SUPPLY CHAIN FACTORS AND DELIVERY OF POWER GENERATION PROJECTS AT THE KENYA ELECTRICITY GENERATING COMPANY LIMITED

BY

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DECLARATION

This is my original work and has not been presented for a study in any University or college.

Signature:…… Date:……

Anthony Katuku Kitungu

D61/63481/2011

This Management Research Project has been submitted for examination with my approval as the appointed supervisor

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DEDICATION

To my wife Mary, my daughter Hannah and my son Solomon who always encouraged me during my studies. God bless you.

ACKNOWLEDGEMENT

My special acknowledgment goes to my Supervisor Onserio Nyamwange and Moderator Dr. Njihia for guiding me in putting together all the materials in order to complete this project. I also thank all my lecturers at the Nairobi University, School of Business who took me through classes in various courses of the MBA programme.

My appreciation goes to KenGen Management, for allowing me to collect data from the organization. Special thanks to all the Project and Supply Chain staff at KenGen who were quite cooperative in responding to my questionnaire.

I greatly thank God for helping me through my studies, it was a tough journey for me but His grace was sufficient.

ABSTRACT

The purpose of the study was to determine supply chain factors that influence the delivery of power generation projects in KenGen. The research design was a case study of Kenya Electricity Generating Company (KenGen). The study used both primary and secondary data to meet its objectives. Collection of primary data was through the use of questionnaire. The researcher used descriptive statistics and principle component factor analysis to analyze quantitative data. For qualitative data, the researcher used content analysis. From the study findings, the researcher established that procurement had a high influence on delivery of power generation projects in KenGen. It was also revealed that transportation and quality control has a big impact on delivery of power generation projects in KenGen as the company was found to use uneconomical means of transport and suffered from lack of systems for due diligence and benchmarking. The study concludes that materials or inventory control as well as materials handling and storage influenced delivery of power generation projects in KenGen. The study further concludes that order processing and production planning greatly influenced delivery of power generation projects in KenGen as there were cases of increased variation orders, delay in order processing and delays in manufacturing of equipment and material. The study recommends that training is required for the users of procured equipment and materials. Independent due diligence should also be carried out before awarding contracts to potential contractors. In addition, proper planning of projects and exhaustive perusal of procurement documents will enable overcome hurdles experienced during the procurement stage.

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LIST OF ABBREVIATIONS

ASCI:	Administrative Staff College of India
FAT:	Factory Acceptance Test
GW:	GigaWatt
IDF:	Import Declaration Form
ISCS:	International Supply Chain Solutions
KENGEN:	Kenya Electricity Generating Company
MW:	MegaWatt
MOE & E:	Ministry of Energy and Petroleum
PMBOK:	Project Management Body of Knowledge
PPOA:	Public Procurement Oversight Authority
WBS:	Work Breakdown Structure
SC:	Supply Chain

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Organizations implement new projects or undertake efficient operations in order to thrive in today's competitive environment. According to Stocks (2008), Projects begin with the end in mind. There must be a statement of objectives with priorities, required delivery dates, costs and quality targets.

In any organization, supply chain plays an important role in helping to shape the competitive position of the organization in the market place. In many cases, it is clear that this component can directly support the corporate and business strategies of the organization or its SBUs. For example, increasing product or service quality (improving the quality of suppliers), increasing market share (securing the supply of critical components at the level required), improving cash flow (minimizing inventory levels or extending payment terms), developing new products (securing the supply of critical inputs to allow new products to be produced), entering new markets (ensuring that suppliers can be made available where they are required) (ISCS, 2013).

According to Jespersen and Larsen (2005), the overall goal of any supply chain strategy is to fulfill the end customers needs and expectations in a cost effective manner. Many organizations and institutions face the challenge of implementing good supply chain practices, yet for organizations to achieve successful implementations of their projects and in order to thrive in the competitive environment, they have to embrace good practices within and outside the industry.

According to Ministry of Energy and Petroleum (MOE & P), (2014), Kenya has an installed capacity of 1.48 GW. Whilst about 57 % is hydropower, about 32% is thermal and the rest comprises geothermal and emergency thermal power. Solar PV and power play a minor role contributing to less than 1%. However Hydro power has ranged from 38.76% of the generation mix due to poor rainfall. Thermal energy sources have been used to make up for these shortfalls, varying between 16.33% of the mix.

Kenya's current effective installed (grid connected) electricity capacity is 1,533 MW. Current electricity demand is 5478 MW and is projected to grow to about 15,000 MW by 2030. To meet this demand, Kenya's installed capacity should increase gradually to 19,200 MW by 2030 (Energypedia.info/wiki/Kenya Energy). This means major projects on construction of new power plants as well as upgrading of the existing power plants have to be undertaken, which have to be backed by efficient procurement and supply chain practices.

1.1.1 Supply Chain Factors and Delivery of Power Generation Projects

Supply chain encompasses all those organizations and activities associated with the flow and transformation of goods from the raw materials stage through to the end user, as well as the associated information flow (Handfield and Nichols, 2002). The same authors define Supply Chain Management as the integration and management of supply chain organizations and activities through cooperative organizational relationships.

A supply Chain consists of all parties involved, directly or indirectly in fulfilling a customer request. The supply chain includes not only the manufacturer and suppliers

but also transporters, warehouses, retailers and even customers themselves (Chopra, Meindl and Kalra, 2010). According to Chopra, Meindl and Karl (2010), there are three principle streams of supply chain management which include sourcing, procurement and supply management; materials management; and logistics. The first stream deals with the selection and maintenance of strong relationships with the suppliers, the second stream deals with forecasting, inventory management, stores management, warehousing, stock keeping, scheduling, production planning and production control as well as order processing while the third stream deals with planning, implementing, and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory, finished goods and related information from point of origin to point of consumption. Handfield, Monczka, Giunipero and Patterson, (2009) identifies supply chain management activities as purchasing; inbound transportation; quality control; demand and supply planning, receiving, materials handling and storage; materials or inventory control; order processing; production planning, scheduling and control; warehousing/distribution; shipping; outbound transportation; and customer service.

According to Mariaria (2013), one of the essentials to timely projects is effective supply chain management. This is in form of materials, equipment, consultants, training, goods and services in order to meet the whole scope of the project. Mariaria observed that, projects' team leaders having come up with the work plan of the project need to have proper supply chain management professionals from the onset before the implementation of the plan and processes. These professionals will come up with a procurement plan in line to project activities that will center on what to procure and what can be done in-house, how much to procure and when to procure.

1.1.2 Project Delivery

A project is a set of activities with a defined start point and a defined end state, which pursues a defined goal and uses a defined set of resources (Slack, Chambers, and Johnston, 2001). Marton (1999) defines a project as any group of activities with a common goal for which we try to control costs, resource usage, completion time, and quality of the output. Burley (2013) noted that in Project management, a deliverable is a product or service that is given to a client. It has a due date and it is tangible measurable and specific.

According to Stocks (2008), the deliverables of a project are reflected in a work breakdown structure (WBS), there must be a statement of objectives with priorities, required delivery dates, costs and quality targets. The WBS brings clarity and definition to the project planning process. It provides a framework for building up information for reporting purposes, (Slack, Chambers, and Johnston, 2001). Stock (2008) identified primary objectives of the cost, performance and time as clear benchmarks against which to judge success or failure of a project. Stock noted that every project should be controlled against detailed cost budgets to ensure that the expenditure authorized in its contract or charter is not exceeded. Stock identified perceived quality characteristics as: performance at least equal to the specifications, reliability and freedom from malfunction, long useful and economic life, safe (posing no unintentional threat of harm to leaving creatures), low operating maintenance costs, comfort and a pleasant impact on the human senses, and environmentally friendly. On time objective, Lock (2008) observed that actual progress has to match or beat planned progress otherwise any project that continues to use resources beyond its

planned finish date can have a knock-on effect and disrupt other projects that are either in progress or waiting to follow.

The government of Kenya is currently focusing on delivery of Vision 2030 goals which focus on reforms and development in eight key areas namely: macroeconomic stability for long-term development, continuity in governance reforms, enhanced equity and wealth creation opportunities for the poor, infrastructure, energy, science, technology and innovation, land reforms, human resources development and security (Ministry of State for Planning, National Development and Vision 2030, 2008). These goals can be achieved through implementation of four types of projects identified by Lock (2008) as civil or chemical engineering and construction projects, manufacturing projects, management projects (often internal for the companies benefit) and projects for pure scientific research projects.

Power generation projects fall in the category of civil or chemical engineering and construction projects. According to lock (2008), such projects are usually remote from the contractor's head office, they incur special risks and problems of organization, they may require massive capital investment, and they deserve (but do not always get) rigorous management of progress, finance and quality. Operations are often hazardous so that health and safety aspects require special attention. Such Projects require massive resources and therefore call for participation of many different specialists to share the risks, and as such the organization and communication across the many participants are complicated.

In order to achieve a proper project delivery, it is important to understand the impact of supply chain management on the project and to identify areas that take supply

chain to more strategic level within the project. This can be done through development of a framework for planning and implementation of an integrated supply chain management.

1.1.3 Kenya Electricity Generating Company (KenGen)

KenGen is a limited liability company, registered under the companies Act of Kenya. The company was incorporated in 1954 as Kenya Power Company Limited (KPC), but later re-launched as KenGen in 1998. This was after the implementation of the energy sector reforms. KenGen listed 30% of its shares at the Nairobi securities Exchange, (NSE) in 2006, with the government of Kenya owning the balance of 70% of the shares, (KenGen, 2009). KenGen's core business is to develop, manage, operate power generation plants and supply electric power to the Kenyan Market and the East African Region. It is the leading electric power generator in Kenya, producing about 80% of electricity consumed in the country.

The company uses various sources to generate electricity ranging from hydro, geothermal, thermal and wind. Hydro is the leading source of electricity, with an installed capacity of 811.9 MW, which is about 53% of the country's total installed capacity (KenGen, 2014). It sells the power in bulk to Kenya Power and Lighting Company (KPLC) which distributes to consumers. The company is now operating in a liberalized market and is in direct competition with five (5) Independent Power Producers who between them produce about 25% of the country's electric power.

According to MOE (2011) the positive economic growth since 2003 has triggered the increase for demand in Electricity. MOE also indicates that the economic growth rate

has also has translated to an average annual electric power demand growth rate of 8%. This is further projected to at an average of 10% for the next twenty (20) years. In 2013 the Government of Kenya promised to deliver 5000+ MW in 40 months (Business Daily 17.9.2013). This means the installation will be completed by end of 2017. Due to the high demand of power in Kenya and in order to fast track the delivery of the 5000+ MW, the government has introduced different structures such as Public Private Partnerships (PPP), more emphasis being on Geothermal Power. The 5000 MW+ expected by 2017 will come from the projects currently under implementation as well as the ones to be implemented at a later date. The mix will comprise of Hydro 24 MW, Thermal 250 MW, Geothermal 1,646 MW, Wind 630 MW, Coal 1920 MW, LNG 1,050 and CO-Generation 18 MW adding up-to 5,538 MW. (KenGen 40-Month 5000+ MW Generation Power Mix, 2013).

KenGen is currently implementing seven (7) power generation Projects namely; Kindaruma 3rd unit, 24 MW, Olkaria 1 unit 4 & 5, 140 MW, Olkaria 4 unit 1 & 2, 140 MW, Ngong Wind Turbine, 6.8 MW, Ngong Wind Turbine, 13.6 MW, Wellhead Generators, 70 MW, Olkaria 1, Unit 6, 70 MW (KenGen , 2014).

In the face of the entry of the new comers, KenGen has an upper hand since they have undertaken most of the required feasibility studies, they have drilled wells and other required facilities are in place. However, for KenGen to retain the market share in the industry, processes that support quick delivery of the Projects have to be embraced. This means KenGen has to be efficient on its Supply Chain Processes.

1.2 Statement of the Problem

Supply chain is one of the Project Management Body of Knowledge (PMBOK) areas and therefore the success of planning procurement and logistics support for projects is often a direct contributor to the overall project success and nearly always has direct influence on cost, schedule and quality (the three pillars of projects management). The ability to implement effective Supply Chain Strategies is essential for all organizations. Organizations have to embrace Supply Chain strategies that enable the delivery of their Projects within set timelines that enable them to recap their investment quickly. It is also important to note that Power Generation Projects call for huge capital outlay (for example, it costs about eight to ten billion Kenya Shillings to construct a 70 MW Thermal Power Generation Plant and about Twenty five to Twenty Seven Billion Kenya Shillings to construct a 70 MW Geothermal Power Plant (KenGen, 2014). This means supply chain activities should be well managed to ensure Projects are completed to achieve the primary objectives of cost, performance, and timeliness.

Scholars have studied the role of Supply Chain in Project delivery as well as other factors influencing delivery of Projects in various public organizations. Kagiri (2005) carried out a case study of Kenya Electricity Generating Company, on time and cost overruns in power projects in Kenya, Mbaabu (2012) carried out a case study of Isiolo County, on factors influencing implementation of road construction projects in Kenya, Mulari and You Wen (2007) investigated the delay factors and their impact on road projects completion in Malaysia. Ngesa (2012) carried out a case study of World Bank financed projects in the road sub-sector in Kenya, on influence of institutional

factors in timely completion of infrastructure projects. Mutia (2010) carried out a case study of Water Resource Management Authority, on factors influencing efficiency in procurement system within the public institutions. Opiyo (2011) carried out a case study of Institutional Reform and Capacity Building, on factors affecting procurement performance in World Bank Projects in Kenya while Ngovi (2011) carried out a study on factors affecting performance of procurement functions in public sector in Kenya.

The above studies did not focus on all the supply chain streams' influence on the performance of an organization. However, Mariaria (2013) focused on factors influencing effective supply chain management in delivery of public development projects in Nakuru town and Baringo Central Constituency. The supply chain factors influencing performance of the organization would not be assumed to be similar across organizations, unless empirical studies prove so. This is due to the contextual, sectoral and managerial differences among the organizations. Mariaria's (2013) research focused on infrastructure projects and there is the need to assert his findings in different context - in this case KenGen, since it is in a different industry (power generation). The research question that this study sought to answer was, ''what are the supply chain factors that influence the delivery of power generation projects in KenGen?''

1.3 Research Objective

The objective of the study was to determine supply chain factors that influence the delivery of power generation projects in KenGen.

1.4 Value of the Study

The study will help KenGen to understand the impact of supply chain on delivery of power generation projects with a focus on the areas that need to be managed so as to minimize delays as well as reduction of projects incidental costs that arise from poor coordination of supply chain activities.

Similarly, the study will add to knowledge which can be used by academicians, scholars and researchers. The study will be useful to practitioners and policy makers in the field of Supply Chain Management as well as Project Management. It will also create awareness to other Government agencies on some of the significant factors that they are likely to encounter in similar public projects.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter provides information from the review of literature on supply chain factors that influence the delivery of projects. The literature review was from a general perspective, owing to the lack of literature focusing directly on supply chain factors influencing delivery of projects in Kenya electricity sub-sector.

2.2 Supply Chain Factors influencing delivery of Power Generation Projects

Handfield, Monczka, Giunipero and Patterson(2008) have identified at-least eleven (11), main activities of supply chain namely procurement, transportation, quality control, demand and supply planning, receiving material handling and storage, materials or inventory control, order processing, production planning, scheduling and control, warehousing/distribution, shipping, and customer service.

2.2.1 Procurement

Procurement deals with supplier identification and selection, buying, negotiation and contracting, supply market research, supplier measurement and improvement, and purchasing system development. It deals with doing “the five rights’’: getting the right quality, in the right quantity, at the right time, for the right price, from the right source. In a public entity in Kenya, this process is guided by the Public Procurement and Disposal Act, 2005. The process follows the procurement cycle which includes: planning the individual procurement, initiating the procurement, checking availability in stores, confirming availability of funding, advertising procurement, receiving and opening of bids, bid evaluation, selecting vendor or contractor, notifying contract

award, committing procurement by contract, administering contract, inspecting and receiving supplies or works (PPOA, 2009).

Power generation projects are expensive to implement, and therefore most of the times the implementing organizations have to seek outside financing through the help of the government. According to Kagiri (2005), donors require the recipients to follow specific rules or specific guidelines for identifying the contractor and to set up specific financial management systems to oversee the use of donor funds. Kagiri (2005) noted that, procurement is an important aspect and if not managed well then, project aid can be withheld, disbursements can be delayed, contracts can be cancelled and worse still contractors barred from doing business with development partners which can be a costly affair.

2.2.2 Transportation

Transportation (inbound and outbound) manages the physical and informational links between supplier and the buyer/customer. The performance of this activity is affected by road/railway network, government licensing, loading and offloading facilities as well prevailing transport rates. If this process is not well planned and coordinated, it can lead to penalties by transporters (inform of truck waiting charges), project delays, and damages of cargo (resulting to poor quality projects) especially if proper handling equipment are not availed. According to Chopra, Meindl and Kalra (2010), transportation is the backbone of logistic and accounts for 50% of the logistics costs, these makes an efficient management of this function to become an important preoccupation of management.

2.2.3 Quality control

Quality control recognizes the importance of supplier and the need to prevent defects early in the materials sourcing process, rather than simply detect quality problems at the time of receipt of goods. This process ensures a quality project is delivered. A common practice by many organizations has been to undertake Factory Acceptance Tests (FATs) before the equipment leave the manufacturers workshop. Mariaria (2013) noted that early supplier involvement will not only aid towards timely project completion and satisfaction but also identification of high quality and cost effective materials.

2.2.4 Demand and supply planning

Demand and supply planning deals with forecasts of anticipated demand, inventory adjustments and order filling while supply planning is the process of taking a demand data and developing a supply, production and a logistics network capable of satisfying demand requirements. This process ensures continuous flow of activities and thus a timely delivery of the project. Electricity generation projects are complex in nature. These means materials will be sourced from different suppliers some of which are scattered in different countries. In order to address the challenges in logistics planning, smart contractors sign contracts with logistics firms who have a global connection network.

2.2.5 Receiving, materials handling

Receiving, materials handling, and storage deals with physical receiving of inbound material as it moves from a supplier to a purchaser. The process ensures right

quantities and quality are complied with and cost deliverables are met. A best practice will be set up an Inspection and Acceptance committee to confirm compliance of the materials to quality and quantity as per the set requirements. This process also calls for adequate handling equipment and facilities suitable for handling materials without exposing them to breakages or any other sort of damage.

2.2.6 Materials or inventory control

Materials or inventory control with one arm (the materials control) being responsible for determining the appropriate quantity to order based on projected demand and managing materials releases to suppliers while the other arm (inventory control) being responsible for determining the inventory level of finished goods required to support customer requirements. The process strikes a balance between ordering costs and stock holding costs meaning money is not tied in stock but at the same time there are no stock outs which are likely to affect the flow of the works. According to Irwin (1989), an organization that has adopted the materials management organizational concept will have a single manager responsible for planning, organizing, motivating and controlling all those activities principally concerned with the flow of materials into an organization. Crocker, Jessop and Morrison (2012) noted that the benefit that arises from the adoption of the materials management concept approach is an enjoyment of improvement communication and coordination between departments within the supply chain.

2.2.7 Order processing

Order processing helps ensure that customers receive material when and where they require it. A critical area to carefully manage on this activity is the variation orders. Oladapo (2001) identified variation orders as a major factor contributing to project delay. Variation orders arise from poor project designs. Oladapo's quantitative assessment of the cost and time impact of variation orders on construction projects established that variations had a significant effect on project cost and accounted for 79 and 68 percent of the cost and time overruns, respectively for the projects studied. The results also showed that changes in specifications and scope, initiated mostly by project owners and their consultants, were the most prevalent sources of variation.

2.2.7 Production planning, scheduling, and control

Production planning, scheduling, and control involve determining a time-phased schedule of production, developing short term production schedules and controlling work in process production.

2.2.8 Warehousing/distribution

Warehousing/distribution deals with the storage of a product before it heads to the customer or it is incorporated into the work. This activity is very important because if poorly managed, materials can be prone to damage, theft and eventually can stop the entire operations of the project. In 2013, a project had to delay for some weeks because of loss of materials (KenGen, 2013). According to Crocker, Jessop and Morrison (2012), security of stores buildings and stockyards is paramount. Precautions should be taken regarding the custody of the keys and in the event of keys

being lost, mislaid or stolen, the fullest possible inquiries must be made and appropriate actions taken. Some materials may require specialized storage so as to ensure the desired quality of the final product.

2.2.9 Shipping

Shipping involves physically getting a product ready for distribution to the customer. It includes packing to prevent damage, completing any special labeling requirements, completing the required shipping documents and/or arranging transportation with an appropriate carrier. Related to this activity is the process of import tax exemption for materials and equipment. The Kenyan government grants exemption on duty, VAT and Import Declaration Form (IDF) fees on materials and equipment for power generation projects in compliance to the law. Where materials and equipment qualify for exemption, the employer and the contractor are required to submit documents for approval by the Ministry of National Treasury through the mother ministry. According to KenGen (2014), this process may take up-to two (2) weeks and therefore the contractor should submit shipping documents at-least twenty one (21) days before the ship docks so as to avoid possible delays.

2.2.10 Customer service

Customer service includes a wide set of activities that attempt to keep a customer satisfied with a product or service. The primary elements of customer service are pre-transaction, transaction, and post transaction activities.

Chopra, Meindl and Karl (2010), grouped the supply chain activities which had been identified by Handfield, Monczka, Giunipero and Patterson (2008) into three principle streams namely: Sourcing, procurement and supply management, Materials

management, and Logistics and distribution. Chopra, Meindl and Karl argue that selecting the right suppliers helps ensure that buyers receive the right inputs to satisfy their quality, cost, delivery and technology requirements. Selecting the right suppliers also creates the foundation for working closely with suppliers, when required and to further improve performance;

Materials management includes the functions of forecasting, inventory management, stores management, warehousing, stock keeping, scheduling, production planning and production control as well as order processing. According to Leenders, Fearon and England (1989), an organization that has adopted the materials management organizational concept will have single manager responsible for planning, organizing, motivating and controlling all those activities principally concerned with the flow of materials into an organization. Materials management views material flows as a system. The main benefit that is derived from the adoption of materials management approach is an improvement in communication and coordination between departments.

Logistics is the process of planning, implementing, and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory, finished goods and related information from point of origin to point of consumption for the purpose of conforming to customer requirements (Crocker, Jessop and Morrison, 2012).

Handfield, Monczka, Giunipero and Patterson (2009) noted that an excellent achievement in supply chain activities can be realized by a commitment to the enablers of supply chain management which are human resources, organizational design, information technology and measurement. They pointed out that an

organization needs to have in place supply chain professionals who have the ability to view the supply chain historically, manage critical relationships, understand the business model, engage in fact-based decision making and understand electronic business systems. Additionally, a Project draws members from almost all the departments of the organization, it is therefore important to build a team that find a balance point at which the members are committed to using their individual talents and skills in support of the teams work.

According to Heerkens (2007), a Project Manager should help people make the transition from individuals to team members. An organization that fails to consider this will experience project delays resulting to penalties and other unwarranted costs. An organization should also embrace real-time shared information technology systems/supply chain planning and execution systems that support demand planning, order commitment, scheduling, and production management, distribution and transportation, planning, materials replenishment, reverse auctions electronic data interchange. Organizations should also adopt organizational designs that feature centrally led by supply teams, executive responsibility for coordinating purchasing and supply chain activities, collocation of supply staff with internal customers, cross-functional teams to manage supply chain processes, supply strategy coordination and review sessions between business units and executive buyer supplier council to coordinate with suppliers. They also recommend supply chain measures that use data from visible resources, quantify what creates value, use goals that change over time, rely on benchmarking to establish performance targets, link to business goals and objectives, feature efficiency and effectiveness measures and assign ownership and accountability.

2.3 Project Delivery

Burley (2013) noted that in Project management, a deliverable is a product or service that is given to a client. It has a due date and it is tangible measurable and specific. According to Stocks (2008), the deliverables of a project are reflected in a work breakdown structure (WBS), there must be a statement of objectives with priorities, required delivery dates, costs and quality targets. The WBS brings clarity and definition to the project planning process. It provides a framework for building up information for reporting purposes (Slack, Chambers, and Johnston, 2001).

According to Mbaabu (2012), delivery of a Project is influenced by six main factors namely: resource mobilization approaches, project leadership and management, contract documentation, local politics, government policies and regulations, and organizational culture. Mbaabu noted that resources should be availed to the site according to approved programme of works and as per contract document (schedule of list of plant and equipment, key personnel). Staff must be given freedom and responsibility to act on their own initiative, a contract for the execution of the work should be signed, establishment of the role played by politicians in creating a favourable environment is key, project implementing agencies should adhere to government policies and regulations and the project leadership should tap the individual initiative in a project management context, and endeavor to create a project management culture within the team.

According to Lock (2008), the success of the contractor and the project manager will be judged according to how well they achieve the three primary objectives of cost, performance and time. Many things need to be in place and many actions taken during

the project execution to help ensure success. Lock noted that there should be good project definition and a sound business case, appropriate choice of the project strategy, strong support for the project and its manager from higher management, availability of sufficient funds and other resources, firm control of changes to the authorized project, technical competence, a sound quality culture throughout the organization, a suitable organization structure, appropriate regard for the health and safety of everyone connected with the project, good project communications, well motivated staff, and quick and fair resolution of conflict.

2.4 Empirical Studies

According to Mariaria (2013), reasons for poor delivery of projects include ineffective methods of supply chain management, bureaucracy and time consuming methods of procurement, training on cost effectiveness and timely delivery of projects, stake holders involvement, failure to involve suppliers at the early design and specification stage leading to frequent changes of design and specifications and cancellation of contracts, frequent delays in signing of the contracts as well as project completion and take over. Mariaria faulted the lengthy procedures that do not support cost saving strategies such as early supplier involvement, lean supply chain management and Just in Time delivery. Mariaria also noted slow implementation of the procurement law. Many organizations assume that the Procurement Act will direct all the procurement activities within the organization. The need for procurement professionals to drive the implementation of the process should not be underestimated.

According to Mbaabu (2012), the factors influencing implementation of projects in Kenya include proper planning, good site management, adequate contractor

experience, adequate client's finance and payment for completed works, favourable external conditions, identification of sub-contractors, proper adequate material and labour supply, maintaining of plants and equipment, and proper communication channels between parties of the project. Mbaavu also noted that contract documentation (which is a procurement function), contributed most to the implementation of road construction projects.

Mulari and Wen (2007), in a study to identify the delay factors and their impact on project completion in Malaysia observed that, the problem of delays in the construction industry is a global phenomenon. The study identified most important causes of project delays as: contractor improper planning, contractors' poor site management, inadequate contractor experience, inadequate clients' finance and payment for completed works, problems with sub-contractors, shortage in materials and labour supply, equipment availability and failure, lack of communication between parties and mistakes during project implementation phase. The study identified effects of delays as: time overrun, cost overrun, disputes, arbitration, litigation, and total abandonment.

According to Ngesa (2012), some of the institutional factors that influence time completion of infrastructure projects include lengthy procurement procedures in the government, poor procurement documentation, and absence of procurement plans. Ngesa identified other factors as lack of appreciation of the role of the project management, failure to integrate technology into project management processes, lack of monitoring and evaluation at all stages of project implementation, improper project feasibility studies, failure to formulate policies to minimize political interference, lack

of monitoring of procurement processes, inadequate and improper design of projects, improper specialization of duties, tasks and responsibilities, lack of transparency and accountability, poor financial planning and capacity building. Ngesa also noted that the development partners failure to harmonize their approval and reporting requirements and recommended frequent World Bank organized clinics on procurement and financial management, and the empowerment of the implementing agencies to take decisions in good time.

Kagiri (2005) identified thirty three variables that contributed to Projects' time and cost overruns. Factor analysis revealed eight underlying factors namely; contractor inabilities, improper project preparation, resource planning interpretation of requirements , works definition, timeliness, government bureaucracy, and risk allocation as having been significant contributors to overruns.

Mwandali (1996) in a study to analyze the factors that affected management of Projects at Kenya Railway, observed that poor communication, little experience of project manager, late procurement of equipment, lack of training for the project managers, ineffective monitoring and controlling systems, lack of personnel motivation, and slow project selection methods to have negatively affected projects delivery.

2.5 Conceptual Framework

An ideal supply chain will constitute of eleven main activities (Independent Variables) as identified by Handfield, Monczka, Giunipero and Patterson (2008) which include, procurement, transportation, quality control, demand and supply planning, receiving, materials handling and storage, materials or inventory control,

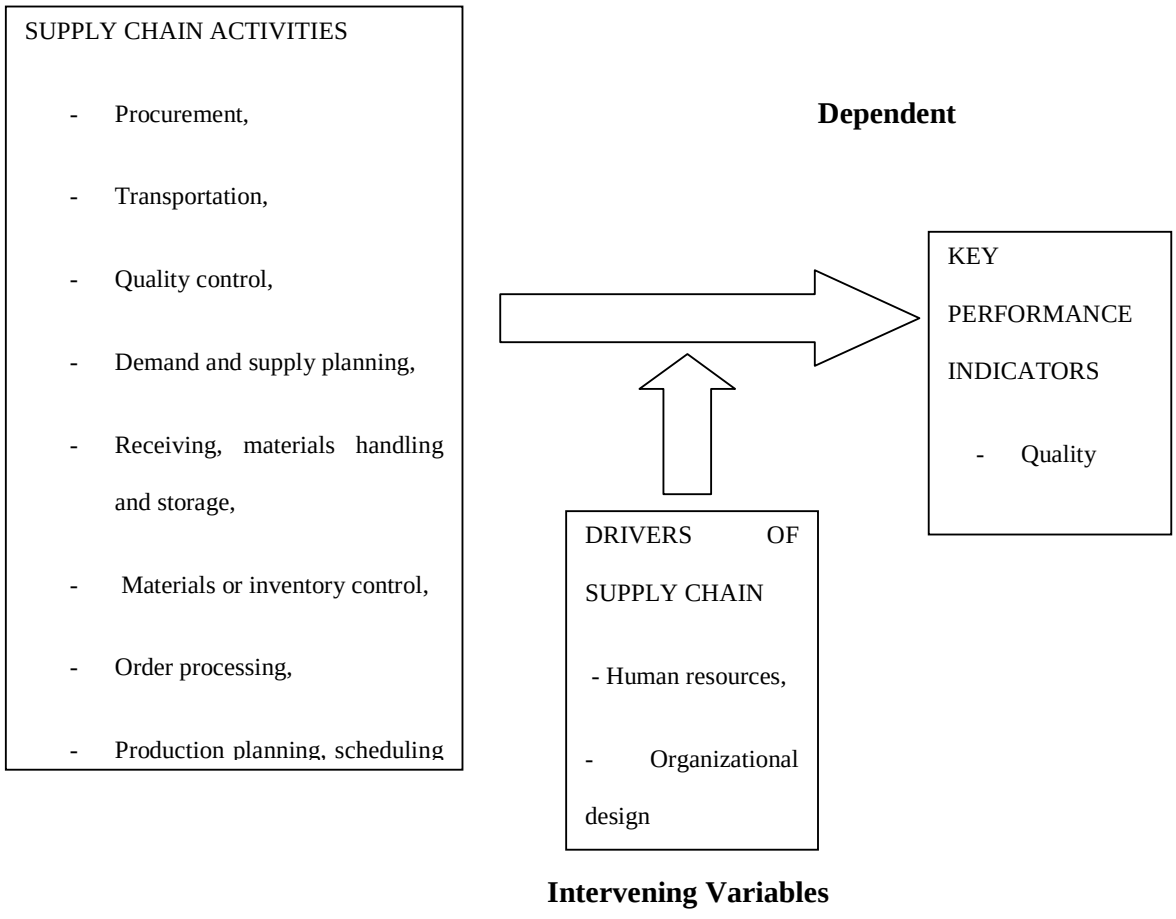
order processing, production planning, scheduling and control warehousing/distribution, shipping, and customer service .

The effective coordination of the eleven activities would be determined by the enablers of supply chain management which would include human resources, organizational design, information technology and measurement.

The key performance indicators (Dependent Variables) would be the delivery of quality projects, within required time frames and within the budgeted costs.

Figure 1: Conceptual Model

Independent Variables



CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides details of research design and data collection techniques used. It also describes the data analysis approach used in the study. This was against the background of the research objective, establishing the supply chain factors influencing delivery of power generation projects in KenGen.

3.2 Research Design

The research design of the study was a case study of Kenya Electricity Generating Company (KenGen). A case study was the most appropriate since it had the benefit of providing an in depth and thorough investigation of the supply chain factors influencing delivery of power generation projects. The case study focused on the depth of the matter rather than the breadth. It was appropriate in providing qualitative evidence, which was of interest to this study.

Case studies enhance understanding of complex issues. They also offer experience or increase depth to what has been established through previous researches. Case studies emphasize detailed contextual analysis of a limited number of events and conditions and their relationships. Previous studies of a similar nature have successfully used this method. Example includes Saunders (2000).

The study considered twenty two (22) power projects that have been undertaken by KenGen in the last twenty years and a survey sample of 35 respondents was nominated. The projects details are presented in the Table 3.1 below

Table 3.1: Projects undertaken by KenGen in the last twenty years

Project Title	Capacity (MW)	Current Status
Gitaru	225 MW	Completed
Gogo	2.5 MW	Completed
Kamburu	94.2 MW	Completed
Kiambere	144 MW	Completed
Kindaruma	72 MW	Completed
Masinga	44 MW	Completed
Ndula	2.0 MW	Completed
Sagana	1.5 MW	Completed
Mesco	0.38 MW	Completed
Sosiani	0.4 MW	Completed
Tana	14.4 MW	Completed
Turkwel	106 MW	Completed
Wanjii	7.4 MW	Completed
Sondu Miriu Hydro plant	60 MW	Completed
Sangoro Hydro plant	21 MW	Completed
Olkaria Geothermal plants	280 MW	Olkaria I unit 4 & 5 and Olkaria 4 under construction
Geothermal Wellheads project	70 MW	Under Construction
Eburru Geothermal plant	2.5 MW	Completed in 2012
Ngong Wind project	25.4 MW	Under Construction
Embakasi Gas Turbine	60 MW	Completed
Garissa	2.4 MW	Completed
Lamu	1.5 MW	Completed

Source: KenGen

3.3 Data Collection

The study used both primary and secondary data to meet its objectives. Collection of primary data was through the use of questionnaire. The design of the questionnaire

was based on supply chain factors that influence the delivery of power generation projects in KenGen. The research questionnaire assessed the perceptions of respondents on the various factors identified by the researcher and the relative importance of the factors. The researcher submitted questionnaires to be filled by Project engineers, and procurement officers responsible for project contracting and implementation.

The questionnaire comprised three parts. Part A sought to capture the general particulars of the respondents. Part B focused on the 11 main factors (Independent Variables) identified as the Supply Chain Factors influencing delivery of power projects from literature review. This part gave each respondent an opportunity to identify variables that they perceived to have an influence on project delivery by responding on a Likert scale from 5 (very high) to 1 (very low). The respondents also had an opportunity to provide their opinions and recommendations. It was assumed that the respondents were knowledgeable on the subject.

3.4 Data Analysis

The questionnaires were checked for completeness and consistency, before processing the data. The analysis of the data collected was according to the objective of the study. For this study to be undertaken, two types of data that is qualitative and quantitative data was collected. The researcher therefore used descriptive statistics and principle component factor analysis by application of the Statistical Package for Social Sciences (SPSS V 21.0). The second part on the frequency of occurrence was analyzed using the relative importance index analysis Chan (1997).

For qualitative data, the researcher used content analysis. Nachmias and Nachmias (1996) define content analysis as a technique for making inferences by systematically and objectively identifying specified characteristics of messages and using the same approach to understand trends. According to Mugenda and Mugenda (1999), content analysis involves observations and detailed description of objects, items or things that comprise the study. Content analysis was useful in obtaining new ideas in even what was thought to be unknown. Previous studies of a similar nature have successfully used this method. Examples include: Mbaabu (2012), Ngesa (2012), Mutia (2010), and Kagiri among many others.

CHAPTER FOUR: DATA ANALYSIS, FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter discusses the interpretation and presentation of the findings. This chapter presents analysis of the data on the supply chain factors that influence the delivery of power generation projects in KenGen. The chapter also provides the major findings and results of the study.

4.2 General Information

The study targeted a sample size of 36 respondents from which 31 filled in and returned the questionnaires making a response rate of 86.1%. This response rate was good and representative and conforms to Mugenda and Mugenda (1999) stipulation that a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and over is excellent.

The study sought to establish the years of service/working period at the power generation projects in KenGen. On the duration that the respondents had worked in the power generation projects in KenGen, it was established that majority (35.5%) of the respondents had worked in the power generation projects in KenGen for a period of between 16 to 20 years, 29% had worked for a period of between 11 to 15 years, 16.1% had worked for a period of between 6 to 10years, 12.9 % had worked for a period of 21 years and above while 6.5% of the respondents had worked in the power generation projects in KenGen for a period of between 1 to 5 years.

4.3 Supply Chain Factors Influencing Delivery of Power Generation Projects in KenGen

The study sought to establish the influence of various supply chain factors such as procurement, transportation, quality control, demand and supply planning, receiving, materials handling and storage, materials or inventory control, order processing, production planning, warehousing/distribution, shipping, customer service, human resource, organizational design, information technology and measurement on on delivery of power generation projects in KenGen.

4.3.1 Procurement

The study required the respondents to rate the influence of procurement on delivery of power generation projects in KenGen. Table 4.1 below shows a summary of the responses.

Table 4. 1: Influence of procurement on delivery of power generation projects in KenGen

	Mean	**Std. Deviation**
Political interference	4.1333	0.6455
Poor subcontracting	4.1104	1.01102
Slow Purchasing system development	4.1067	0.93828
Lack of Supply market research	4.0597	.71522
Lengthy Supplier identification and selection procedures/bureaucracies	4.0373	.65893
	Mean	**Std. Deviation**
Prolonged Negotiation and contracting	3.9552	1.17335
Inappropriate Supplier measurement and improvement systems	3.5128	0.94096

	Mean	Std. Deviation
Delays in disbursement of funds by financiers	3.3267	0.89100
Inadequate procurement plans and budgets	2.8667	0.96329
Bad relations with financiers	2.6800	0.96926

On the influence of procurement on delivery of power generation projects in KenGen, the respondents indicated that the aspects of procurement that had a high influence on delivery of power generation projects in KenGen included political interference poor subcontracting, slow purchasing system development, lack of supply market research, lengthy supplier identification and selection procedures/bureaucracies, prolonged negotiation and contracting and also inappropriate supplier measurement and improvement systems. This is in line with Kagiri (2005) who noted that, procurement is an important aspect and if not managed well then, project aid can be withheld, disbursements can be delayed, contracts can be cancelled and worse still contractors barred from doing business with development partners which can be a costly affair.

The respondents also indicated that the aspects of procurement that had a medium influence on delivery of power generation projects in KenGen were delays in disbursement of funds by financiers, inadequate procurement plans and budgets and bad relations with financiers.

4.3.2 Transportation

According to Chopra, Meindl and Kalra (2010), transportation is the backbone of logistic and accounts for 50% of the logistics costs, these makes an efficient management of this function to become an important preoccupation of management.

The study sought to establish the influence of transportation on delivery of power generation projects in KenGen. Table 4.2 below shows a summary of the responses.

Table 4. 2: Influence of transportation on delivery of power generation projects in KenGen

	Mean	Std. Deviation
Uneconomical means of transport	4.3707	0.8569
Poor infrastructure e.g. roads or railway	4.3512	0.0907
Delays in acquiring licensing for road use	3.6576	0.6139
Inadequate Loading and offloading facilities	3.5606	0.6586
High transport rates	3.4848	0.7550

From the study findings, the respondents were of the view that the aspects of transportation that had a high influence on delivery of power generation projects in KenGen included uneconomical means of transport, poor infrastructure e.g. roads or railway, delays in acquiring licensing for road use e.g. incase of out of gauge consignments and inadequate loading and offloading facilities while high transport rates had a medium effect. This concur with Chopra, Meindl and Kalra (2010) who indicated that if the transportation process is not well planned and coordinated, it can lead to penalties by transporters (inform of truck waiting charges), project delays, and damages of cargo (resulting to poor quality projects) especially if proper handling equipment are not availed.

4.3.3 Quality Control

The study also sought to establish the influence of transportation on delivery of power generation projects in KenGen. The findings are as presented in table 4.3 below.

Table 4. 3: Influence of quality control on delivery of power generation projects in KenGen

	Mean	Std. Deviation
Lack of systems for due diligence and benchmarking	4.1941	.96770
Defective and poor quality materials shipped to site	3.8718	.79898
Lack of integrity by the employees receiving materials	3.7363	.96827
Wrong specifications	3.4908	.86225

On the influence of quality control on delivery of power generation projects in KenGen, the study found that lack of systems for due diligence and benchmarking, defective and poor quality materials shipped to site and lack of integrity by the employees receiving materials had a high influence on delivery of power generation projects in KenGen while wrong specifications had a medium influence on delivery of power generation projects. This concur with Mariaria (2013) who noted that early supplier involvement will not only aid towards timely project completion and satisfaction but also identification of high quality and cost effective materials. This process ensures a quality project is delivered

4.3.4 Demand and Supply Planning

The study inquired on the influence of demand and supply planning on delivery of power generation projects in KenGen and the findings were as presented in table 4.4 below.

Table 4. 4: Influence of demand and supply planning on delivery of power generation projects in KenGen

	Mean	Std. Deviation
Inappropriate Inventory adjustments and order filling	4.1333	0.5802
Inaccurate demand forecasts	4.0400	0.8292
Poor production and logistic networks which are not capable of satisfying demand requirements	3.3733	0.7880

The study established that inappropriate inventory adjustments and order filling and inaccurate demand forecasts had a high influence on delivery of power generation projects in KenGen while poor production and logistic networks which are not capable of satisfying demand requirements had a medium influence. This agrees with Chopra, Meindl and Kalra (2010) who opined that the demand and supply planning process ensures continuous flow of activities and thus a timely delivery of the project.

4.3.5 Receiving, materials handling and storage

The study further sought to determine the influence of receiving, materials handling and storage on delivery of power generation projects in KenGen. The findings were as presented in table 4.5 below.

Table 4. 5: Influence of receiving, materials handling and storage on delivery of power generation projects in KenGen

	Mean	Std. Deviation
Non compliance to right quantities and quality	4.0819	0.94096
Unsuitable handling and storage facilities	3.8533	0.91080
Incompetent Inspection and Acceptance committees	3.2667	0.96329
High costs of material handling and storage	3.0733	0.78797

Regarding the influence of receiving, materials handling and storage, the study deduced that the aspects that had a high influence included non compliance to right quantities and quality and unsuitable handling and storage facilities while incompetent inspection and acceptance committees and high costs of material handling and storage had a medium influence. The findings correlate with Mariaria (2013) who was of the view that the process ensures right quantities and quality are complied with and cost deliverables are met. This process also calls for adequate handling equipment and facilities suitable for handling materials without exposing them to breakages or any other sort of damage.

4.3.6 Materials or inventory control

The study sought to establish the influence of materials or inventory control on delivery of power generation projects in KenGen and the findings are as depicted in table 4.6 below.

Table 4. 6: Influence of materials or inventory control on delivery of power generation projects in KenGen

	Mean	Std. Deviation
Poor material Optimization	4.4595	0.50523
Disorganized releases of materials to customers	4.0541	1.05267

From the findings, poor material optimization and disorganized releases of materials to customers had a high influence. This agrees with Crocker, Jessop and Morrison (2012) who noted that the benefit that arises from the adoption of the materials management concept approach is an enjoyment of improvement communication and coordination between departments within the supply chain.

4.3.7 Order processing and Production planning

The study required the respondents to rate the influence of order processing and production planning on delivery of power generation projects in KenGen. Their responses are as shown in table 4.7 below.

Table 4. 7: Influence of order processing and production planning on delivery of power generation projects in KenGen

	Mean	Std. Deviation
Increased variation orders	4.4030	.67554
Delay in order processing	4.1940	.67955
Delays in manufacturing of equipment and material	3.5373	1.03468

From the study findings, majority of the respondents agreed that all the aspects of order processing and production planning had a high influence on delivery of power generation projects in KenGen.. Oladapo (2001) identified variation orders as a major factor contributing to project delay. Variation orders arise from poor project designs.

4.3.8 Warehousing/distribution

The study also required the respondent to indicate the influence of warehousing/distribution on delivery of power generation projects in KenGen. The findings are as presented in table 4.8 below.

Table 4.8: Influence of warehousing/distribution on delivery of power generation projects in KenGen

	Mean	Std. Deviation
Poor warehouse layouts that do not enhance ease in use of handling equipments	3.8108	0.73929

	Mean	Std. Deviation
Damage or deterioration of materials	2.3341	0.81650
Material theft	2.1649	0.91779

From the findings, poor warehouse layouts that do not enhance ease in use of handling equipments had a high influence on delivery of power generation projects in KenGen while damage or deterioration of materials and material theft had a low influence. According to Crocker, Jessop and Morrison (2012), security of stores buildings and stockyards is paramount. Precautions should be taken regarding the custody of the keys and in the event of keys being lost, mislaid or stolen, the fullest possible inquiries must be made and appropriate actions taken.

4.3.9 Shipping

The study further inquired on the influence of shipping on delivery of power generation projects in KenGen. The responses are presented in table 4.9 below.

Table 4.9: Influence of shipping on delivery of power generation projects in KenGen

	Mean	Std. Deviation
High freight charges	4.2269	.51745
Delays in execution of bonds	4.0162	0.91697
Consignment delays due to transshipments	3.7297	1.07105
Delays in tax exemption letters	3.5946	0.49774
Poor documentation	3.5166	.49875

Inadequate insurance covers to compensate loses	3.1254	.85835
Incorrect packaging	2.6418	.59548

Shipping involves physically getting a product ready for distribution to the customer. It includes packing to prevent damage, completing any special labeling requirements, completing the required shipping documents and/or arranging transportation with an appropriate carrier (KenGen, 2013). The study found that the aspects of shipping that influence delivery of power generation projects in KenGen to a high extent include high freight charges, delays in execution of bonds, consignment delays due to transshipments, delays in tax exemption letters and poor documentation. However, inadequate insurance covers to compensate lose and incorrect packaging had a medium influence.

4.3.10 Customer service

The study sought to establish the influence of customer service on delivery of power generation projects in KenGen and the findings are presented in table 4.10 below.

Table 4.10: Influence of customer service on delivery of power generation projects in KenGen

	Mean	**Std. Deviation**
Slow responses to suppliers' queries	4.4253	0.87620
Poor supplier relationship management systems	4.3514	0.97799
Delay in payment to suppliers	4.2162	1.05765

From the findings, slow responses to suppliers' queries, poor supplier relationship management systems and delay in payment to suppliers all had a high influence on delivery of power generation projects in KenGen. This correlates with Chopra, Meindl and Karl (2010) who argue that selecting the right suppliers helps ensure that buyers receive the right inputs to satisfy their quality, cost, delivery and technology requirements. Selecting the right suppliers also creates the foundation for working closely with suppliers, when required and to further improve performance.

4.3.11 Human Resource, Organizational design and Information Technology

The study also asked a question regarding influence of human resource, organizational design and information technology on delivery of power generation projects in KenGen. The responses are presented in table 4.11 below.

Table 4.11: Influence of human resource, organizational design and information technology on delivery of power generation projects in KenGen

	Mean	Std. Deviation
Lack of motivation to staff	4.3373	.63552
Lack of an IT system to support procurement services	4.1926	.68253
Lack of controls for preventing misuse of IT systems	3.9688	.63250
Lack of adequate professional skill by project teams	3.6716	.56106
Inappropriate organizational structure	3.5925	.68253

According to the findings, majority of the respondents indicated that the human resource, organizational design and information technology on delivery of power

generation projects in KenGen to a high extent include lack of motivation to staff, lack of an IT system to support procurement services, lack of controls for preventing misuse of IT systems, lack of adequate professional skill by project teams and inappropriate organizational structure.

4.3.12 Measurement

The study further sought to establish the influence of of measurement on delivery of power generation projects in KenGen. The responses are presented in table 4.12 below.

Table 4.12: Influence of measurement on delivery of power generation projects in KenGen

	Mean	Std. Deviation
There are set standards for use as yardstick within the organization	4.158	0.928
Lack of Proper tools for measuring performance at various levels within the supply chain	2.248	0.703

From the findings, it was clear that there are set standards for use as yardstick within the organization and also that there are proper tools for measuring performance at various levels within the supply chain. According to Lock (2008), the success of the contractor and the project manager will be judged according to how well they achieve the three primary objectives of cost, performance and time. Lock noted that there should be good project definition and a sound business case, appropriate choice of the

project strategy, strong support for the project and its manager from higher management, availability of sufficient funds and other resources, firm control of changes to the authorized project, technical competence, a sound quality culture throughout the organization, a suitable organization structure, appropriate regard for the health and safety of everyone connected with the project, good project communications, well motivated staff, and quick and fair resolution of conflict.

4.3.13 Other Supply Chain factors

The respondents cited other Supply Chain factors that would affect delivery of power projects in the project they were involved as unfavourable weather conditions, procurement laws and regulations, understaffing in crucial supply chain processes, incorrect labeling of goods, price escalations, poor coordination among the stakeholders in the supply chain, organizing of site storage facilities for bulk equipment, lack of training has led to mistakes in preparation of tender documents, oversight internal processes that are not anchored in law, need for long term contracts and major spares and equipment availability. This concur with Mbaabu (2012) who identifies the factors influencing implementation of projects in Kenya include proper planning, good site management, adequate contractor experience, adequate client's finance and payment for completed works, favourable external conditions, identification of sub-contractors, proper adequate material and labour supply, maintaining of plants and equipment, and proper communication channels between parties of the project.

Other factors cited include availability of responsive contractors / suppliers during tendering stage, community issues/ resettlement of affected persons, lack of sufficient

funding of projects, financiers covenants, delay in the preparation of contracts,, uncoordinated complete procurement of other related power plant facilities for instance, delay in the 280 MW due to delay in construction of transmission line, poor decision making, delay in decision making by management with regard to contracts, rewards scheme for contractors to promote timely delivery, change management, language barrier, poor/ inadequate participation of end- user during procurement stage and lack of stakeholder involvement. This is in line with Mulari and Wen (2007) who in a study to identify the delay factors and their impact on project completion in Malaysia identified most important causes of project delays as: contractor improper planning, contractors' poor site management, inadequate contractor experience, inadequate clients' finance and payment for completed works, problems with sub-contractors, shortage in materials and labour supply, equipment availability and failure, lack of communication between parties and mistakes during project implementation phase.

4.4 Factor Analysis

Factor analysis is a systematic, statistical procedure used to uncover relationships amongst several variables. This procedure enables numerous correlated variables to be condensed into fewer dimensions known as factors. The purpose of factor analysis is to discover simple patterns in the pattern of relationships among variables. In the context of this research, the variables are the degree of agreement with various specific perception statements while the factors are the general underlying constructs. In this procedure, rotation is applied to identify meaningful factor names or descriptions.

Table 4. 13: Communalities of Factor Variance

	Initial	Extraction
Lengthy Supplier identification and selection procedures/bureaucracies	1.000	.890
Prolonged Negotiation and contracting	1.000	.920
Poor subcontracting	1.000	.902
Lack of Supply market research	1.000	.943
Inappropriate Supplier measurement and improvement systems	1.000	.803
Slow Purchasing system development	1.000	.868
Inadequate procurement plans and budgets	1.000	.810
Bad relations with financiers	1.000	.889
Delays in disbursement of funds by financiers	1.000	.892
Political interference	1.000	.773
Uneconomical means of transport	1.000	.945
Delays in acquiring licensing for road use e.g incase of out of gauge consignments	1.000	.968
Inadequate Loading and offloading facilities	1.000	.906
High transport rates	1.000	.799
Poor infrastructure e.g roads or railway	1.000	.782
Wrong specifications	1.000	.815
Defective and poor quality materials shipped to site	1.000	.877
Lack of systems for due diligence and benchmarking	1.000	.857
Lack of integrity by the employees receiving materials	1.000	.682
Inaccurate demand forecasts	1.000	.832
Inappropriate Inventory adjustments and order filling	1.000	.897
Poor production and logistic networks which are not capable of satisfying demand requirements	1.000	.909
Non compliance to right quantities and quality	1.000	.939
High costs of material handling and storage	1.000	.829
Incompetent Inspection and Acceptance committees	1.000	.734
Unsuitable handling and storage facilities	1.000	.771
Poor material Optimization	1.000	.816
Disorganized releases of materials to customers	1.000	.901
Delay in order processing	1.000	.774
Increased variation orders	1.000	.844
Delays in manufacturing of equipment and material	1.000	.856
Damage or deterioration of materials	1.000	.927
Material theft	1.000	.923
Poor warehouse layouts that do not enhance ease in use of handling equipments	1.000	.816
Poor documentation	1.000	.801
High freight charges	1.000	.897
Incorrect packaging	1.000	.904
Inadequate insurance covers to compensate loses	1.000	.804

Consignment delays due to transshipments	1.000	.914
Delays in tax exemption letters	1.000	.912
Delays in execution of bonds	1.000	.904
Poor supplier relationship management systems	1.000	.886
Delay in payment to suppliers	1.000	.913
Slow responses to suppliers' queries.	1.000	.913
Lack of adequate professional skill by project teams	1.000	.827
Lack of motivation to staff	1.000	.812
Inappropriate organizational structure	1.000	.871
Lack of an IT system to support procurement services	1.000	.886
Lack of controls for preventing misuse of IT systems	1.000	.784
Lack of Proper tools for measuring performance at various levels within the supply chain	1.000	.892
There are set standards for use as yardstick within the organization	1.000	.802

Extraction Method: Principal Component Analysis.

Table 4.13 helps to estimate the communalities for each variance. This is the proportion of variance that each item has in common with other factors. For example 'Delays in acquiring licensing for road use e.g. incase of out of gauge consignments' has 96.8% communality or shared relationship with other factors. This value has the greatest communality with others, while 'Lack of integrity by the employees receiving materials' has the least communality with others of 68.2%.

Table 4. 14: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	15.706	30.795	30.795	15.706	30.795	30.795
2	5.014	9.831	40.626	5.014	9.831	40.626
3	4.663	9.143	49.770	4.663	9.143	49.770
4	3.676	7.208	56.978	3.676	7.208	56.978
5	2.913	5.712	62.690	2.913	5.712	62.690
6	2.667	5.230	67.920	2.667	5.230	67.920
7	2.234	4.380	72.299	2.234	4.380	72.299
8	1.801	3.531	75.831	1.801	3.531	75.831
9	1.748	3.427	79.258	1.748	3.427	79.258
10	1.234	2.420	81.678	1.234	2.420	81.678
11	1.118	2.193	83.871	1.118	2.193	83.871
12	1.038	2.035	85.906	1.038	2.035	85.906
13	.968	1.898	87.804			
14	.927	1.818	89.622			
15	.803	1.574	91.196			
16	.716	1.403	92.600			
17	.641	1.258	93.857			
18	.503	.987	94.844			
19	.487	.956	95.800			
20	.383	.751	96.551			
21	.338	.663	97.214			
22	.319	.626	97.841			
23	.223	.437	98.278			
24	.204	.400	98.678			
25	.190	.373	99.050			
26	.178	.349	99.399			
27	.128	.251	99.651			
28	.104	.204	99.855			
29	.074	.145	100.000			
30	1.920E15	3.764E15	100.000			
31	1.596E15	3.130E15	100.000			
32	1.111E15	2.179E15	100.000			
33	9.885E16	1.938E15	100.000			
34	9.787E16	1.919E15	100.000			
35	8.382E16	1.644E15	100.000			
36	6.508E16	1.276E15	100.000			
37	5.890E16	1.155E15	100.000			
38	4.704E16	9.223E16	100.000			
39	3.418E16	6.702E16	100.000			
40	3.126E16	6.129E16	100.000			

41	2.315E16	4.539E16	100.000			
42	1.307E16	2.562E16	100.000			
43	6.589E17	1.292E16	100.000			
44	8.176E17	1.603E16	100.000			
45	2.025E16	3.970E16	100.000			
46	2.615E16	5.127E16	100.000			
47	4.572E16	8.964E16	100.000			
48	6.380E16	1.251E15	100.000			
49	7.620E16	1.494E15	100.000			
50	1.355E15	2.656E15	100.000			
51	1.517E15	2.974E15	100.000			

Extraction Method: Principal Component Analysis.

In table 4.14, the Kaiser Normalization Criterion is used, which allows for the extraction of components that have an Eigen value greater than 1. The principal component analysis was used and 12 factors were extracted. As the table shows, these 12 factors explain 85.906% of the total variation. Factor 1 contributed the highest variation of 30.795%. The contributions decrease as one move from one factor to the other up to factor 12.

Table 4. 15: Component Matrix

	Component											
	1	2	3	4	5	6	7	8	9	10	11	12
Lengthy Supplier identification and selection procedures/bureaucracies	.212	.786	.329	.049	.180	.125	.025	.061	.172	.032	.178	.041
Prolonged Negotiation and contracting	.231	.474	.718	.132	.013	.102	.114	.001	.208	.179	.092	.043
Poor subcontracting	.384	.669	.453	.162	.160	.063	.063	.171	.065	.084	.012	.034
Lack of Supply market research	.300	.582	.599	.112	.088	.037	.102	.007	.207	.264	.106	.011
Inappropriate Supplier measurement and improvement systems	.466	.216	.027	.201	.057	.261	.434	.317	.252	.108	.058	.243
Slow Purchasing system development	.860	.122	.051	.154	.031	.082	.182	.017	.183	.025	.110	.000
Inadequate procurement plans and budgets	.621	.228	.001	.289	.117	.222	.351	.301	.012	.098	.034	.036
Bad relations with financiers	.850	.042	.071	.069	.099	.204	.190	.064	.194	.112	.112	.001
Delays in disbursement of funds by financiers	.568	.198	.036	.330	.373	.219	.331	.099	.053	.322	.081	.001
Political interference	.727	.111	.038	.307	.058	.018	.049	.109	.265	.142	.094	.137
Uneconomical means of transport	.851	.072	.169	.192	.294	.181	.127	.035	.060	.036	.069	.050
Delays in acquiring licensing for road use e.g incase of out of gauge consignments	.824	.281	.012	.121	.335	.157	.091	.155	.057	.119	.018	.092
Inadequate Loading and offloading facilities	.919	.046	.073	.055	.005	.094	.077	.110	.108	.031	.084	.068
High transport rates	.795	.012	.120	.127	.278	.066	.017	.073	.081	.202	.030	.030
Poor infrastructure e.g roads or railway	.081	.013	.095	.160	.745	.293	.035	.016	.206	.073	.207	.084
Wrong specifications	.189	.041	.063	.007	.786	.157	.318	.073	.092	.013	.012	.125
Defective and poor quality materials shipped to site	.507	.226	.530	.347	.197	.103	.098	.173	.099	.057	.002	.255
Lack of systems for due diligence and benchmarking	.235	.201	.082	.135	.171	.414	.570	.173	.068	.396	.105	.090
Lack of integrity by the employees receiving materials	.193	.029	.225	.425	.268	.363	.100	.351	.191	.044	.018	.195

Inaccurate demand forecasts	.722	.067	.000	.080	.224	.183	.133	.131	.079	.298	.101	.275
Inappropriate Inventory adjustments and order filling	.020	.201	.555	.001	.138	.335	.130	.429	.379	.026	.256	.070
Poor production and logistic networks which are not capable of satisfying demand requirements	.344	.017	.159	.703	.107	.404	.105	.044	.068	.230	.006	.158
Non compliance to right quantities and quality	.210	.226	.375	.135	.297	.276	.244	.527	.156	.088	.386	.035
High costs of material handling and storage	.297	.248	.153	.486	.042	.304	.033	.398	.064	.102	.209	.329
Incompetent Inspection and Acceptance committees	.376	.517	.063	.219	.013	.296	.014	.162	.203	.248	.106	.210
Unsuitable handling and storage facilities	.147	.173	.057	.600	.212	.100	.179	.061	.465	.023	.184	.122
Poor material Optimization	.223	.626	.024	.097	.133	.339	.314	.102	.186	.023	.289	.056
Disorganized releases of materials to customers	.275	.604	.132	.203	.199	.138	.136	.415	.249	.007	.121	.275
Delay in order processing	.437	.199	.521	.068	.247	.269	.115	.104	.101	.200	.185	.161
Increased variation orders	.293	.423	.660	.063	.233	.087	.227	.073	.130	.028	.018	.049
Delays in manufacturing of equipment and material	.605	.279	.485	.238	.059	.193	.001	.038	.041	.124	.153	.194
Damage or deterioration of materials	.544	.179	.608	.304	.084	.080	.178	.056	.089	.236	.113	.110
Material theft	.520	.261	.496	.292	.158	.130	.386	.158	.131	.091	.103	.044
Poor warehouse layouts that do not enhance ease in use of handling equipments	.102	.168	.292	.305	.178	.575	.299	.193	.072	.169	.271	.054
Poor documentation	.071	.147	.336	.432	.462	.268	.105	.061	.161	.177	.248	.237
High freight charges	.137	.349	.485	.175	.234	.343	.104	.059	.437	.336	.006	.023
Incorrect packaging	.288	.126	.033	.447	.262	.022	.353	.428	.333	.050	.210	.265
Inadequate insurance covers to compensate loses	.627	.260	.194	.510	.034	.139	.061	.003	.075	.112	.055	.006
Consignment delays due to transshipments	.791	.376	.130	.141	.072	.176	.141	.072	.073	.128	.149	.073
Delays in tax exemption letters	.805	.203	.174	.001	.157	.284	.190	.064	.034	.177	.115	.034

Delays in execution of bonds	.839	.195	.055	.171	.008	.313	.166	.025	.030	.016	.023	.053
Poor supplier relationship management systems	.762	.058	.033	.311	.066	.084	.279	.277	.049	.136	.054	.120
Delay in payment to suppliers	.740	.211	.055	.423	.153	.192	.111	.022	.217	.089	.071	.081
Slow responses to suppliers' queries.	.698	.342	.320	.084	.007	.175	.161	.053	.281	.052	.206	.124
Lack of adequate professional skill by project teams	.308	.444	.334	.357	.234	.282	.160	.066	.193	.155	.138	.226
Lack of motivation to staff	.498	.482	.252	.115	.113	.171	.412	.063	.140	.080	.068	.097
Inappropriate organizational structure	.816	.142	.212	.146	.143	.114	.037	.132	.168	.084	.173	.024
Lack of an IT system to support procurement services	.821	.061	.290	.049	.113	.276	.089	.133	.014	.042	.063	.022
Lack of controls for preventing misuse of IT systems	.598	.350	.032	.215	.260	.006	.165	.002	.096	.176	.348	.023
Lack of Proper tools for measuring performance at various levels within the supply chain	.655	.377	.110	.004	.048	.226	.066	.216	.327	.224	.003	.221
There are set standards for use as yardstick within the organization	.579	.266	.195	.277	.254	.071	.242	.119	.162	.117	.120	.291

The initial component matrix was rotated using Varimax (Variance Maximization) with Kaiser Normalization. The above results allowed for the identification of which variables fall under each of the 12 major extracted factors. Each of the 51 variables was looked at and placed to one of the seven factors depending on the percentage of variability; it explained the total variability of each factor. A variable is said to belong to a factor to which it explains more variation than any other factor. All items except one in the 12 factors identified had factor loadings above the *cut-off* value (*0.4*)

impressing their importance and meaningfulness to the factors in the light of recommendations by Hair *et al*. (1998).

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presented the discussion of key data findings, conclusion drawn from the findings highlighted and recommendation made there-to. The conclusions and recommendations drawn were focused on addressing the objectives of the study.

5.2 Summary of Findings

The study found that the aspects of procurement that had a high influence on delivery of power generation projects in KenGen included political interference, poor subcontracting, slow purchasing system development, lack of supply market research, lengthy supplier identification and selection procedures/bureaucracies, prolonged negotiation and contracting and also inappropriate supplier measurement and improvement systems. The aspects of procurement that had a medium influence on delivery of power generation projects in KenGen as delays in disbursement of funds by financiers, inadequate procurement plans and budgets and bad relations with financiers.

The aspects of transportation that had a high influence on delivery of power generation projects in KenGen included uneconomical means of transport, poor infrastructure e.g. roads or railway, delays in acquiring licensing for road use e.g. incase of out of gauge consignments and inadequate loading and offloading facilities while high transport rates had a medium effect.

On the influence of quality control on delivery of power generation projects in KenGen, the study found that lack of systems for due diligence and benchmarking, defective and poor quality materials shipped to site and lack of integrity by the employees receiving materials had a high influence on delivery of power generation projects in KenGen while wrong specifications had a medium influence on delivery of power generation projects in KenGen.

Regarding the influence of demand and supply planning on delivery of power generation projects in KenGen, it was deduced that inappropriate inventory adjustments and order filling and inaccurate demand forecasts had a high influence on delivery of power generation projects in KenGen and respectively while poor production and logistic networks which are not capable of satisfying demand requirements had a medium influence.

Regarding the influence of receiving, materials handling and storage, the study deduced that the aspects that had a high influence included non compliance to right quantities and quality and unsuitable handling and storage facilities while incompetent inspection and acceptance committees and high costs of material handling and storage had a medium.

The study sought to establish the influence of materials or inventory control on delivery of power generation projects in KenGen. From the findings, poor material optimization and disorganized releases of materials to customers had a high influence.

From the study findings, the aspects of order processing and production planning including Increased variation orders, delay in order processing and delays in

manufacturing of equipment and material had a high influence on delivery of power generation projects in KenGen.

On the influence of warehousing/distribution on delivery of power generation projects in KenGen, it was clear that poor warehouse layouts that do not enhance ease in use of handling equipments had a high influence on delivery of power generation projects in KenGen while damage or deterioration of materials and material theft had a low influence.

The study found that the aspects of shipping that influence delivery of power generation projects in KenGen to a high extent include high freight charges, delays in execution of bonds, consignment delays due to transshipments, delays in tax exemption letters and poor documentation. However, inadequate insurance covers to compensate loses and incorrect packaging had a medium influence

The study sought to establish the influence of customer service on delivery of power generation projects in KenGen. From the findings, slow responses to suppliers' queries, poor supplier relationship management systems and delay in payment to suppliers all had a high influence on delivery of power generation projects in KenGen.

According to the findings, the human resource, organizational design and information technology on delivery of power generation projects in KenGen to a high extent include lack of motivation to staff, lack of an IT system to support procurement services, lack of controls for preventing misuse of IT systems, and lack of adequate professional skills by project teams.

The study further sought to establish the influence of of measurement on delivery of power generation projects in KenGen. From the findings, it was clear that there are set standards for use as yardstick within the organization and also that there are proper tools for measuring performance at various levels within the supply chain.

Other supply chain factors that affect delivery of power projects were identified as unfavourable weather conditions, procurement laws and regulations, understaffing in crucial SC processes, incorrect labeling of goods, price escalations, poor coordination among the stakeholders in the supply chain, organizing of site storage facilities for bulk equipment, lack of training which has led to mistakes in preparation of tender documents, oversight internal processes that are not anchored in law, need for long term contracts and major spares and equipment availability.

Other factors cited include availability of responsive contractors / suppliers during tendering stage, community issues/ resettlement of affected persons, lack of sufficient funding of projects, financiers covenants, delay in the preparation of contracts,, uncoordinated complete procurement of other related power plant facilities for instance, delay in the 280MW led to delay in construction of transmission line, poor decision making, delay in decision making by management with regard to contracts, rewards scheme for contractors to promote timely delivery, change management, language barrier, poor/ inadequate participation of end- user during procurement stage and lack of stakeholder involvement.

5.3 Conclusions

From the study findings, the study concludes that procurement that had a high influence on delivery of power generation projects in KenGen mainly through

political interference, poor subcontracting, slow purchasing system development and lack of supply market research. It was also revealed that transportation and quality control on delivery of power generation projects in KenGen as the company was found to use uneconomical means of transport and suffered from lack of systems for due diligence and benchmarking.

The study also concludes that materials or inventory control as well as materials handling and storage influenced delivery of power generation projects in KenGen. This was also the case for demand and supply planning. KenGen was found to have inappropriate inventory adjustments and order filling and inaccurate demand forecasts. The company also suffers from poor material optimization and disorganized releases of materials to customers.

The study further concludes that order processing and production planning greatly influenced delivery of power generation projects in KenGen as there are cases of increased variation orders, delay in order processing and delays in manufacturing of equipment and material. KenGen also has poor warehouse layouts that do not enhance ease in use of handling equipments. It was also clear that there were shipping issues that influenced delivery of power generation projects in KenGen such as high freight charges, delays in execution of bonds and consignment delays due to transshipments.

Finally the study concludes that the customer service at KenGen also influence delivery of power generation projects as the company is bogged with slow responses to suppliers' queries, poor supplier relationship management systems and delay in payment to suppliers. This is coupled with the human resource, organizational design

and information technology issues. However, the company has set standards for use as yardstick.

5.4 Recommendations

The study recommends that to address the various supply chain factors identified to enable delivery of timely, cost effective and quality power projects, supply chain training is required for the users of procured equipment and materials. The procurement officers involved must learn how projects are developed from the projects staff also. Further, the supply chain staff involved in projects development should work hand in hand with the projects team when delivering the projects. There is also a need for continuous capacity building of project staff to keep with changing trends.

The study also recommends that independent due diligence should be carried out before awarding contracts to potential contractors. This is mainly through a serious market survey. Robust supplier / contractor identification must be put in place including conducting through due diligence to ensure that only contractors who have adequate capacity, capability and who are reliable are contracted to deliver projects.

Since proper Planning in the project execution from procurement to implementation saves time and money, there is need for fast tracking contract negotiations signing and closure of all conditions precedent to commencement. In addition, proper planning of projects and exhaustive perusal of procurement documents will enable overcome hurdles experienced during the procurement stage.

Approving authorities / personnel need to give seriousness to some aspects that may require urgent approvals so as not to delay the projects. Further, finances adequate to

implement power projects need to be secured before rolling out projects to enhance liquidity.

There is need for effective project teams and coordinated team management. There should also be involvement and coordination of the stakeholders including the local community to enhance project ownership and therefore their success. The communities' near the projects should be involved from the onset and shown the benefits of the project to the company and community as well.

The study also recommends that the procuring officers should have knowledge of existing procurement rules and timelines such as PPOA requirements in order to allow for appropriate and timely actions. In addition, public procurement Act should be amended since it is very bureaucratic and makes the process tedious.

The study also recommends that clear specifications should be provided and the manufacturers should be given incentives to reduce the lead time. There is also need to have specific supply chain member permanently attached to a project. The delivery of the projects can also be enhanced through timely identification of projects, proper feasibility studies, proper project implementation plan and proper budgeting of projects to avoid cost over runs.

5.5 Limitations of the Study

The respondents were drawn from different KenGen Projects which are scattered in different parts of the country. Most of them were busy on Projects sites and therefore it took quite sometime to have a meaningful number of filled questionnaires. Nonetheless, the respondent rate was high enough such that this limitation had insignificant impact on the overall findings of the study.

5.6 Suggestion for Further Studies

Another study should be done to establish the supply chain factors that influence the delivery of other projects in Kenya such as the water projects. A comparative study should also be done on the various projects to see whether the same factors apply across the board.

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APPENDICES

Appendix I: Research Questionnaire

Please answer the following questions by ticking in the bracket or filling in the blank spaces provided

SECTION A: GENERAL INFORMATION

1. Name: (Optional)

   _____

2. Position:

   _____

3. Department

   _____

4. State the number of years you have worked in Projects

   _____

SECTION B- SUPPLY CHAIN FACTORS INFLUENCING THE DELIVERY OF POWER GENERATION PROJECTS IN KENGEN

1. From your perspective, kindly rank the significance of the supply chain factors listed below on a sale of 1 – 5 in their influence on delivery of power generation projects in KenGen

Each scale represents the following rating:

(5) = Very High (4) = High (3) = Medium (2) = Low (1) = Very Low

Supply Chain Factors	**5**	**4**	**3**	**2**	**1**
Procurement					
Lengthy Supplier identification and selection procedures/bureaucracies					
Prolonged Negotiation and contracting					
Poor subcontracting					
Lack of Supply market research					
Inappropriate Supplier measurement and improvement systems					
Slow Purchasing system development					
Inadequate procurement plans and budgets					
Bad relations with financiers					
Delays in disbursement of funds by financiers					
Political interference					
Transportation					
Uneconomical means of transport					
Delays in acquiring licensing for road use e.g incase of out of gauge consignments					
Inadequate Loading and offloading facilities					
High transport rates					
Poor infrastructure e.g roads or railway					
Quality Control					
Wrong specifications					
Defective and poor quality materials shipped to site					
Lack of systems for due diligence and benchmarking					
Lack of integrity by the employees receiving materials					
Demand and Supply Planning					
Inaccurate demand forecasts					
Inappropriate Inventory adjustments and order filling					
Poor production and logistic networks which are not capable of satisfying demand requirements					
Receiving, materials handling and storage					

Non compliance to right quantities and quality					
High costs of material handling and storage					
Incompetent Inspection and Acceptance committees					
Unsuitable handling and storage facilities					
Materials or inventory control					
Poor material Optimization					
Disorganized releases of materials to customers					
Order processing					
Delay in order processing					
Increased variation orders					
Production planning					
Delays in manufacturing of equipment and material					
Warehousing/distribution					
Damage or deterioration of materials					
Material theft					
Poor warehouse layouts that do not enhance ease in use of handling equipments					
Shipping					
Poor documentation					
High freight charges					
Incorrect packaging					
Inadequate insurance covers to compensate loses					
Consignment delays due to transshipments					
Delays in tax exemption letters					
Delays in execution of bonds					
Customer service					
Poor supplier relationship management systems					
Delay in payment to suppliers					
Slow responses to suppliers' queries.					
Human Resource					
Lack of adequate professional skill by project teams					
Lack of motivation to staff					
Organizational design					
Inappropriate organizational structure					
Information Technology					
Lack of an IT system to support procurement services					
Lack of controls for preventing misuse of IT systems					
Measurement					
Lack of Proper tools for measuring performance at various levels within the supply chain					
There are set standards for use as yardstick within the organization					

PART C

Question: What other Supply Chain factors not listed in part B do you consider to have had an affect on delivery of power projects you were involved in?

(I) .....

(II) .....

(III) .....

(IV) .....

RECOMMENDATIONS

What solutions would you propose for addressing the various supply chain factors identified to enable delivery of timely, cost effective and quality power Projects.

……

……

……

Thank you