for money; and procurement governance in accordance with international best practices (enhance competition,	Likert scale

		accountability, transparency, and ethical standards) (ICPAK, 2016; PPOA, 2016)	
Procurement performance (cost, time and quality)	The acquisition, undertaking, and delivery of Multi-million shilling public projects by various procuring entities to support infrastructure development.	Extent to which procurement is within cost estimate; extent of variance in scheduled procurement time, compliance to quality specifications, performance specification, defect rate, reduction in judicial appeals and shareholder conflicts.	Percentage