

**PUBLIC PRIVATE PARTNERSHIP ON COMPLETION OF GEOTHERMAL ENERGY
INFRASTRUCTURE PROJECTS IN NAIVASHA SUB-COUNTY, KENYA**

MURIITHI DAVIES MUGOH

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DECLARATION

This research project is my original work and has not been submitted for any academic award in any University.

.....
Signature

.....
Date

DAVIES MUGOH MURIITHI

L50/84323/2016

This research project has been submitted for the examination with my approval as the University's Supervisor.

.....
Signature

.....
Date

PROF. CHARLES M. RAMBO, PhD

Department of Open Learning
School of Open, Distance and e-learning
University of Nairobi

DEDICATION

I dedicate this research project to my mother and father for the continued support and guidance. I would also like to give a special dedication to my brother and sisters in recognition of your unwavering support and love.

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ABBREVIATIONS AND ACRONYMS

| | |
|-------------------|--|
| BOT | Build-Operate-Transfer |
| DBFO | Design-Build-Finance-Operate |
| ERC | Energy Regulatory Commission |
| GDC | Geothermal Development Company |
| GLI | Global Legal Insight |
| GOK | Government of Kenya |
| ICT | Information and Communication Technology |
| IMF | International Monetary Fund |
| KENGEN LTD | Kenya Electricity Generating Company Limited |
| KSH | Kenya Shillings |
| MoE&P | Ministry of Energy and Petroleum |
| MW | Megawatt |
| O&M | Operation and Maintenance |
| PPP | Public Private Partnership |
| PPPIRC | Public-Private Partnership in Infrastructure Resource Center |
| PPPU | Public Private Partnership Unit |
| SPSS | Statistical Package for the Social Sciences |
| SPV | Special Purpose Vehicle |
| USD | U.S. dollar |

ABSTRACT

In today's turbulent economic environment many governments have turned to partnerships with the private sectors as they face increasingly constrained budgets and with ineptitude to generate additional revenues. The study sought to establish how public private partnership influence completion of geothermal energy infrastructure project in Naivasha Sub-County, Kenya by specifically looking at how provision of quality work, expertise knowledge and skills, cost effectiveness to deliver infrastructure projects, use of appropriate technology and meeting budget constraints as a PPP function influence the completion of geothermal energy infrastructure project in Naivasha Sub-County. To achieve these objectives, the study was hinged on Competence Theory which integrates the skill and expertise of the staff and the adopted technology on the completion of projects and Principle –agent theory whose major focus is on the provision of funds, expertise and technology in ensuring that the project is a success. The study has adopted a descriptive research design where the respondents are required to indicate the what, where and how of a phenomenon under study. The study sampled 108 senior management staff from the PPP Unit within the National Treasury of the Government of Kenya, Kenya Electricity Generating Company (KenGen), Energy Regulatory Commission (ERC) and Geothermal Development Company (GDC) under the Ministry of Energy and Petroleum out of which 91 filled and restored the polls. Basic irregular testing was utilized to choose the respondents from every stratum. Information accumulation included the utilization of surveys. The gathered information were gone into Statistical bundle for sociology (SPSS) adaptation 21.0 where they were examined. In the investigation procedure, information was broke down utilizing distinct insights including measures of focal tendencies that is (mean and standard deviation) and the percentages where figures and tables were used to represent the data. The study found that provision of quality work, expertise knowledge and skills, cost effectiveness, use of appropriate technology and meeting budget constraints had a positive and significant effect on the completion of geothermal energy infrastructure projects under PPP programmes in Naivasha Sub-County. The study found that PPP promotes intrinsic job rewards, and pay and fringe benefits given to employees hence motivation them to provide quality work. The study also found that PPP in geothermal infrastructure projects leads to recruitment of employees with expertise knowledge and skills which encourages creativity and innovation when dealing with such projects. The study recommends that, to ensure Geothermal energy infrastructure projects are completed on time, the stakeholders involved must ensure that there is job security, intrinsic job rewards, and pay and fringe benefits given to employees as they are the motivating factors that leads to quality work delivered at the end of the project life cycle. The study also recommends that the government should encourage PPP in not only geothermal infrastructure projects but big infrastructure projects as it comes along with advanced expertise and experience which encourages creativity and innovation when dealing with such projects.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

In today's turbulent economic environment many governments have turned to partnerships with the private sectors as they face increasingly constrained budgets and with ineptitude to generate additional revenues. These contractual arrangements are usually associated with improved service delivery, increased quality, cost savings, high level of technology and lower costs of financing. Public Private Partnership has developed impressively in late decades and these days represent a critical bit of public investment (Posner et al, 2009).

A report by the Global Competitiveness indicated that 15-17% of corporate leaders in India and Brazil distinguish deficiencies in infrastructure as the number one constraint in terms of doing business. The Global Risks Report features delayed disregard of investments in infrastructure and updating as one of the chief dangers to the worldwide economy. In numerous nations, the conventional public delivery of foundation ventures has frequently turned out to be disillusioning as these tasks consistently go over spending plan and over calendar and regularly ignore the subsequent life-cycle costs thus advancement of PPP. For example, a review of significant road and rail projects in Europe and North America amid the period 1927– 1998 shows a normal overspend of 28%, with little variety from decade to decade. (World Economic Forum report, May 2013 pg.14-15)

Governments face a relentlessly need to discover satisfactory financing not only to develop but also to maintain the required infrastructure to help the ever growing population. However, these efforts face challenges by the rise in urbanization, the recovery prerequisites of maturing foundation, the need to extend systems to new populations, and the objective of accomplishing previously unserved or underserved territories. Besides, foundation administrations are frequently given at a working shortfall, which is secured just through sponsorships, along these lines constituting an extra deplete on open assets. This has seen generally governments and local governments turn to the private sector for assistance with not only financing but also the design,

construction, maintenance and operation of critical infrastructure facilities (Engel, Fischer and Galetovic, 2010).

The Great Recession of 2007-2008 has conditioned an extreme fiscal austerity. Governments at all levels are currently operating under gradually more constrained budgets. While public demands have not subsided, quite on the contrary, they have intensified; public agencies are facing a growing scarcity of both human and financial resources. Today, many find that traditional financing sources are no longer adequate to satisfactorily address existing infrastructure needs (Ankner, Jones, and Fetterman, 2008).

Public private partnerships are often seen as highly powerful arrangements that can mobilize resources and develop solutions to complex problems, cutting across sectors and policy domains. In the current past, nations have been requesting private accomplices to back, oversee and keep up framework filling open needs in a developing scope of segments. Advancement of infrastructure projects with private capital through Public Private Partnership (PPP) has turned out to be one of the usually received acquisition systems in created and creating nations (Levin and Tadelis, 2010). In Kenya, there is expanded interest for quality and moderate administrations from subjects in different segments, for example, transport, water and sewerage, media transmission/data and correspondence innovation (ICT), social administrations, energy and power. The legislature has thusly been participating in broad daylight private organizations to decrease the subsidizing hole for framework evaluated at USD 40 Billion by the year 2020; lessen government sovereign borrowings and related dangers; extend economy and fortify employment creation; increment nature of open administrations to the Kenyan nationals and; to use efficiencies of the private sector in running public services, (Ministry of Finance, Kenya, 2015)

The African Infrastructure Country Diagnostic Report estimates that Kenya's infrastructure funding gap is about Ksh178.5 billion per year. Infrastructure development is capital intensive and the government's limited resources cannot meet the current infrastructure deficit in the country which has led to increase in the cost of conducting business. Recently, we have seen various multinationals closing down their operations in Kenya only to set up their chain stores in other countries. This has been disastrous with regard to job losses, further worsening the current

high unemployment rate. It has also led to the retrogression of the current account deficit since we subsequently import the goods which were previously being manufactured in the country.

Public Private Partnerships have the potential to transform Kenya's achievement of its development projects towards realization of Vision 2030. PPPs allow the government to tap into the private sector's expertise, innovativeness and flexibility towards timely conclusion of projects, financial efficiency and quality assurance (Juris Nooks – Legal article, 2015). According to the Kenya PPP Program, Kenya has gained critical ground in general society private associations scene in the course of recent years. PPPs in Kenya are represented by Law 15 of 2013 on PPPs and the PPP Regulations distributed in December 2014, which oversee private interest out in the open undertakings, regardless of the administration organization contracting out the administration or resource. This undeniable administrative structure has made PPPs an essential piece of Kenya's Private Sector Development Strategy, and has been surveyed emphatically by outside observers. (Infrascope Report, 2015)

Public infrastructure plays an imperative part in financial development if well-picked and financed inside suitable monetary requirements. Open venture is foremost to monetary development, however just as a major aspect of a reasonable financial structure giving a stable long haul macroeconomic stage of longer-term development, reserve funds and practical duties, (International Monetary Fund, 2005).

1.1.1 Public private partnership functions

Improved quality: PPPs enhance improved quality and better outcomes due to the potential for increased emphasis on monitoring and evaluation. Private firms in a long haul organization will probably improve the situation work since they have a proprietorship stake in the task and need the association with the administration to proceed.

Expertise knowledge and skills: PPP enable public agencies to exploit the technical and professional expertise of the private sector in the delivery of public goods and services. Infrastructure projects are highly technical and usually require specialized knowledge contrary to the fact that many governments, especially local governments, do not have the in-house expertise. PPP's accordingly make more noteworthy utilization of the specific aptitude in the private area especially in the domain of venture administration and execution. What's more, the

Government can likewise tap on the private areas systems to amplify resource usage and business potential.

Cost efficiencies and adequacy: PPP's **can incite cost efficiencies and plausibility, which are the deferred results of broadened rivalry, an updated level of hazard exchange, a nearer coordination of the specific parts of an undertaking, better entire life costing and enhanced headway**, (Van Herpen, 2002). Moreover, the shorter undertaking course of events and other efficient advantages more often than not bring about noteworthy reserve funds which can be used to subsidize other required administrations. Noteworthy cost funds are likewise acquired over the long haul by coordinating capital venture and the conveyance of administrations since upkeep will be considered when the advantage is intended to amplify effectiveness.

Innovation: PPPs render access to cutting edge innovation (both equipment and programming). It likewise presents private part innovation and advancement in arrangement of better open administrations through enhanced operational effectiveness. What's more, they offer more decision and present day administrations. Private financial specialists have the funding to put resources into particular preparing, assets, and innovation, empowering them to offer more decision as far as administration arrangement than the legislature can do without anyone else, (Booz and Company, 2008).

Spending imperatives: PPP's assistance decrease the capital requests on general society treasury for foundation advancement. The entrance to private area financing permits expanded interest out in the open foundation, as governments can actualize ventures without the need to raise or spending plan extra supports, just like the case in standard acquisition. This empowers the legislature to conquer any hindrance between the requirement for framework and its money related limit.

1.1.2 Geothermal energy infrastructure in Kenya

Power is one of the key infrastructures for growth of Industry and economy. In Kenya, hydropower accounts for the largest proportion of energy production however; its unreliability has currently pushed the government to favour other types of energy generation such as wind, thermal and geothermal. The Kenyan government has planned to raise total installed energy capacity to 6,762MW by the year end 2017, most of which will be produced by geothermal and

thermal. It is worthwhile noting that geothermal energy is intended to be the main contributor to the grid by 2031, a strategy that has seen geothermal capacity nearly doubled between 2008 and 2013.

Geothermal energy is physically dependable in light of the fact that it is reliable, productive, and can without much of a stretch oblige changes in power request. Not at all like irregular sustainable power sources, for example, wind and sunlight based, geothermal power plants can reliably keep running at almost full limit and they can adaptably change their power yield as required, (Randy and Ryan, 2012). In Kenya, geothermal prospect zones are fundamentally situated inside the Kenyan Rift framework. One of the principle downsides of geothermal power is its geographic reliance in that a zone must have particular land qualities for the generation of geothermal power. Olkaria geothermal field is the fundamental source in Kenya which is situated in Naivasha Sub-County. As indicated by KenGen report, improvement of Olkaria asset has been ease back for the most part because of financing and the best illustration is Olkaria North East situation where subsidizing deferred the Olkaria II plant development by finished 10 years, (KenGen report, 2015). Olkaria Geothermal power station is a progression of six geothermal power stations grouped in Naivasha Sub-County. Four of the stations Olkaria I, Olkaria II, Olkaria III and Olkaria IV are operational. Olkaria V is under development and Olkaria VI is gotten ready for 2021.

Kenya is one of the quickest developing geothermal markets on the planet and is rapidly building up its geothermal assets with different tasks under development while others are now operational. On the off chance that all the on-going ventures are finished on time, Kenya will lead the world with significant increases to their geothermal framework throughout the following decade and will turn into a focal point of geothermal innovation on the African mainland, (GEA Report, 2013).

1.2 Statement of the Problem

Kenya, in the same way as other developing nations, is endeavouring to meet its infrastructure development requirements. The current financial difficulties, joined with failings in existing foundation, are attracting increased attention for privately financed PPP to upgrade and enhance the delivery of infrastructure since these plans help diminish the capital stresses on people in public treasury. The basic support for receiving PPP would fundamentally diminish the forthright

expenses for the administration in giving and keeping up open offices and that it takes into consideration change in general society offices and administrations since PPP energizes development by the private area. Kenya Vision 2030 and the Second Medium Plan 2013– 2017 distinguish energy as one of the framework empowering influences for Kenya's change into a recently industrializing, middle-income nation giving a high caliber of life to every one of its residents in a perfect and secure condition. Access to intensely valued, dependable, quality, protected and practical energy is fundamental for accomplishment of the Vision. Kenya's development is anticipated to increment to 6.1 % in 2017, to a great extent inferable from interests in framework. Be that as it may, the advancement of its energy and transport framework is viewed as one of the primary difficulties for Kenya to develop its economy further.

Inadequate energy generation capacity by the power supply companies is one of the main challenges these sector due to the limited investment in generation of power and overdependence on hydropower which currently comprises of 50% of the total energy being generated in the country. Currently, geothermal energy is intended to be the main contributor to the grid and whose generation is so much involving in terms of the funding, level of technology required as well as the expertise knowledge and skills. This can be achieved by engaging the private sector who are regularly more specific, bigger, and have more involvement in the development and operation of businesses than government. What's more, the private sector, being liable to the profit motive and capital market teach, endeavors to work effectively and misuses specialized and administrative aptitude and economies of worldwide scale, and will put resources into innovation and process developments ahead of schedule to diminish entire life-cycle cost.

PPP boosts quality and better results through joining of services with supporting resources and enhanced economies of scale; empower open organizations to abuse the specialized and expert aptitude of the private division in the conveyance of open products and ventures; render access to cutting edge innovation (both equipment and programming); prompt cost efficiencies and viability.

Kenya has previously engaged in PPP's mainly in the transport sector which have enabled faster modernization of our roads, translating to quality and better maintained roads for instance the operation and maintenance of the Nairobi-Thika Superhighway which was constructed in 2013, and the operation and maintenance of Nairobi-Southern Bypass whose construction has just been

completed. The government has also unveiled other key road projects to be constructed and maintained through the PPP Model such as the dualing and upgrade of the Nairobi-Mombasa road, Nairobi-Nakuru-Mau Summit road as well as a second bridge in Nyali in a bid to ease congestion in the coastal city of Mombasa.

PPP's have demonstrated successful methods for spanning the gaps amongst demand and **assets, quality and openness, and hazard and advantage**. This clarifies why rising and quickly developing economies remain to profit by the financial advancement that is created by foundation PPPs. It is against this acknowledgment that this study intends to connect this research gap by researching the impact of PPP on completion of geothermal infrastructure project in Naivasha Sub-County, Kenya with focus to the energy sector as is one of the infrastructure enablers for Kenya's transformation into a newly industrialising and middle income country.

1.3 Purpose of the Study

The purpose of this study was to establish how public private partnership influence completion of geothermal energy infrastructure project in Naivasha Sub-County, Kenya

1.4 Objectives of the Study

The study was guided by the following objectives:

- i. To establish how provision of quality work influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County.
- ii. To establish how expertise knowledge and skills influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County.
- iii. To establish how cost effectiveness to deliver infrastructure project influence completion of geothermal energy infrastructure projects in Naivasha Sub-County.
- iv. To determine the extent to which use of appropriate technology influence completion of geothermal energy infrastructure projects in Naivasha Sub-County.
- v. To examine how meeting budget constraints influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County.

1.5 Research Questions

- i. How does the provision of quality work influence the completion of geothermal energy infrastructure project in Naivasha Sub-County?
- ii. How does expertise knowledge and skills influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County?
- iii. How does cost effectiveness to deliver infrastructure project influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County?
- iv. How does use of appropriate technology influence completion of geothermal energy infrastructure projects in Naivasha Sub-County?
- v. How do meeting budget constraints influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County?

1.6 Significance of the Study

The issue of public private partnerships is especially relevant nowadays. This arrangement enables developing countries afford the infrastructures needed to support their economic activities. In order to support a rapidly growing economy as envisaged in the Kenya Vision 2030, which aims to transform Kenya into an industrialized middle income country by 2030, the Government has been engaging in public private partnerships. Energy is identified as one of the infrastructure enablers for Kenya's transformation and most essential in achievement of the vision however, there are major challenges facing the electricity supply sector due to inadequate generation capacity arising out of insufficient investment in power generation. Therefore the study of public private partnership on completion of geothermal energy infrastructure project in Naivasha Sub-County, Kenya is anticipated to document useful information to various stakeholders.

The study is envisaged to be beneficial to the government which is expected to acquire relevant knowledge on several reasons as to why they should collaborate with the private sector in developing and providing infrastructure services. The study is hoped to render useful information to the PPP Unit under The National Treasury on the underlying functions that influence success in these noble initiatives as well as provide rigorous mechanisms in coordination, advancement,

and oversight of the execution of the PPP Program in the nation. Likewise, through the data from the investigation, the private part might be educated on the new and more extensive market in which to grow and put its funds in a steady, long haul income. The investigation likewise plans to energize researchers do additionally look into in other foundation segments, for example,; transport, water and sewerage, telecommunication/information and, communication technology (ICT).

1.7 Basic Assumptions of the Study

The study assumes that the respondents displayed honesty, accuracy and trustworthy based on their responses to the research questions.

1.8 Delimitations of the Study

The survey covered public private partnerships on completion of geothermal energy infrastructure project in Naivasha Sub-County, Kenya. It mainly focused on the PPP functions such as provision of quality work, expertise knowledge and skills, cost effectiveness, technology and, budget constraints and how each influences completion of infrastructure projects in the energy sector with special focus to geothermal energy infrastructure project in Naivasha. This study was only limited to PPP infrastructure projects in the energy sector without focusing on PPP projects in other sectors.

The study interviewed staff from The National Treasury of the Government of Kenya (GOK) through the PPP Unit and Kenya Electricity Generating Company (KenGen), Energy Regulatory Commission (ERC) and Geothermal Development Company (GDC) under the Ministry of Energy and Petroleum (MoE&P). These respondents were chosen since they were included both in PPP association process where KenGen was the contracting expert for the geothermal foundation venture in Naivasha, GDC is a Special Purpose Vehicle (SPV) to quicken the improvement of geothermal assets in Kenya while ERC is in charge of directing sustainable power source and different types of energy, planning of characteristic national energy design, gathering and keeping up energy information among others. The PPP Unit center is to fill in as the secretariat and specialized arm of the PPP Committee, which is commanded with surveying and endorsing PPP extends in the nation.

1.10 Definition of Significant Terms used in the Study

Completion of Geothermal Energy Infrastructure project: Completion of geothermal projects refers to the time taken to successfully complete the project. In this study the study focuses on the time performance, quality of the work, satisfaction and the cost performance of the entire project.

Cost effectiveness to deliver Infrastructure Project: Refers to the completion of projects at the minimum costs possible. The study looks at the cost reductions employed and global management capacity of the project

Expertise knowledge and skills: Refers to the competency and experience in any given field. With regards to this study, the focus is on the creativity, cognitive process and strategies being used by the project stakeholders and the level of teamwork employed.

Infrastructure: Infrastructure refers to financial administrations from utilities, for example, power, gas, media communications, and water and transport works, for example, streets, spans urban travel frameworks, seaports, and air terminals which are focal in advancing monetary exercises in the nation. Great framework helps in giving financial administrations proficiently, promoting economic competitiveness and supports high productivity. Poor infrastructure impedes economic growth and can be seriously detrimental to the efficient use of scarce resources.

Meeting Budget Constraints: Budget constraints refer to limited resources such as funds and the resources necessary to complete the project on time. This includes; budget deficits, fiscal gap, and limited resources

PPP Unit: It is the asset place for best practice and gatekeeper of the trustworthiness of the PPP procedure in Kenya. It assumes an imperative part in issue distinguishing proof, making suggestions to the PPP Committee with respect to potential arrangements, and guaranteeing that tasks meet such quality criteria as moderateness, esteem for cash, and proper exchange of hazard.

Provision of Quality work: This refers to the qualities such as pay and fringe benefits that the completed work will provide, job security and work autonomy.

Use of Appropriate Technology: Use of technology in this study refers to the application of technology for successful completion of the entire project. This will involve the acceptability of the adopted technology, ease of use, ease of maintenance and affordability of the adopted technology.

Public Private Partnership: A PPP is conceptualized as a contractual agreement between one or more governments/public agencies and one or more private sector or non-profit partners for the purpose of supporting the delivery of public services or financing, designing, building, operating and/or maintaining a certain project, (Alexandru V. Roman, 2015).

1.11 Organization of the Study

The study comprises of five different chapters with each chapter building on different parts in the development of the study for example, chapter one comprises of background of the study, problem statement, purpose of the study etc. Chapter two of this study is based on looking at the theoretical reviews related to the subject of study. The theories include; Competence theory, Principal agent theory and the Public Private Partnership Model. The chapter also reviewed related literature arranged as per study objectives (provision of quality work, expertise knowledge and skills, use of appropriate technology, cost effectiveness and meeting budget constraints) while identifying research gaps through local studies done, rundown of the writing audit and reasonable structure. Section Three spreads look into approach. It involves presentation, investigate configuration, target populace, test size and methods to be taken after amid examining, gear utilized amid information gathering instruments, steering, legitimacy of instruments, dependability of instruments, information accumulation strategies, information examination procedures and moral contemplations. Part four will cover results and elucidation of research discoveries. Section five incorporates rundown, dialog, conclusions and proposals of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The theories underpinning this study were reviewed in this chapter based on the thematic areas that the study sought to accomplish.; provision of quality work, expertise knowledge and skills, use of appropriate technology, cost effectiveness and meeting budget constraints which are meant to form a framework within which the research findings are interpreted. The chapter also includes theoretical framework and conceptual framework respectively.

2.2 Completion of Geothermal Energy Infrastructure Project

Population in Kenya is on the rise and need for reliable, abundant and sustainable source of energy is increasing at an alarming rate. Currently the primary energy sources in Kenya are biomass, petroleum and electricity, which contribute 69%, 22% and 9%, respectively, of total energy consumption in Kenya (Global Legal Insight, 2017). The biomass mainly consists of wood fuel and charcoal and majorly used in the rural areas; an estimate of 80% of the Kenyan population. The large use of biomass is contributed by the lack of grid connection to the villages (Global Legal Insight, 2017). Petroleum used in Kenya is imported and the cost of importation continues fluctuating making it an expensive source of energy to Kenyan private and public sectors. Electricity in Kenya is generated from geothermal, hydropower, thermal and wind; which respectively contributes about 47%, 39%, 13% and 0.4% of the total electric energy in Kenya (Global Legal Insight, 2017). The two major sources of electric energy in Kenya are geothermal and hydrothermal sources. Though hydrothermal source generates the largest percentage of electric energy, it is constantly faced with the challenge of weather fluctuations; this always results in high frequency power outages. The geothermal source which is the second major contributor of electricity therefore needs to be upgraded and the current projects on the same completed to enhance electric energy supply in Kenya.

Kenyan's installed electricity capacity is 2.5 GW of which 1.5 GW is connected to the grid. Due to rapid rise in population in Kenya a lot of energy is required to run both homes and industries, making the 1.5GW electric energy inadequate for Kenyan population. The inadequacy of electric energy has resulted in high cost of electricity; U.S\$0.150 per kWh. There is need to reduce this

cost and the best way is to complete the geothermal project located in Naivasha. Kenya has been identified as one of the largest geothermal energy producers in the world and therefore completing the geothermal project will make electric energy in Kenya abundant and cost effective, (GLI, 2017).

The ministry of energy and petroleum is targeting to install electric capacity of above 5 GW of electricity in Kenya (Kenya Vision 2030, 2016). The large electric capacity target is expected to be enhanced by completion of the geothermal power project in Naivasha. This target will help Kenya meet her projected vision 2030 energy demands. It is expected that on completion of the project accessibility to electricity in Kenya will significantly increase and also the cost of electricity will substantially reduce. Increase in electric energy accessibility and reduction of cost of electricity is expected to help Kenya compete favourably in the economic field because cost of production in industries will reduce (Global Legal Insight, 2017).

A geothermal project is a massive undertaking and therefore requires enough investment, innovation and technology. In Kenya, KenGen is the only government company tasked with generation of electricity. The expenses of completion of a geothermal project is high and can hardly be met by a single company, therefore, a collaboration of other stakeholders is necessary. The collaboration calls for private sector investments into the project; this collaboration helps in successful and quality completion of the project. The coming together of private sector into the geothermal project results in what is known as public private partnership (KenGen report, 2015)

2.3 The Concept of Public Private Partnership

PPP are authoritative courses of action between public segment and private sector investors for joint, cooperative and communitarian arrangement and financing of open tasks and administrations. These plans emerge out of the acknowledgment that in spite of the fact that people in general division is in charge of the conveyance of framework ventures, it regularly experiences budgetary, specialized and institutional impediments in profiting such activities consequently the need of working together with the Private part in arrangement of such administrations (Link, 2006). Regan (2005) characterizes Public Private Partnership as the game plans for the acquirement of merchandise and enterprises using, diversifying and comparative game plans with the private division; the private segment is contracted to give open products and ventures in the interest of government. Additionally, Grout (2003) and Ahadzi (2004) opined that

on a very basic level, the private substance turns into the long haul supplier of administrations while government turns into the buyer of the administrations. Open Private Partnerships are intended to improve the common sharing of costs, dangers and advantages of foundation extends between general society and the private area by misusing the qualities of either side while all the while defeating their impediments. Open Private Partnerships give one component to accomplishing social objectives since Government contribution in creating and overseeing associations can furnish groups with the fundamental assets and motivating forces to seek after different activities.

A well thought out and adequately structured Public-Private-Partnership arrangement should efficiently and effectively achieve superior results than the traditional public sector infrastructure financing approaches (Bouma and Berkhout, 2015). This is because the Public-Private-Partnership approach endeavors to saddle an extensive variety of administrative, business and specialized aptitudes of the private part while profiting from the okay, socio-political altruism and the lower cost of capital of the general population division. This blend is required to improve time, quality and cost productivity of resultant undertakings (Savas, 2000). It ought to likewise prompt higher adaptability and better hazard administration among open framework ventures. In Kenya, the idea of Public-Private-Partnership has gotten with the administration going into organizations with Private segment financial specialists in the arrangement of different administrations.

As indicated by Smith (2009), a PPP can be extensively characterized as an authoritative understanding between the Government and a private firm focused towards financing, planning, executing and working framework offices and administrations that were customarily given by the general population division. It encapsulates ideal hazard portion between the gatherings limiting expense while acknowledging venture formative destinations. In this manner, the venture is to be organized such that the private division gets a sensible rate of profit for its speculation.

Babiak (2008) contends that PPP offers fiscal and non-financial points of interest for people in general part. It tends to the constrained financing assets for nearby foundation or improvement ventures of general society segment along these lines permitting the designation of open assets for other neighborhood needs. It is an instrument to disperse venture dangers to both open and private division. PPP is designed for the two divisions to increase enhanced productivity and task

execution forms in conveying administrations to people in general. In particular, PPP stresses Value for Money concentrating on diminished costs, better hazard distribution, quicker execution, enhanced administrations and conceivable age of extra income.

The primary partners associated with a standard PPP incorporate general society expert, which is in charge of the outline, delicate, and administration of the PPP get; the PPP contractual worker, which is in charge of the advancement of the venture in the terms determined by people in general specialist; the budgetary operators, who are in charge of giving the monetary assets; and the subsidizing specialists, who are in charge of installment and the arrangement of the wage stream (Ferris, 2013).

A portion of the factors may incorporate the level of inclusion of people in general specialist in the subsidizing and financing of the plan, the length and nature of the agreement between the general population expert and the PPP contractual worker, hazard sharing between the private and open gatherings, errands included, budgetary plans, or blend of green-field activities and takeover ventures. The most regular case of PPP plans is the BOT (Build, Operate, and Transfer). By and by, the fundamental BOT guideline can be reached out to incorporate extra provisos that may incorporate appropriations amid operation, introductory commitments, or advances from the general population specialist. Other regular sorts of PPP incorporate DBFO with shadow tolls or back by temporary worker (Williams, 2013).

Eschenfelder (2011) contends that the upsides of PPP incorporate the joining of the private segment's capital and ability, the assistance of conditions for an existence cycle enhancement of the task, a more client situated administration, and the advancement of new business openings. The most important inconveniences incorporate higher budgetary and exchange costs, the negative open impression of tolls, and the complex authoritative structure.

As indicated by Harris, (2011) a fruitful PPP requires a structure that is suited to the specific states of the task, clear and powerful hazard assignment, strength for the authoritative and legitimate system, and in addition a straightforward offering process. Also, general society expert ought to have clear goals and abstain from putting preposterous desires on the private party.

2.4 Provision of Quality work and completion of Geothermal Energy Infrastructure Project

Globally, most governments lack the financial capacity, resources and the technological machinery to implement infrastructure projects and to efficiently inspire sustainable development (Pattberg, 2012). Therefore, combining the roles of private and public sectors will enhance effectiveness in the government projects. Private sectors are mostly profit or positive results oriented, and therefore they will advocate for proper management of funds and other resources in the project. Proper management will make the project coordinators look for the right expertise to run the project. The experts will hence advise the project funders of right quality products to use in the project; this will result in quality project completion.

The World Economic Forum, (2005), reports that globally, the PPP model is gaining popularity with most national governments (Ruto and Ismail, 2017). In the report, the governments are seen as using the PPP relationship in their procurement procedures to help in quality service deliveries to their citizens. The relationship helps in minimization of fund wastages. Through minimization of fund wastages, quality of infrastructural development is enhanced.

In Indonesian future power plans, the budget and target is seen as an enormous undertaking for the government and therefore the government must seek for funds to ensure the project is delivered qualitatively to the citizens of the country. The report by PwC, (2013) points to the need of involving private sectors in accomplishing the project qualitatively. The report suggested that Indonesian government would incorporate independent power producer to help fund the project and ensure proper management of the project. Proper management and enough funds would surely guarantee Indonesians the electrification network they dearly required.

In the report by Development Bank Group (2013), Rwanda is seen as in dire need of enough electrification to effectively power its rural and urban centers. The project is big and the government notes that the money from the already existing tariffs from the installed electricity capacity is not sufficient to run the project. The government by that time was also having several projects running and hence there were no enough funds to run the project. The government therefore decided to collude with private sectors to deliver the project. The quality of the project was thereafter to be determined from several parameters such as reduced tariffs on electric power and an even power distribution throughout Rwanda.

Delivery of value benefits that offer some incentive for cash through PPP supports a long haul way to deal with the creation and administration of open area resources. Accomplishing an incentive for cash in the arrangement of an administration requires that full record is gone for broke and costs over a long timescale instead of concentrating on here and now capital consumption. Quality administrations would then be able to be maintained over numerous years at the least long run monetary cost. PPP, in any case, isn't an "enchantment shot". While it can have the advantage of calming here and now weight on people in general funds, in light of the fact that PFI joins open area budgetary commitments to the conveyance of the administration it doesn't convey, as a few governments think, 'free' framework; neither does it include skewing open funds or avoiding duty regarding the best possible administration of the benefits (Ruto and Ismail, 2017).

PPP operation is facing challenges that can hamper the provision of quality services (Bouma and Berkhout, 2015). These challenges need to be fully addressed in order for the PPP operation to be effective and quality services realized. Some of these challenges include; lack of institution for integrated decision making i.e. decision making involving the public and private sectors. The public and private sector involved in the project need to make a unanimous agreement in order to determine the effects of various trades-offs involved in the project. This will help in both parties having a common goal for the project and hence quality will be realized in the project.

Kenny (2017), conducted a study on how governance affects quality of work in public construction projects. According to his findings failures in governance is likely to lead to poor construction of infrastructure at high cost. According to his study, good governance in a project enhances transparency. Poor governance does not enhance transparency and oversight in projects leading to corruption in infrastructure construction. Poor transparency increases costs and delays in construction projects and the result is poor quality work. It is the corruption that leads to mismanagement of available resources; mismanagement of resources results in poor quality work. He concluded that poor governance in construction projects leads to poor quality work and the reverse is true.

In Australian report of Infrastructure Planning and Delivery (2012), the best practices leading to quality of infrastructure is discussed. In the report, the best practices are of two types; best practices considering government policy and emerging practices demonstrating value to the

project but do not exist in the construction guiding policies. Best practices are subdivided into 5 groups; best practice, good practice, standard practice, emerging practice and ad hoc practice.

In the research conducted by De (2008), “International Infrastructure Development in East Asia he points out that provision of quality work on public infrastructure can be improved by stepping up the public investment in the infrastructure systems. This can be done by increasing government revenue allocation to the infrastructure systems. More revenues allocation will help in procuring equipment best for the work to be done and importing expertise if need arises. Right equipment and experts will guarantee quality in the work to be done.

In an empirical review by Bouma and Berkhout (2015) on the inclusive green growth, this study uses welfare theory to define and elaborate the challenges associated with Inclusive Green Growth strategies, with the aim to define key elements for effective policy design. The review revealed that stimulating Inclusive Green Growth is complicated. In the mixture of policy instruments used to implement the different agendas, the study established that there is need for the government to embrace public–private partnerships so as to leverage function in terms of financing, efficiency of public good provisioning, improve local representation, and reduced regulatory problems that are inherent in development cooperation.

2.5 Expertise Knowledge and Skills and completion of Geothermal Energy Infrastructure Project

The partnership between public and private sectors results in advanced expertise and experience; these encourage innovation, costs of operations reduction, shorter delivery times and improvement in the functional design, better facility management and operational processes (Bouma and Berkhout, 2015). Geothermal drilling requires expensive equipment and experts for both management and drilling itself; because of the PPP collaboration, the experts and machines are easily accessed. The technical capacity of both the drilling engineers and the maintenance engineers play a significant role in ensuring an optimum operation of the drilling equipment in geothermal plant. Geothermal drilling in Kenya started after independence; however, it has been fully embraced by the government a few years back (Kenya Vision 2030, 2016). Ngugi (2012), in his study, revealed for 5000 MW advancement objective, for a 12 fix operation, Kenya would require to build up a 1000 in number specialized group running from researchers and architects

to penetrating team and field and lab experts, will's identity associated with the geothermal assets improvement.

Kenya has had just a single apparatus operation group numbering around 200 individuals in the asset advancement. This group has shaped the foundation of the geothermal resourced advancement extension arrange for that the Country is attempted. There is a limit hole that requires to be rapidly filled. The boring organization arrangement has been that basic individuals from the apparatus group are utilized one year in front of apparatus conveyance. The work lead time enable the staff to be drafted and prepared. Kenya business system improves abilities advancement to meet the aptitudes hole particularly at work and gathering trainings instead of individual preparing. Kenya has additionally gone into coordinated efforts with preparing organizations in particular the United Nations University Geothermal Training Program in Iceland to encourage upgraded preparing. Further, aptitude conveyed into the nation to fill in ability holes orders preparing as a deliverable in order to upgrade at work preparing (Ngugi, 2012).

In their examination, Assaf et al. (1995) brings up that, in any development venture, there are numerous specialized gatherings included, for example, temporary workers, advisors, subcontractor and customer. Frequently, it might be troublesome for these different separate gatherings to organize well with a specific end goal to finish the venture. In any case, the spine staff of the venture must have the coveted specialized ability to upgrade the accomplishment of the task. In an investigation directed by Leung (2004) it was discovered that trouble in coordination between the gatherings is one of the elements that add to delay.

Al-Kharashi et al. (2009) expressed that need coordination between the specialized staff in any development venture will prompt postponement. For instance, in a circumstance that recently changed development illustrations of a task might be issued later by the contractual workers to the subcontractors. This prompts development botches and the work requiring to be revamped. Reproduction work takes extra time, thusly affecting the culmination time of the venture. As far back as venture administration has turned into a formal train, the quality and significance of undertaking arranging has been viewed as a noteworthy foundation of each effective task and the improvement of undertaking staff is basic. Kalinova (2007) pass on that arranging and administration of an undertaking, regardless of its multifaceted nature require the sentiments of a

framework in light of the quantity of partners included. Common correspondence between these partners upgrades division of work, advancement of individual abilities and obligations regarding powerful basic leadership. Legitimate administration additionally advances appropriate arranging amid the venture's execution.

Various experimental investigations of venture administration achievement factors recommended arranging as one of the real supporters of task achievement (Skitmore et al., 1974). Arranging incorporates the capacity of the contracting faculty to design and to complete every movement adequately, at the perfect time. As such, this requires both the faculty to adapt to issues as quickly as time permits, and the capacity and the adaptability of staff to fill in as a group inside the time imperative. An undertaking's prosperity is, to some degree, dependent upon compelling administration of the time requirements, expenses and execution. It is basic for the undertaking chief to have and show proper capabilities. Past administration contemplates have explored the effect of competency on execution.

Manaan, Ahadzie, Panford, and Proverbs (2014) built up a competency based execution display for development venture directors where administrative conduct input is evaluated. The examination built up that nine execution markers for venture supervisors' competency ought to be created. The investigation built up execution markers to include initiative, basic leadership, commonality and congeniality, trustworthiness and respectability, correspondence, picking up, comprehension and application and self-adequacy. The examination additionally settled other execution pointers to comprise of upkeep of outside relations. With regards to development extend administration; it is expected that if the undertaking administrator and the venture group have all the required capability for the work then the task execution will be effective.

Arendse (2013) looked to increase comprehension of the venture administration skills required for the fruitful usage of South African Built Environment industry ventures. This was because of the way that South Africa is looked with the test of decreasing the immense overabundance of framework conveyance. The examination researched the task administration abilities required to enhance the execution of the business in conveying the truly necessary foundation in time. The examination investigated abilities that are instrumental to the powerful execution of task administration strategies and analyzed the contributory issues of undertaking administration initiative and venture achievement. The discoveries set up that notwithstanding the all the more

ordinarily underscored venture organization ability, for example, setting and overseeing degree, courses of events and spending plans, an undertaking administrator must be skilled in organizing the task errand and clearing up scope. The investigation built up that an undertaking chief needs to impart adequately, create SMART venture goals, indicate consistency and plan the task monetarily (Arendse, 2013).

An investigation by Edum-Fotwe and McCaffer (2000) on the creating venture administration competency: points of view from the development business built up that undertaking administrators should be capable in specialized aptitudes, administrative abilities, budgetary aptitudes, data innovation abilities, legitimate aptitudes, relational abilities and general abilities like deal, showcasing and advertising to oversee extends adequately. Patanakul and Milosevic (2008) in the competency show for viability in dealing with different undertakings consider proposed a rundown of abilities that various venture chiefs ought to have in a competency display for adequacy in dealing with numerous activities. The investigation set up capabilities that are special to different undertaking chiefs to comprise of authoritative experience, interdependency administration, and multitasking, synchronous group administration.

Karuingi (2014) in his investigation on the determinants of convenient fruition of undertakings at Kenya Power and Lighting Company, Thika embraced to decide the elements that impact opportune fulfillment of energy extends inside Thika district. Illustrative and exploratory research plans were received. The objective populace was venture designers, directors and specialized staff working in ventures. Obtainment delays, opportune accessibility of assets and climatic components were seen to be the principle factors that impacted the convenient finish of KPLC extends in the considered region.

2.6 Cost effectiveness to deliver Infrastructure project and completion of Geothermal Energy Infrastructure Project

According to the world report (1990s), annual public company losses results from inefficiency and unmanageable pricing policies (Humbatove and Single, 2016). The pricing policy may include mispricing which can be brought by the government's plan to subsidize goods without proper study of the market. Therefore, PPP collaboration is needed to study the market and provide a sustainable pricing policy. The sustainable pricing policy will ensure that the public get public services like electricity at moderately equal and low prices throughout.

According to Asian Development Bank (2012), the collaboration between public and private sectors results in efficient use of resources. The efficiency in use of resources enables the project management teams organize the resources to help in acquisition of proper technology to run the project. Good technology helps in time saving hence making PPP project cost effective.

Since payback on PPP framework ventures relies upon client expenses, the genuine cost of conveying a specific administration can without much of a stretch be resolved. This data offers the chance to present more creative income sources that would not be conceivable under traditional strategies for benefit conveyance. Proficiency might be accomplished by consolidating different exercises, for example, plan and development, more adaptable contracting and obtainment, snappier endorsements for capital financing and more proficient basic leadership process.

The expanded association of people in general in PPPs can help empower the private segment and increment work and financial development. Neighborhood private firms that wind up plainly capable in dealing with PPP foundation tasks can "send out" their mastery and acquire pay outside the limits of their own nations or locales of starting point. For instance, the development gauges exhibited in the Zambian national spending plans showed that there has been certain development in the development business, e.g., 20.5% of every 2004, 19.9% out of 2005, 14.4% out of 2006 and 13.3% of every 2007 (Ministry of Finance and National Planning, 2008). In this manner, in setting up the approach system for PPPs in Zambia, the administration has made a stage for business to be attempted with expanded choices. By being business accomplices, general society and private segments end up noticeably critical to each other's prosperity and manageability (Mukela, 2007).

According Tudor, (2010) cost effectiveness in delivering a project can be achieved through proper management and enough investments. The project of Tudor focused on IT infrastructure. Tudor argued that to achieve cost effectiveness in providing IT infrastructure a framework for managing the provision of IT services; this can be applied to other infrastructural projects. Tudor's second argument was that an infrastructural project must have a management approach suitable for the project in question. Thirdly, Tudor said that an agile project delivery framework suitable for all types of projects is necessary. Tudor further iterated that businesses and

organization must invest hugely to help in reducing risks in the projects. Risks increase expenses in projects hence making the projects costly.

Muzira and Diaz, (2014), in their study on “Rethinking Infrastructure Delivery”, they brought up the importance of using the best alternative to reduce cost. They studied the cost effectiveness in replacing the commonly used concrete and asphalt with adoquines to surface secondary rural roads. The adoquines were easy to place; they did not require expensive and sophisticated equipment in their placement. The small volume of vehicles using this roads hence the maintenance cost was also low. Therefore, from the study it can be concluded that alternatives, including materials and machineries, should be considered in reducing costs of infrastructural projects.

The report of the department of transport and main roads, Queensland, (2013) highlights factors that can help in making an infrastructural project cost effective. The factors include: use of innovation, research and technology to save money; depending on findings from initial stages of the project appropriate innovation and technology can be put in place to help reduce the cost of the project, improving technical and project delivery skills; this helps in reducing costs associated with errors during the project, and optimizing asset management practices; this helps in proper maintenance on the available equipment to be used in the project.

2.7 Use of Appropriate Technology and completion of Geothermal Energy Infrastructure Project

Appropriate technology is needed to complete the project at the right time. In Indonesia, several geothermal energy power plants have been constructed, some were managed by traditional procurement methods while some were managed through the PPPs approach. It was noted that construction and commissioning of PPPs had better performance than the traditional procurement (Atmo, 2015). For example, the Wayang Windu geothermal fired power plant which was being managed through PPPs was completed a head of time, while Paiton-9 and others managed using old procurement lagged behind the schedule. The main reason for not completing Paiton-9 and other projects at the right time was the lack of the required technological knowledge and appropriate equipment in running the project. In Wayang Windu project, the management had freedom to hire experienced engineers and also with the early debt

finance they were able to obtain technically proven power plant equipment to help in completion of the project.

Enshassi, Mohamed and Abushaban (2009) did an investigation on factors influencing the execution of development extends in the Gaza Strip. The investigation built up an exhaustive writing survey to produce an arrangement of components accepted to influence extend execution. An aggregate of 120 polls were appropriated to 3 key gatherings of venture members; in particular proprietors, advisors and contractual workers. The study discoveries show that each of the 3 bunches concur that the most imperative elements influencing venture achievement are: postpones due to outskirts supposition prompting materials lack; spending limitations, inaccessibility of assets; low level of undertaking initiative aptitudes and crude materials.

Langat and Wanyoike (2016) conducted an analysis of the Relationship between Rig Maintenance and Timely Completion of Well Drilling Projects at Menengai Geothermal Project, Nakuru-Kenya. The specific objectives of the study were to analyze the influence spares availability, technical capacity, maintenance scheduling, and manufacturers' maintenance support on rig downtime. Findings show that spare availability, staff technical capacity, maintenance scheduling, and manufacturers' maintenance support have a positive and moderate influence on timely completion of geothermal wells at the MGP. The study has recommended that the company should focus on developing the staff technical capacity in the field of rig maintenance through developing of training curriculums and exchange programs.

According to Mbiti (2017) in his study to determine factors influencing effective implementation of mega projects in Kenya with reference to standard gauge railway project, the study specifically sought to assess the effect of building information modeling technology, top management support, stakeholder participation and project team competency on the effective implementation of megaprojects in Kenya. The study concluded that Technology has an effect on the Effective implementation of SGR project in Kenya. The study also concluded that Project Team Competency has an effect on the Effective implementation of SGR project in Kenya.

2.8 Meeting Budget Constraints and completion of Geothermal Energy Infrastructure Project

The main geothermal resource risk constraint is experienced during the high upfront development stage; at this stage there are a lot of uncertainties concerning the site's capacity (Dolmon, 2009). Pre-survey, exploration and test drilling phases have high risks especially considering the fact that validating geothermal resources through test-drilling is capital intensive (Hilmarsion, 2015). At the forefront stage commercial financiers are unwilling to donate or lend funds to the projects; this leaves private equity and government support as the primary source of funding. The lack of commercial financiers imposes financial constraint which may result in the projects abandonment at the early stage. Budget constraint can result in delays of the project's completion date. In geothermal power plants, after completion of preliminary phases, budget constraint does not affect the completion of the project; geothermal energy is a clean source of energy and therefore international financiers will be attracted (Atmo, 2015). The combination of enough finance and PPPs approach will held in delivering the project at the right time.

Karuingi (2014) in his investigation on the determinants of opportune fulfillment of ventures at Kenya Power and Lighting Company, Thika attempted to decide the variables that impact convenient finish of energy extends inside Thika locale. Expressive and exploratory research outlines were embraced. The objective populace was venture designers, managers and specialized staff working in ventures. Obtainment delays, convenient accessibility of assets and climatic elements were seen to be the primary factors that affected the auspicious finish of KPLC extends in the examined zone.

Enshassi, Mohamed and Abushaban (2009) uncovered in their examination on factors influencing the execution of development extends in the Gaza Strip that spending imperatives influence the execution of infrastructural ventures. To moderate this, the investigation prescribed that undertaking proprietors to work cooperatively with temporary workers and encourage normal installments keeping in mind the end goal to conquer deferrals, question and claims; venture members ought to effectively have their contribution to the procedure of basic leadership; and) consistent coordination and connection between venture members through the task life cycle so as to tackle issues and create venture execution.

2.9 Theoretical Framework

This section presents a theoretical review on public private partnership and completion of infrastructure projects. The theories presented here are; competence theory, principal agent theory and the public private partnership model. The following is a discussion on each of them.

2.9.1 Competence Theory

The competence theory was developed by McClelland and McBer in the 1980s. The creators' characterized competency as the hidden normal for a person that is causally identified with foundation referenced successful or potentially unrivaled execution in an occupation or circumstance. From that point forward various competency structures have been produced by various venture administration foundations. The theory postulates that the core competencies enable the firm to develop the requisite techniques, expertise, systems and infrastructure to provide quality products and services satisfy the needs of its customers (Prahalad and Hamel, 2006).

The theory explains that integration of multiple technologies and coordination of diverse production skills assist firms to create value in its products and services. The theory is used to develop a strategy to use the core competencies of the organization to meet project demands and (Prahalad and Hamel, 2009). In the context of this study, the author assumes that the geothermal infrastructural development team is personnel who have the requisite project management competencies to manage the complex geothermal projects effectively to satisfy the needs and expectations of all stakeholders. This theory integrates the tenants of technology and employee skill and expertise to meet project requirements for successful completion.

2.9.2 Principal Agent Theory

The approach to completion of projects and performance in PPPs is informed by the Principal Agent Theory (PAT) as developed by Laffont and Tirole (1993). Whereas there is no unified theoretical basis for success determinants in PPPs, the choice of this theory is based on the nature of the relationship between the partners i.e. the government (Principal) ideally responsible for the provision of certain goods and services to its citizens, who engages the private partner (the agent) to do this in return for some benefit (incentive mechanism).

This model has additionally as of late been completely inspected by financial specialists taking a gander at the hypothetical establishments of PPPs. For instance, Benett and Elisabetta (2006) and Martimort and Pouyet (2006) utilized fragmented contracts hypothesis to consider the conditions under which it is ideal to package building and administration obtainment (one vital issue in PPP courses of action) and find intriguing outcomes. Office connections happen when one accomplice in an exchange - the chief, representatives to another - the specialist and the welfare of the main is influenced by the decisions of the operator. The assumptions of the agency relationships are three; the first is that of bounded rationality, secondly is that of opportunism and lastly is on information asymmetry.

The main target of public private partnership is for the private companies to provide funds for the project in conjunction with the government. The private companies therefore, waive the government of infrastructural investment costs. In such a relationship, the enthusiasm of the vital and specialist may separate, the primary can't impeccably and costless screen the exercises of the operator and the key can't flawlessly and costless screen and gain the data accessible to or controlled by the operator. This normally makes an organization issue i.e. the likelihood of deft conduct with respect to the operator that conflicts with the welfare of the chief. To address the agency problem, certain measures which usually involves a cost to be known as agency costs and often includes those of monitoring, bonding/contracting and residual loss to the principal. To mitigate the agency problem and reduce agency costs, the principal needs to institute an appropriate incentive structure and establish effective monitoring mechanism to control any deviant activities of the agent and to motivate the agent to act in the way that the principal wishes. Jensen and Meckling (1976) recognize two important steps that can be used to minimize the potential for agency problems. The first is that the principal-agent risk sharing mechanism needs to be designed efficiently and secondly; the design must be monitored through the use of appropriate performance measurement criteria.

2.9.3 The Public Private Partnership Model

In theory, PPP are intended to beat the relentless difficulties that have confronted generally conveyed open works ventures, by profiting by the social systems and social embeddedness of governments and firms partaking in technical infrastructural projects. The accentuation in this paper is on concession style PPP models that package some blend of office configuration,

building, financing, operation and support into an agreement with a solitary concessionaire (Teicher, Alam and Gramberg, 2006).

Consequently, the concessionaire either gathers all client charge income or is paid a yearly expense over the life of a long haul contract enduring in the vicinity of 25 and 99 years. Given that the office is developed on spending plan and works as arranged, the yearly installment or client charge income gathered by the concessionaire is adequate to take care of capital costs, upkeep and operational costs, and an edge of benefit (Siemiatycki, 2009).

This packaged way to deal with framework venture conveyance is intended to develop early and progressing collaboration between the accomplices so their association is of an undeniably complementary nature (Smyth and Edkins, 2007). Accountability and execution is expanded among the undertaking accomplices by better connecting money related reward with continuous task execution, especially when yearly installments to the concessionaire are produced altogether through client expenses (Flyvbjerg, 2007).

While PPPs have advanced and been adjusted to suit their specific venture setting, each undertaking keeps on being conveyed through a moderately comparative arrangement of hidden courses of action (Yescombe, 2007). PPPs are conveyed through connections amongst governments and many firms that represent both people in general and private division accomplices. As in the DBB show, the diverse gatherings associated with a PPP each have their own targets and interests in partaking in the organization, some of which are correlative and others that might be in strife. Quickly sketching out these interests features a portion of the similitudes and contrasts between the conventional Design offer form and the concession style PPP approach (Teicher, Alam and Gramberg, 2006).

Through the span of the long haul working period, an essential goal for the administration accomplice is to keep up some control over key venture arranging duties, for example, the setting of administration levels, quality and security guidelines, client expense rates, and office development designs. These are basic government obligations that add to ensuring the general population intrigue. In the meantime, the political party in power can end up noticeably helpless against open clamor in situations where control has been legally exchanged to the private

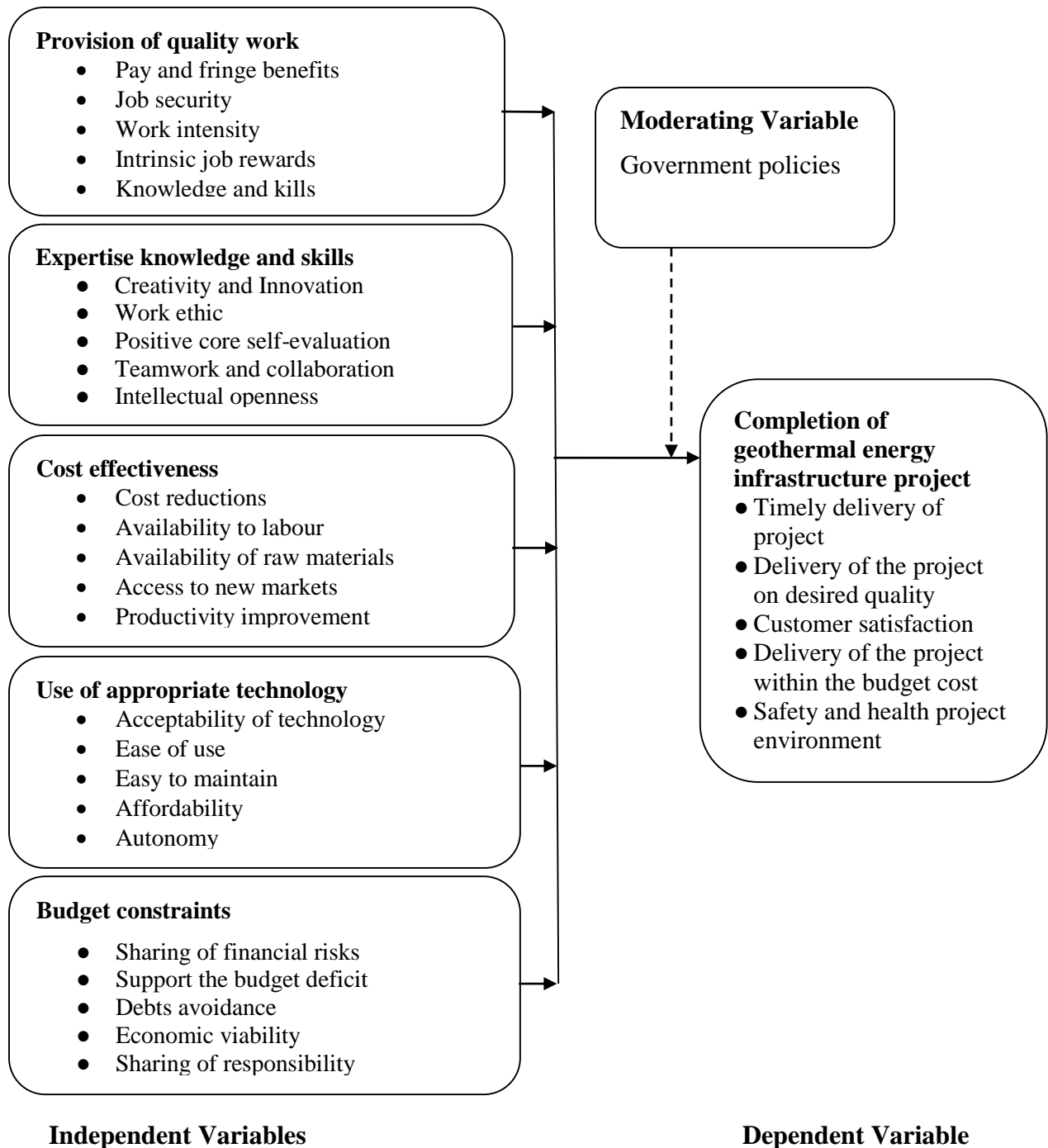
segment accomplice, empowering disliked choices by the private segment accomplice (Thomsen, and Stephen, 2005).

2.10 Conceptual Framework

As shown in figure 2.1, functions of public private partnership on completion of geothermal energy infrastructure project in Naivasha Sub-County, Kenya. The conceptual framework looked at the relationship represented by the independent variables and dependent variables.

Figure 2.1: Conceptual Framework

PUBLIC PRIVATE PARTNERSHIP



2.11 Summary of Literature

The study was pinned on three theories; competence theory, principal agent theory and the public private partnership model. The competence theory is expected to provide an understanding to the researcher on the role of key staff expertise and skills in any given project. This theory emphasizes on underlying characteristic of an individual that is causally related to

criterion referenced effective and/or superior performance in a given project. The principal agent theory brings the nexus between the government and the private investor. The theory gives reasons why a government should resort on private investors to provide essential services to her citizens. With regards to this study, geothermal infrastructural projects are capital intensive and require superior technological input, resources and expertise that the Kenyan government do not have at the moment.

The study reviewed the role of PPP in the provision of quality work and completion of Geothermal Energy Infrastructure Project. Based on the reviewed literature, PPP brings on board the right expertise to advise the project funders of right quality products to use in the project resulting to quality project completion.

On the expertise knowledge and skills, it was reviewed that leadership, decision-making, mutuality and approachability, honesty and integrity, communication, learning, understanding and self-efficacy are key qualities that every staff should possess to deliver quality work within the prescribed timelines. Administration expertise, such as setting and managing scope, timelines and budgets and ability of the project manager must be competent in structuring the project task and clarifying scope are critical in mega project such as geothermal infrastructural projects. The advantages of PPPs have been broadly talked about in the writing (Fedderke and Bogetić, 2006). PPPs can present advancement in the way benefit conveyance is composed and actualized. They can likewise present new advances and economies of scale that regularly diminish the cost or enhance the quality and level of the administrations.

The utilization of innovation in geothermal infrastructural ventures demonstrated that innovation is a significant formula since innovation can be the information of strategies, procedures, or it can be inserted in

machines, PCs and gadgets can be worked by people without nitty gritty learning of the workings of such things.

2.12 Matrix for Empirical Literature

| Variable | Author (Year) | Title of the Study | Findings | Knowledge gaps |
|---------------------------------------|--------------------------------|--|---|--|
| Expertise knowledge and skills | Karuingi (2014) | Determinants of convenient finish of undertakings at Kenya Power and Lighting Company, Thika | Procurement delays, opportune accessibility of assets and climatic elements were seen to be the fundamental factors that impacted the auspicious consummation of KPLC extends in the considered region | The study focused on procurement factors, availability of funds and climatic factors which are not the main focus in the present study |
| | Edum-Fotwe and McCaffer (2000) | Creating venture administration competency: points of view from the development industry | Project chiefs should be able in specialized abilities, administrative aptitudes, money related aptitudes, data innovation abilities, lawful aptitudes, relational abilities and general aptitudes like deal, advertising and advertising to oversee extends viably | The study comprehensively touched on key skills that the staff ought to possess for successful completion of the project. However, the findings cannot be used in the case of PPP as this comes with agent-principle relationships that require both parties to agree on the expertise and skills for the success of the project |
| | Patanakul and Milosevic (2008) | Competency model for effectiveness in managing | Competencies that are unique to multiple-project managers consist of organizational | The study was conducted in a different country whose financial and expertise cannot be |

| | | | | |
|--|----------------|--|---|---|
| | | multiple projects | experience, interdependency management, and multitasking, simultaneous team management | compared to that of Kenya |
| | Arendse (2013) | Undertaking administration skills required for the fruitful execution of South African Built Environment industry projects | Project organization mastery, for example, setting and overseeing extension, timetables and spending plans, a venture supervisor must be equipped in organizing the task assignment and elucidating degree. The examination set up that an undertaking director needs to impart adequately, create SMART venture goals, indicate consistency and plan the task monetarily | The concept of PPP is not part of the study hence the findings cannot be used in the case of PPP funded projects |
| | Mbiti (2017) | factors affecting successful execution of uber extends in Kenya with reference to standard gage railroad project | Project Team Competency affects the Effective usage of SGR venture in Kenya | The study focused on a railway projects which does not encompass a large pool of expertise and skill as compared to geothermal projects |

| | | | | |
|---------------------------|-------------------------|--|--|--|
| Cost effectiveness | Tudor, (2010) | Effectiveness in delivering a project can be achieved through proper management and enough investments | Cost effectiveness in providing infrastructure can be achieved by being innovative | The study was done in a country whose financial footing and growth is better than Kenya. This indicates that the present study has to provide relevant literature with regards to Kenyas means of reducing mega projects costs |
| | Muzira and Diaz, (2014) | Rethinking Infrastructure Delivery | Alternatives, including materials and machineries, can be used as a means in reducing costs of infrastructural projects. | The study was conducted in a western Country hence the need to establish whether the findings apply local is crucial |
| | Queensland, (2013) | Factors that can help in making an infrastructural project cost effective | Use of innovation, research and technology to save money; depending on findings from initial stages of the project appropriate innovation and technology can be put in place to help reduce the cost of the project, improving technical and project delivery skills; this helps in reducing | The study was blanket on a number of factors hence does not provide comprehensive cost effective mechanisms that any infrastructural project can employ as they work to complete the projects |

| | | | | |
|--------------------------------------|--|---|---|---|
| | | | costs associated with errors during the project, and optimizing asset management practices | |
| Use of appropriate technology | Enshassi, Mohamed and Abushaban (2009) | On factors influencing the execution of development extends in the Gaza Strip. | Delays in light of outskirts/streets conclusion prompting materials deficiency; spending requirements, inaccessibility of assets; low level of task initiative abilities; heightening of material costs; inaccessibility of very experienced and qualified work force; and low quality of accessible gear and crude materials | The study was on construction projects which is totally different from energy infrastructural projects |
| | Langat and Wanyoike (2016) | Analysis of the Relationship between Rig Maintenance and Timely Completion of Well Drilling Projects at Menengai Geothermal Project, Nakuru-Kenya | Availability, staff technical capacity, maintenance scheduling, and manufacturers' maintenance support have a positive and moderate influence on timely completion of geothermal wells at the MGP | The study was on timely completion of maintenance of well drilling project not completion of new projects |
| | Mbiti (2017) | Factors | Technology has an effect | The study lacks literature |

| | | | | |
|----------------------------------|---------------------------|---|---|--|
| | | influencing effective implementation of mega projects in Kenya with reference to standard gauge railway project | on the Effective implementation of SGR project in Kenya | on the role of PPP in technological application in infrastructural projects |
| Provision of quality work | Bouma and Berkhout (2015) | Inclusive green growth | Stimulating Inclusive Green Growth is complicated, as it requires that the market and governance failures underlying current non-inclusive and non-green growth pathways are adequately addressed | The study reviewed numerous green energy projects and it's not clear how PPP influences completion of geothermal projects |
| | De (2008) | International Infrastructure Development in East Asia | Provision of quality work on public infrastructure can be improved by stepping up the public investment in the infrastructure systems | The document did not focus on PPP and cannot be used by policy makers as a reference material when looking at how PPP influencing completion of infrastructural projects |
| Budget constraints | Karuingi (2014) | Determinants of convenient fruition of tasks at Kenya Power and Lighting Company, | Procurement delays, auspicious accessibility of assets and climatic components were seen to be the principle factors that affected the | Did not look at the role of PPP in meeting budget constraints for the projects |

| | | | | |
|--|--|--|---|--|
| | | Thika | opportune culmination of KPLC extends in the examined zone | |
| | Enshassi, Mohamed and Abushaban (2009) | Factors affecting the performance of construction projects in the Gaza Strip | Budget constraints affect the project participants ability to avail necessary resources such as materials, highly skilled personell and other procurement related issues hence affecting the projects performance | Did not look at the role of PPP in meeting budget constraints for the projects |
| | Atmo, (2015) | Structuring procurement to improve sustainability outcomes of power plant projects | Budget constraint can result in delays in completion of preliminary phases | The study was conducted in a different country and the findings may not apply in Kenyas geographical location. |

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter gives the description of the methodologies which the researcher will use in the study to collect data, the processes that were followed in carrying out the research, the methods, the analysis and interpretation of data that will be gathered from the field. Under the following sub-headings; research design, target population, sampling procedures and sample size the methods and procedures used in this study will be explained. Further, instrumentation, validity and reliability of the instruments, the methods of processing data as well as ethical considerations will be explained in details.

3.2 Research Design

According to (Kumar, 2012), a plan describes research design, structure and strategy of inquiry regarded to provide answers to the proposed research questions to the problem. Research design was as well defined to be a blueprint for conducting a study with the higher set limits to regulate factors that may affect the rationality of the results by (Burns and Grove, 2009). Only one organization was used in this study as the case study. The referred case study is seen as being an intensive investigation of the particular unit under consideration. A case study has been chosen because of the key role that it plays in collecting critical information about a phenomenon under study.

3.3 Target Population

In view of the research question stated above, the target population of this research was staff from the PPP Unit inside The National Treasury of the Government of Kenya, Kenya Electricity Generating Company (KenGen), Energy Regulatory Commission (ERC) and Geothermal Development Company (GDC) under the Ministry of Energy and Petroleum. These respondents were selected since they were involved both in PPP partnership process where KenGen was the contracting authority for the geothermal infrastructure project in Naivasha, GDC is a Special Purpose Vehicle (SPV) to quicken the improvement of geothermal assets in Kenya while ERC is in charge of controlling sustainable power source and different types of vitality, readiness of demonstrative national vitality design, gathering and keeping up vitality information among

others. The PPP Unit center is to fill in as the secretariat and specialized arm of the PPP Committee, which is commanded with evaluating and endorsing PPP extends in the nation. The investigation targets 150 staff individuals from the four gatherings as Shown in table 3.1.

Table 3. 1: Target Population

| | Population | Percentage |
|--------------|-------------------|-------------------|
| PPP Unit | 25 | 16.7 |
| ERC | 27 | 18.0 |
| KenGen | 48 | 32.0 |
| GDC | 50 | 33.3 |
| Total | 150 | 100.0 |

Source: MoE&P records (2017)

3.4 Sample Size and Sampling Procedure

3.4.1 Sample Size

As indicated by Krejcie and Morgan (Krejcie and Morgan, 1970), "as the populace builds, the specimen measure increments at a lessening rate and remains moderately steady at somewhat more than 380 cases." In this examination, the target study population had been estimated to be 150 and as such the Krejcie & Morgan table of (1970) attached, recommends a sample size of 108. In this study 108 respondents will form part of the study. This is illustrated in the Table 3.2;

3.4.2 Sampling Procedure

Sampling is the process of gathering data where few population elements are selected and the outcomes are taken to represent the entire population. In making up a sample, all the necessary and needed number of elements, objects and respondents from the population frame are selected. Stratified random sampling method will be used in picking the sample to be used in this study. Kothari (2004) stated that stratified random sampling technique is preferred because of its representativeness of the population and homogeneity of the estimates of the population parameter thus resulting to greater precision. Dividing the population into numerous strata helps in reducing the standard errors and controlling variance. In this study, the population will be

divided into four different categories including staff members from the PPP Unit inside The National Treasury of the Government of Kenya, Kenya Electricity Generating Company (KenGen), Energy Regulatory Commission and Geothermal Development Company (GDC) under the Ministry of Energy and Petroleum. Basic irregular inspecting will be utilized to choose the respondents from every stratum where a proportion of 30% will be taken from all the available strata. Sampling error in a population is reduced by the frequency of the random sampling (Cooper and Schindler, 2003).

Table 3. 2: Sampling Frame

The sample size at category is arrived at by using the proportionate method.

PPP Unit: $108(25/150) = 18$

ERC: $108(27/150) = 19$

KenGen: $108(48/150) = 35$

GDC: $108(50/150) = 36$

| | Population | Sample |
|--------------|-------------------|---------------|
| PPP Unit | 25 | 18 |
| ERC | 27 | 19 |
| KenGen | 48 | 35 |
| GDC | 50 | 36 |
| Total | 150 | 108 |

3.5 Research Instruments

The variables of this study were measured by the use of questionnaires. Questionnaires were used because they are inexpensive, also ensure anonymity and permit the utilization of the standardized questions, provide time for subjects to think about responses, and it is easy to score (Saunders, 2012). The instruments were divided into seven sections (section A, B, C, D, E, F and G). Section A inquired about the demographic information of the respondents such as level of education and experience, Section B contained questions regarding provision of quality work,

Section C: expertise knowledge and skills, Section D: cost effectiveness to deliver infrastructure project, Section E: use of appropriate technology, Section F: meeting budget constraints and Section G: completion of geothermal energy infrastructure projects.

3.5.1 Pilot Testing of Instruments

Prior to the main study, the specialist completed steering of research instruments among 10 respondents from the private accomplices which is 10% of the example estimate. The steering test ought to be 1 to 10% of study test contingent upon the examination test measure. (Mugenda and Mugenda, 2003). The pilot assemble was done through arbitrary examining. Steering help in uncovering questions that could be unclear which takes into account their audit until the point that they pass on a similar importance to every one of the subjects (Creswell, 2008). The opinions and suggestions was incorporated into the revised and final draft of the instruments, however, the pilot group was not be involved in the final study.

3.5.2 Validity of Research Instruments

Validity is the degree of which research instruments measure the intended information and consequently allows appropriate interpretation of scores (Gay et al 2009). To ascertain the validity of research instrument, the researcher consulted with the research supervisor to compare questions in the instruments vis-à-vis objectives or research questions. This focused on content and construct validity. Content legitimacy guarantees that all respondents comprehend the things on the survey likewise to abstain from misconception and furthermore yields a consistent judgment with reference to whether the instrument covers what it should.

3.5.3 Reliability of Research Instruments

Reliability is the level of consistency in measures (Gay, et al., 2009). The idea of unwavering quality alludes to the devices being utilized to watch, measure, and analyze the variable under investigation. The dependability relies upon the exploration poll that will be utilized as a part of this investigation and it gives solid data that will be utilized as a part of basic leadership. The unwavering quality of the instrument will be evaluated utilizing Cronbach's Alpha Coefficient which is a measure of interior coefficient.

3.6 Data Collection Procedure

The researcher collected data through questionnaires. The questionnaires are closed-ended to avoid biasness. The questionnaires are formulated in such a way as to meet the objectives of the study. The main reasons for using questionnaires was on the basis that it; ensures unanimity, uniformity, economy and time saving, suitability in special type of response and less pressure on the respondents. The analyst looked for the assent from the head of divisions and organizations required to complete the information gathering. The scientist connected with inquire about collaborators who aided information gathering. The exploration collaborators were prepared to plainly comprehend the examination instruments, motivation behind the investigation and morals of research. The scientist and research partners regulated the polls to the objective respondents on a working day when most respondents were accessible. The surveys were controlled through drop and pick later technique, nonetheless, the exploration partners waited for respondents who had time to fill in as they wait. The questionnaires were collected within two working days for data analysis.

3.7 Data Analysis Techniques

Response received was dissected utilizing illustrative and inferential insights. Information gathered was coded, entered and broke down utilizing Statistical Package for Social Science (SPSS, Version 21.0). SPSS was utilized on the grounds that it is quick and adaptable and gives more exact investigation bringing about tried and true conclusions. As per Cresswell, (2013) SPSS is outlined particularly for the investigation of sociology information and contains the greater part of the schedules social researchers utilize. Information examination included calculation of specific measures alongside hunting down examples of connections that exist between the needy variable and free factors. The information was dissected by factors and goals of the investigation. Engaging insights was utilized to break down, exhibit and translate information. Enlightening investigation included the utilization of recurrence dissemination tables. Moreover, the analyst additionally led inferential examination which included coefficient of connection, coefficient of assurance, ANOVA and a different relapse investigation to build up the quality and connection between the reliant and autonomous factors.

The following multi-regression model equation was used in this study since it had five independent variables;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \epsilon$$

Where:

Y represents the dependent variable (Completion of geothermal energy infrastructure project)

β_0 =constant

X_1 = provision of quality work

X_2 = expertise knowledge and skills

X_3 = cost effectiveness

X_4 = use of appropriate technology

X_5 = budget constraints

ϵ = Error Term normally distributed about a mean of 0 and for purpose of computation, the ϵ is assumed to be 0.

3.8 Ethical Consideration

Due to legal and ethical considerations in carrying out the study, the researcher exercised care that the rights of those who participated in the investigation were protected. To uphold the legal requirement, the researcher observed the principle of beneficence which includes freedom from harm, exploitation and risk benefit ratio. Justice is another principle that the researcher observed while carrying out the study. It includes the privilege to reasonable treatment and the privilege to security.

To guarantee that moral thought is kept up, a letter from the University was gotten. The specialist additionally sought after an allow from the National Council of Science Technology and Innovation (NACOSTI) in Nairobi offices. This was to enable the researcher carry out the research in an acceptable way as NACOSTI ensures that research ethics are observed during the entire research exercise.

3.9 Operationalization of the Variables

| Objective | Variable | Indicators | Measure ment scale | Research Approach | Tools of analysis | Type of data analysis |
|-----------|----------|------------|--------------------------|----------------------|----------------------|-----------------------------|
| | | | | | | |

| | | | | | | |
|--|--|---|---------|--------------------|--------------------------------------|--|
| To establish how provision of quality work influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County | Independent: Provision of quality work | <ul style="list-style-type: none"> – Pay and fringe benefits – Job security – Work intensity – Intrinsic job rewards – Knowledge and skills | Nominal | Descriptive Design | Mean Std deviation Percentage | Descriptive Regression analysis |
| To establish how expertise knowledge and skills influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County | Expertise knowledge and skills | <ul style="list-style-type: none"> – Creativity and Innovation – Work ethic – Positive core self-evaluation – Teamwork and collaboration – Intellectual openness | Nominal | Descriptive Design | Mean Std deviation Percentage | Descriptive Regression analysis |
| To establish how cost effectiveness to deliver infrastructure project influence the | Cost effectiveness | <ul style="list-style-type: none"> – Cost reductions – Availability to labour – Availability of raw materials – Access to new markets | Nominal | Descriptive Design | Mean Std deviation Percentage | Descriptive Regression analysis |

| | | | | | | |
|---|-------------------------------|--|---------|--------------------|---|---|
| completion of geothermal energy infrastructure projects in Naivasha Sub-County | | – Productivity improvement | | | | |
| To determine the extent to which use of appropriate technology influence completion of geothermal energy infrastructure projects in Naivasha Sub-County | Use of appropriate technology | <ul style="list-style-type: none"> – Acceptability of technology – Ease of use – Easy to maintain – Affordability – Autonomy | Nominal | Descriptive Design | <p>Mean Std deviation</p> <p>Percentage</p> | <p>Descriptive</p> <p>Regression analysis</p> |
| To examine how meeting budget constraints influence the completion of geothermal energy infrastructure projects in Naivasha | Meeting budget constraints | <ul style="list-style-type: none"> – Sharing of financial risks – Support the budget deficit – Debts avoidance – Economic viability – Sharing of responsibility | Nominal | Descriptive Design | <p>Mean Std deviation</p> <p>Percentage</p> | <p>Descriptive</p> <p>Regression analysis</p> |

| | | | | | | |
|--|---|--|------------------|--------------------|--|---|
| Sub-County | | | | | | |
| To determine the extent of completion of geothermal energy infrastructure projects | Completion of geothermal energy infrastructure projects | <ul style="list-style-type: none"> - Timely delivery of project - Delivery of the project on desired quality - Customer satisfaction - Delivery of the project within the budget cost - Safety and health project environment | Nominal interval | Descriptive Design | | <p>Descriptive</p> <p>Regression analysis</p> |

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, INTERPRATATION AND DISCUSSIONS

4.1 Introduction

Presentation of the findings and discussion are discussed with respect to the study objectives in this chapter. The sections of the chapter will be: Questionnaire return rate, background information of the respondents, Provision of quality work and completion of geothermal energy infrastructure projects in Naivasha Sub-County, Expertise knowledge and skills and completion of geothermal energy infrastructure projects in Naivasha Sub-County, Cost effectiveness to deliver infrastructure project and completion of geothermal energy infrastructure projects in Naivasha Sub-County, Use of appropriate technology and completion of geothermal energy infrastructure projects in Naivasha Sub-County, and Meeting budget constraints and completion of geothermal energy infrastructure projects in Naivasha Sub-County..

4.2 Questionnaire Return Rate

The study sampled a total of 108 respondents who were issued with questionnaires out of which 91 dully filled and returned. This represented 84.2% return rate and the result of return rate is presented in table 4.1.

Table 4.1: Questionnaire Return Rate

| Category | Frequency | Percentage |
|--------------------------|------------|--------------|
| Returned questionnaire | 91 | 84.2 |
| Unreturned questionnaire | 17 | 15.8 |
| Total | 108 | 100.0 |

This is considered agreeable to make conclusions for the study. This study is presented by Bailey (2000) who says that a return rate greater than 70% is considered excellent. This suggests in light of this statement; the return rate for this study is great.

4.3 Background Information of the Respondents

This section sought to establish the background information of the respondents by looking at the years of service in the PPP infrastructure projects, education level and sector of the respondents. The findings are shown in the subsequent sub-sections.

4.3.3 Distribution of respondents by years of involvement in PPP infrastructure projects

The desire to know how long the respondents have been involved in PPP infrastructure projects was important because the number of years one has accumulated in the PPP infrastructure projects is an indicator of experience and therefore the experience is supposed to help in facilitating successful completion of PPP infrastructure projects. In this context, the respondents were asked to state length of service of involvement with PPP infrastructure projects. The results are presented in table 4.2

Table 4. 2: Distribution of respondents by years of service

| Years of Service | Frequency | Percentage (%) |
|-------------------------|------------------|-----------------------|
| Less than 1 year | 7 | 8 |
| 1-5 | 14 | 15 |
| 6-10 | 21 | 23 |
| 11-15 | 28 | 31 |
| 20 and above | 21 | 23 |
| Total | 91 | 100.0 |

The findings in table 4.2 illustrates that out of 91 respondents who participated in the study, 28(31%) had been involved in in PPP infrastructure projects between 11 and 15 years, 21(23%) had been involved for 6-10 years and 20 years and above each, 14(15%) had been involved in PPP infrastructure projects between 1 and 5 and 7(8%) had been involved in in PPP infrastructure projects for less than 1 year.

This finding indicates that more than 70 (77%) of the respondents who participated in the study have been involved in PPP infrastructure projects for more than 5 years. This is an indication that those involved in PPP infrastructure projects have enough experience to help in the timely completion of PPP infrastructure projects.

4.3.4 Distribution of Respondents by Level of Education

The study sought to know the level of education of participants in the study. This was important because education has a lot of influence on innovation, adoption of methodologies, meeting project goals, and meeting the budgets for PPP infrastructure projects. Therefore the respondents were asked to state their level of education and the results are represented in table 4.3.

Table 4. 3: Distribution of respondents by Level of Education

| Level of Education | Frequency | Percentage (%) |
|---------------------------|------------------|-----------------------|
| College Diploma | 10 | 11 |
| Bachelor’s Degree | 52 | 57 |
| Master’s degree | 24 | 26 |
| PHD | 5 | 5 |
| Total | 91 | 100.0 |

Of 91 who participated in the study, 52(57%) had Bachelors qualifications, 24 (26%) had master’s degree qualification, 10(11%) had college diploma while 5(5%) had PHD qualifications. The results indicate 81 (88%) of those involved in PPP infrastructure projects had bachelor degree and above. Therefore, when it comes to academic qualifications, they have adequate personnel with the right credentials that can lead to successful completion of PPP infrastructure projects, hence, if PPP infrastructure projects are experiencing completion problems, then there is something else other than academic qualifications.

4.3.5 Distribution of Respondents by Sector

The study sought to get information from participants to establish their designations because energy infrastructure projects involve stakeholders from different sectors. Therefore the respondents were asked to state their designations and this is represented in table 4.4.

Table 4. 4: Distribution of Respondents by Sector

| Sector | Frequency | Percentage (%) |
|---------------|------------------|-----------------------|
| PPP Unit | 12 | 13 |
| KenGen | 30 | 33 |
| ERC | 13 | 14 |
| GDC | 36 | 40 |
| Total | 91 | 100.0 |

Out of 91 participants who participated in the study, 36(40%) represented Geothermal Development Company (GDC), 30(33%) represented Kenya Electricity Generating Company (KenGen), 13 (14%) represented Energy Regulatory Commission (ERC) and 12 (13%) represented public private partnership unit. The results indicate that the key stakeholders in PPP infrastructure projects in geothermal sector are involved. The involvement of PPP unit in geothermal projects is concerned with assessing and approving PPP projects in the country. There response in this study therefore will be with regards to their technical support in ensuring that geothermal infrastructure projects are successful completed as they assume an extensive part in distinguishing issues, making suggestions to the PPP Committee with respect to potential arrangements, and guaranteeing that activities meet such quality criteria as reasonableness, esteem for cash, and proper exchange of hazard which these investigation tries to set up.

There were also respondents from KenGen who are the contracting authority for the geothermal energy infrastructure projects in Naivasha Sub-County and also the main electricity providers in the country producing about 75% of the electricity ranging from hydro, geothermal, thermal and wind. As the key contracting authority and producer of electricity, their involvement in the study will provide an insight on how PPP influences completion of geothermal projects. Involvement of experts from ERC and GDC will provide the study with the status of the development of geothermal resources in the country.

4.4 Provision of Quality Work and Completion of Geothermal Energy Infrastructure Projects

The researcher asked the study participants to give their opinion on provision of quality work and completion of geothermal energy infrastructure projects in Naivasha Sub-County. Based on statements on a Likert scale of 1-5, where 1 = very low extent, 2 = low extent, 3 = moderate extent, 4 = great extent and 5 = very great extent. Results are presented in table 4.5.

Table 4. 5: Statements on Provision of Quality Work and Completion of Geothermal Energy Infrastructure Projects

| Item | Statements | 1 | 2 | 3 | 4 | 5 | Mean | SD |
|------|--|-----------|-----------|-------------|-------------|-------------|------|------|
| 1 | Pay and fringe benefits to employees by the employer lead to provision of quality work | 1 (1%) | 2 (2%) | 5 (6%) | 50 (55%) | 33 (36%) | 4.23 | 0.14 |
| 2 | Job security for employees lead to provision of quality work | 3 (3%) | 1 (1%) | 11 (12%) | 56 (62%) | 20 (22%) | 3.98 | 0.21 |
| 3 | Work intensity ensures employees are committed and leads to quality work | 1 (1%) | 1 (1%) | 11 (12%) | 57 (63%) | 21 (23%) | 4.05 | 0.29 |
| 4 | Intrinsic job rewards leads to provision of quality work | 0 (0%) | 0 (0%) | 5 (6%) | 62 (68%) | 24 (26%) | 4.20 | 0.18 |
| 5 | Provision of quality work by employees depends on knowledge and skills | 0 (0%) | 1 (1%) | 8 (9%) | 52 (57%) | 30 (33%) | 4.21 | 0.16 |
| | Composite Mean/ Standard deviation | | | | | | 4.13 | 0.20 |

From the study findings, most of the respondents were in agreement that pay and fringe benefits offered to employees by their employers in the sector leads to provision of quality work as shown by 50(55%) of the respondents who agreed to a great extent and 33(36%) respondents who agreed to a very great extent. This can be summarized by a mean score of 4.23 indicating that the respondents agreed to a great extent with the statement.

On whether job security for employees lead to provision of quality work, 56 (62%) of the respondents agreed to a great extent, 20 (22%) very great extent and 11 (12%) moderating. This can be further shown by a mean score of 3.98 which indicates that the respondents agreed to a great extent that job security for employees lead to provision of quality work in the completion of geothermal energy infrastructure projects.

The respondents also agreed to a great and very great extent that work intensity ensures employees are committed and leads to quality work as shown by 57 (63%) and 21 (23%) of the respondents respectively. The study can deduce that the commitment of which is one of the determinants of the quality of work an employee can provide is highly dependent on work intensity.

The respondents also agreed to a great extent and very great extent that intrinsic job rewards leads to provision of quality work as illustrated by 62 (68%) and 24 (26%) respectively. The responses are further summarized by a mean score of 4.20 which shows that intrinsic job rewards leads to provision of quality work to a great extent in the geothermal infrastructure projects.

When asked whether provision of quality work by employees depends on knowledge and skills, the respondents agreed to a great extent as shown by 52 (57%) of the respondents. From the composite mean of 4.13, it is clear that public private partnership plays a critical role in ensuring the quality of the work provided in the geothermal infrastructure projects by the employees is beyond reproach. As indicated by Ruto and Ismail (2017), the national governments are seen as using the PPP relationship in their procurement procedures to help in quality service deliveries to their citizens and encourage a long-term approach to the creation and management of public sector assets.

4.5 Expertise Knowledge and Skills and Completion of Geothermal Energy Infrastructure Projects

The respondents who participated in the study were asked to give their opinion on expertise knowledge and skills and completion of geothermal energy infrastructure projects in Naivasha Sub-County. Results are presented in table 4.6.

Table 4. 6: Statements on Expertise Knowledge and Skills and Completion of Geothermal Energy Infrastructure Projects

| Items | Statements | 1 | 2 | 3 | 4 | 5 | Mean | SD |
|-------|---|-----------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1 | Creativity and Innovation depends entirely on employees knowledge and skills | 0 (0%) | 2 (2%) | 13 (14%) | 49 (54%) | 27 (30%) | 4.35 | 0.88 |
| 2 | Work ethic enhances expertise knowledge and skills in employment | 0 (0%) | 5 (6%) | 16 (17%) | 57 (63%) | 13 (14%) | 4.15 | 1.49 |
| 3 | Positive core self-evaluation improves on the expertise knowledge and skills | 0 (0%) | 0 (0%) | 21 (23%) | 53 (58%) | 17 (19%) | 4.11 | 0.81 |
| 4 | Teamwork and collaboration leads to expertise knowledge and skills | 0 (0%) | 11 (12%) | 31 (34%) | 23 (25%) | 26 (29%) | 4.27 | 0.62 |
| 5 | Intellectual openness leads to learning and enhances expertise knowledge and skills | 0 (0%) | 5 (6%) | 34 (37%) | 37 (41%) | 15 (16%) | 3.91 | 0.78 |
| | Composite Mean/ Standard deviation | | | | | | 4.16 | 0.92 |

It was found that most of the employees agree that creativity and innovation depends entirely on employees' knowledge and skills as shown by 49(54%) and 27(30%) respondents who agreed to a great extent and very great extent respectively. The respondents also agreed that work ethic enhances expertise knowledge and skills in employment to a great extent as shown by 57(63%) a mean score of the respondents and a mean score of 4.35. Project administration expertise, such as setting and managing scope, timelines and budgets are competency measures that the project managers or employees must possess in structuring the project task to clarify scope hence employee expertise and skills are essential.

It was also agreed to a great extent that positive core self-evaluation improves on the expertise knowledge and skills as shown by a mean score of 4.15.

On whether teamwork and collaboration leads to expertise knowledge and skills, most of the respondents confirmed that there has been timely disclosure as shown by 31 (34%) and 26 (29%) of the respondents who indicated very great and greater extent respectively. The respondents also agreed to a great extent that intellectual openness leads to learning and enhances expertise knowledge and skills as shown by a mean score of 3.91.

In summary, the respondents a great to a great extent that expertise knowledge and skills of the employees greatly affects completion of geothermal energy infrastructure projects as shown by a composite mean of 4.16 The study have revealed that creativity, work ethics and intellectual openness by the employees leads to successful completion of geothermal energy infrastructure projects. The findings conform to Bouma and Berkhout (2015) findings that PPP results in advanced expertise and experience which further encourages innovation, costs of operations reduction, shorter delivery times and improvement in the functional design, better facility management and operational processes. The findings also support Ngugi’s (2012) that geothermal infrastructure requires expensive equipment and experts for both management and technical work and with PPP collaboration, the experts and machines are easily accessed.

4.6 Cost Effectiveness and Completion of Geothermal Energy Infrastructure Projects

The respondents who participated in the study were asked to give their opinion on cost effectiveness and completion of geothermal energy infrastructure projects in Naivasha Sub-County. Results are presented in the table 4.7.

Table 4. 7: Statements on Cost Effectiveness and Completion of Geothermal Energy Infrastructure Projects

| Item | Statements | 1 | 2 | 3 | 4 | 5 | Mean | SD |
|------|--|-----------|-----------|-------------|-------------|-------------|------|------|
| 1 | Provision of services / products at a reduced cost ensures cost effectiveness in the delivery of the project | 0 (0%) | 1 (1%) | 18 (20%) | 43 (47%) | 29 (32%) | 4.15 | 0.70 |
| 2 | Availability of labor ensures cost effectiveness in the use of labor | 2 (2%) | 4 (5%) | 25 (27%) | 50 (55%) | 10 (11%) | 3.96 | 1.33 |
| 3 | Availability of raw materials guarantees completion of | 0 (0%) | 0 (0%) | 14 (15%) | 36 (40%) | 41 (45%) | 4.46 | 0.71 |

| | | | | | | | | |
|---|---|-----------|-----------|-------------|-------------|-------------|-------------|-------------|
| | infrastructure project and its cost effectiveness | | | | | | | |
| 4 | Access to new markets increases demand of products/services that leads to economies of scale hence cost effectiveness | 0 (0%) | 0 (0%) | 21 (23%) | 47 (52%) | 23 (25%) | 3.93 | 0.84 |
| 5 | Use of modern technology in productivity improvement leads to cost effectiveness | 0 (0%) | 0 (0%) | 12 (13%) | 39 (43%) | 40 (44%) | 4.26 | 0.88 |
| | Composite Mean/ Standard deviation | | | | | | 4.15 | 0.89 |

According to Table 4.7, majority of the respondents agreed to a great extent that; provision of services / products at a reduced cost ensures cost effectiveness in the delivery of the project as shown by a mean score of 4.15.

A larger percentage of the respondents also indicated that availability of labor ensures cost effectiveness in the use of labor to a greater extent as shown by 50(55%) and 25(27%) respondents who indicated a moderate extent. This is depicted by a mean score of 3.96.

On whether availability of raw materials guarantees completion of infrastructure project and its cost effectiveness, 14(15%), 36(40%) and 41(45%) agreed to a moderate extent, greater extent and very great extent respectively. This gave an average response that the availability of raw materials guarantees completion of infrastructure project and its cost effectiveness to a great extent as shown by a mean score of 4.46.

The respondents further revealed that access to new markets increases demand of products/services that leads to economies of scale hence cost effectiveness to a great extent as shown by a mean score of 3.93 and that the use of modern technology in productivity improvement leads to cost effectiveness to a great extent as shown by a mean score of 4.26.

The composite mean of 4.15 further shows that the respondents agreed to a great extent that cost effectiveness greatly affects the completion of geothermal energy infrastructure projects. This is in line with Asian Development Bank report (2012) that the collaboration between public and

private sectors results in efficient use of resources thus, enabling the project management teams organizes the resources to help in acquisition of proper technology to run the project hence making PPP project cost effective. The findings also agree with Harris (2006) argument PPP leads to inventive and less expensive plans, general expenses for proficient administrations, for example, those for reviews and contract administration exercises are diminished, the dangers of undertaking invades are decreased by configuration fabricate contracts; and the cost of working or keeping up offices by applying economies of scale, imaginative advances, acquisitions and remuneration game plans that are more adaptable.

4.7 Use of Appropriate Technology and Completion of Geothermal Energy Infrastructure Projects

The respondents who participated in the study were asked to give their opinion on use of appropriate technology and completion of geothermal energy infrastructure projects in Naivasha Sub-County. Results are presented in table 4.8.

Table 4. 8: Statements on Use of Appropriate Technology and Completion of Geothermal Energy Infrastructure Projects

| Items | Statements | 1 | 2 | 3 | 4 | 5 | Mean | SD |
|-------|---|-----------|-----------|-------------|-------------|-------------|------|------|
| 1 | Use of appropriate technology influences user acceptance of the technology in terms of its intended purpose. | 0 (0%) | 0 (0%) | 12 (13%) | 47 (52%) | 32 (35%) | 4.06 | 0.91 |
| 2 | Ease of use of adopted technology does not necessarily depend on the use of appropriate technology. | 0 (0%) | 4 (4) | 9 (10%) | 48 (53%) | 30 (33%) | 4.35 | 1.33 |
| 3 | Use of appropriate technology ensures selection of technology that is easy to maintain. | 0 (0%) | 0 (0%) | 12 (13%) | 57 (63%) | 22 (24%) | 4.16 | 0.55 |
| 4 | Affordability of technology influences its sustainability which entirely depends on use of appropriate technology | 0 (0%) | 0 (0%) | 7 (8%) | 31 (34%) | 53 (58%) | 4.44 | 0.72 |
| 5 | Use of appropriate technology | 0 | 0 | 2 | 32 | 57 | 4.46 | 0.94 |

| | | | | | | | | |
|--|--|------|------|------|-------|-------|-------------|-------------|
| | guarantees autonomous technology that functions with little or no human intervention | (0%) | (0%) | (2%) | (35%) | (63%) | | |
| | Composite Mean/ Standard deviation | | | | | | 4.29 | 0.89 |

On the statements under the effect of the use of appropriate technology on completion of geothermal energy infrastructure projects in Naivasha Sub-County, the respondents were in agreement that; use of appropriate technology influences user acceptance of the technology in terms of its intended purpose, ease of use of adopted technology does not necessarily depend on the use of appropriate technology and use of appropriate technology ensures selection of technology that is easy to maintain as shown by mean scores of 4.06, 4.35 and 4.16 respectively.

The study also revealed that affordability of technology influences its sustainability which entirely depends on use of appropriate technology and use of appropriate technology guarantees autonomous technology that functions with little or no human intervention to a great extent as shown by a mean of 4.44 and 4.46 respectively. Technology has an effect on the effective completion of geothermal infrastructure project as found by Mbiti (2017) that technology has an effect on the effective implementation of SGR project in Kenya.

4.8 Meeting Budget Constraints and Completion of Geothermal Energy Infrastructure Projects

The respondents who participated in the study were asked to give their opinion on meeting budget constraints and completion of geothermal energy infrastructure projects in Naivasha Sub-County. Results are presented in table 4.9.

Table 4. 9: Statements on Meeting Budget Constraints and Completion of Geothermal Energy Infrastructure Projects

| Items | Statements | 1 | 2 | 3 | 4 | 5 | Mean | SD |
|-------|---|-----------|-----------|-----------|-------------|-------------|------|------|
| 1 | The sharing of financial risk to meet budget constraints enables both public and private players to focus their | 0 (0%) | 2 (2%) | 8 (9%) | 52 (57%) | 29 (32%) | 4.21 | 0.78 |

| | | | | | | | | |
|---|--|-----------|-----------|------------|-------------|-------------|-------------|-------------|
| | strengths and resources for the project's benefit. | | | | | | | |
| 2 | Ability to harness additional financial resources and operating efficiencies cap budget deficit thus meeting budget constraints. | 0 (0%) | 4 (4%) | 5 (6%) | 59 (65%) | 23 (25%) | 4.08 | 0.66 |
| 3 | Availability of additional resources to meet budget constraints leads to debt avoidance. | 0 (0%) | 0 (0%) | 7 (8%) | 56 (61%) | 28 (31%) | 4.41 | 0.59 |
| 4 | PPP investment to meet budget constraints increase GDP per capita, implying that consistent investment in PPPs will increase GDP levels sizably making it economic viable. | 0 (0%) | 0 (0%) | 4 (5%) | 35 (38%) | 52 (57%) | 4.48 | 0.53 |
| 5 | Sharing the responsibility for a given project reduces the pressures imposed on the public agency while simultaneously acting as a quality control mechanism thus meeting budget constraints | 0 (0%) | 0 (0%) | 9 (10%) | 27 (30%) | 55 (60%) | 4.32 | 0.63 |
| | Composite Mean/ Standard deviation | | | | | | 4.30 | 0.64 |

The study found that sharing of financial risk to meet budget constraints enables both public and private players to focus their strengths and resources for the project's benefit to a great extent as shown by mean score of 4.21. The study also found that ability to harness additional financial resources and operating efficiencies cap budget deficit thus meeting budget constraints and Availability of additional resources to meet budget constraints leads to debt avoidance to a great extent as shown by mean scores of 4.08 and 4.41 respectively. The study respondents also agreed to a great extent that PPP investment to meet budget constraints increase GDP per capita, implying that consistent investment in PPPs will increase GDP levels sizably making it economic viable and sharing the responsibility for a given project reduces the pressures imposed on the public agency while simultaneously acting as a quality control mechanism thus meeting budget constraints to a great extent as shown by mean score of 4.48 and 4.32 respectively.

It is evident from the composite mean of 4.30 that involvement of PPP in geothermal energy infrastructure projects through the funding cost sharing greatly affects the completion of such projects to a great extent.

Financial challenges in the completion of geothermal infrastructure projects impose financial constraint which may result in the projects abandonment at the early stage as alluded by Karuingi (2014). To avoid such budget constraint which is likely to result in delays of the project's completion date; most governments have adopted the involvement of PPP which comes along with enough finance in delivering the project at the right time.

4.9 Completion of Geothermal Energy Infrastructure Projects

The study finally sought to establish the extent to which geothermal energy infrastructure projects have been completed in Naivasha Sub-County. The respondents were required to indicate their level of agreement with statements on completion of geothermal energy infrastructure projects. The results are shown in table 4.10.

Table 4. 10: Statements on Completion of Geothermal Energy Infrastructure Projects

| Items | Statements | 1 | 2 | 3 | 4 | 5 | Mean | SD |
|-------|---|-----------|-----------|-------------|-------------|-------------|-------------|-------------|
| 1 | The projects are delivered on time | 0 (0%) | 0 (0%) | 21 (23%) | 33 (36%) | 37 (41%) | 4.35 | 0.89 |
| 2 | The projects are delivered on desired quality or specification level | 0 (0%) | 0 (0%) | 2 (2%) | 24 (26%) | 65 (71%) | 4.62 | 0.86 |
| 3 | The projects meets customer quality requirements | 0 (0%) | 0 (0%) | 15 (16%) | 40 (44%) | 36 (40%) | 4.30 | 0.95 |
| 4 | The projects are delivered within the budget cost | 0 (0%) | 0 (0%) | 9 (10%) | 51 (56%) | 31 (34%) | 4.43 | 0.65 |
| 5 | The projects considers infrastructure design, mitigation strategies to minimize the likelihood of a significant adverse effect on the environment | 0 (0%) | 0 (0%) | 0 (0%) | 28 (31%) | 63 (69%) | 4.56 | 0.57 |
| | Composite Mean/ Standard deviation | | | | | | 4.45 | 0.78 |

From the study findings, the respondents agreed to a very great extent that projects are delivered on time, the projects are delivered on desired quality or specification level, projects meets

customer quality requirements, projects are delivered within the budget cost and that the geothermal projects considers infrastructure design, mitigation strategies to minimize the likelihood of a significant adverse effect on the environment as indicated by mean scores of 4.35, 4.62, 4.30, 4.43 and 4.56 respectively.

4.10 Regression Analysis

Table 4. 11: Model Summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------|----------|-------------------|----------------------------|
| 1 | 0.783 | 0.636 | 0.617 | 0.217 |

Table 4.11 is a model fit which establish how fit the model equation fits the data. The R value represents a simple correlation which is 0.783. This shows a strong linear relationship between public private partnership influence and completion of geothermal energy infrastructure projects. The adjusted R² was used to establish the predictive power of the study model and it was found to be 0.636 implying that 63.8% of the variations in completion of geothermal energy infrastructure projects in Naivasha Sub-County, Kenya are explained by provision of quality work, expertise knowledge and skills, cost effectiveness, use of appropriate technology and meeting budget constraints leaving 36.8% percent unexplained. Therefore, further studies should be done to establish the other factors (36.8%) affecting the completion of geothermal energy infrastructure projects in Naivasha Sub-County.

Table 4. 12: ANOVA Results

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|-------|------------|----------------|----|-------------|--------|-------|
| 1 | Regression | 5.262 | 5 | 1.052 | 39.634 | 0.000 |

| | | | | | | |
|--|----------|-------|----|-------|--|--|
| | Residual | 2.257 | 85 | 0.027 | | |
| | Total | 7.519 | 90 | | | |

The probability value of 0.000 indicates that the regression relationship was highly significant in predicting how provision of quality work, expertise knowledge and skills, cost effectiveness, use of appropriate technology and meeting budget constraints influence the completion of geothermal energy infrastructure projects. The F calculated at 5 percent level of significance was 39.634 since F calculated is greater than the F critical (value = 2.37), this shows that the overall model was significant.

Table 4. 13: Regression Coefficients

| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|-------|--------------------------------|-----------------------------|------------|---------------------------|--------|-------|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 0.902 | 0.039 | | 23.403 | 0.000 |
| | Provision of quality work | 0.529 | 0.159 | 0.312 | 3.326 | 0.001 |
| | expertise knowledge and skills | 0.423 | 0.175 | 0.674 | 2.420 | 0.018 |
| | cost effectiveness | 0.411 | 0.205 | 0.033 | 2.009 | 0.048 |
| | use of appropriate technology | 0.543 | 0.112 | 0.393 | 4.840 | 0.000 |
| | meeting budget constraints | 0.576 | 0.104 | 0.459 | 5.538 | 0.000 |

The equation;

$$(Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \epsilon)$$

Is established to the model for the study:

$$Y = 0.902 + 0.529X_1 + 0.423X_2 + 0.411X_3 + 0.543X_4 + 0.576X_5$$

The regression equation above has established that taking all factors into account (provision of quality work, expertise knowledge and skills, cost effectiveness, use of appropriate technology and meeting budget constraints) constant at zero, completion of geothermal energy infrastructure projects in Naivasha Sub-County would be 0.902. The findings presented also show that taking all other independent variables at zero, a unit increase in the provision of quality work would lead to a 0.529 increase in the scores of completion of geothermal energy infrastructure projects and a unit increase in the scores of expertise knowledge and skills would lead to a 0.423 increase in the scores of completion of geothermal energy infrastructure projects. Further, the findings shows that a unit increases in the scores of cost effectiveness would lead to a 0.411 increase in the scores of completion of geothermal energy infrastructure projects. The study also found that a unit increase in the scores of use of appropriate technology would lead to a 0.543 increase in the scores of completion of geothermal energy infrastructure projects and a unit increase in the scores of meeting budget constraints would lead to a 0.576 increase in the scores of completion of geothermal energy infrastructure projects. Overall, meeting budget constraints had the greatest effect on the completion of geothermal energy infrastructure projects, followed by use of appropriate technology, then provision of quality work and expertise knowledge and skills while cost effectiveness had the least influence on the completion of geothermal energy infrastructure projects. All the variables were significant ($p < 0.05$).

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter entails the summary of key findings as presented in chapter four; conclusions will then be drawn based on the findings and recommendations there-to. This chapter will thus be structured into summary of findings, conclusion, recommendations and areas for further research.

5.2 Summary of Findings

5.2.1 Provision of Quality Work and Completion of Geothermal Energy Infrastructure Projects

The study found that provision of quality work influences the completion of geothermal energy infrastructure projects to a great extent. It was revealed that job security, intrinsic job rewards, and pay and fringe benefits given to employees by employers in the sector are a motivation factor leading to provision of quality work. The amount of work to be done by the employees within a given timeline was also found to greatly affect the quality of work done by the employees to a great extent as it ensures employee commitment. The study also found that employees with adequate knowledge and skills will provide quality work than those with no skills or knowledge on the work at hand.

5.2.2 Expertise Knowledge and Skills and Completion of Geothermal Energy Infrastructure Projects

The study found that PPP in geothermal infrastructure projects leads to recruitment of employees with expertise knowledge and skills which further encourages creativity and innovation when dealing with such projects. This is evidenced by the findings that more than 70(77%) of the respondents who participated in the study have been involved in PPP infrastructure projects for more than 5 years. An indication that those involved in PPP infrastructure projects have enough experience to help in the timely completion of PPP infrastructure projects. The study also found that work ethic greatly enhances expertise knowledge and skills in employment.

The study further revealed that **venture organization skill, for example, setting and overseeing degree, courses of events and spending plans** are competency measures that the project managers or employees must possess in structuring the project task to clarify scope hence employee expertise and skills are essential.

It was also found that teamwork and collaboration and positive core self-evaluation improves on the expertise knowledge and skills. The results have shown that PPP results in advanced expertise and experience which further encourages teamwork and collaboration, costs of operations reduction, **shorter conveyance times and change in the practical outline, better office administration and operational procedures.**

5.2.3 Cost Effectiveness and Completion of Geothermal Energy Infrastructure Projects

The study found that PPP in geothermal infrastructure projects results to provision of services / products at a reduced cost thus ensuring cost effectiveness in the delivery of the project. The study also found that PPP in geothermal infrastructure projects leads to availability of labor, raw materials hence ensuring cost effectiveness in the use of labor and raw materials respectively to a greater extent. PPP involvement in geothermal infrastructure projects has also enabled the government and firms involved in accessing new markets increases demand of products/services that leads to economies of scale hence cost effectiveness to a great extent.

Involvement of PPP in geothermal infrastructure projects, therefore, leads to innovative and less costly designs, overall costs reduction **by applying economies of scale, inventive advances, obtainments and pay game plans that are more adaptable.**

5.2.4 Use of Appropriate Technology and Completion of Geothermal Energy Infrastructure Projects

The study found that involvement of PPP in geothermal infrastructure projects ensures use of appropriate technology in terms of; user acceptance; ease of use and ease of maintenance, which greatly affects the effective completion of geothermal infrastructure projects.

5.2.5 Meeting Budget Constraints and Completion of Geothermal Energy Infrastructure Projects

The study found that the government is able to share financial risk in public private partnership projects to meet budget constraints which empowers both the general population and private players to center their qualities and assets for the task's advantage as it were.

Through PPP, the study found that the government can harness additional financial resources and operating efficiencies cap budget deficit thus meeting budget constraints. This was further found to increase GDP levels sizably making it economically viable.

The study found that PPP enables the government to share the responsibility for a given project to reduce the pressures imposed on the public agency while simultaneously acting as a quality control mechanism to a great extent. It is evident that involvement of PPP in geothermal energy infrastructure projects through the funding cost sharing positively affects the completion of such projects to a great extent.

Based on The regression analysis; provision of quality work, expertise knowledge and skills, cost effectiveness, use of appropriate technology and meeting budget constraints positively and significantly influences the completion of geothermal energy infrastructure projects under PPP programmes in Naivasha Sub-County. Overall, meeting budget constraints by PPP had the greatest effect on the completion of geothermal energy infrastructure projects, followed by use of appropriate technology, then provision of quality work and expertise knowledge and skills while cost effectiveness had the least influence on the completion of geothermal energy infrastructure projects.

5.3 Conclusion

Based on the study findings in chapter four, the study concludes that PPP ensures high quality work towards the completion of geothermal energy infrastructure projects. The involvement of PPP ensures that there is job security, intrinsic job rewards, and pay and fringe benefits given to employees hence motivation them to provide quality work.

The study can also conclude that PPP in geothermal infrastructure projects leads to recruitment of employees with expertise knowledge and skills which encourages creativity and innovation when dealing with such projects. The study further concludes that PPP creates an environment

that instills work ethics at the work place hence enhancing expertise knowledge and skills in employment. PPP also brings on board an environment for teamwork and collaboration to share and improve on the expertise knowledge and skills. Hence, resulting to advanced expertise and experience.

PPP in geothermal infrastructure projects results to provision of services / products at a reduced cost thus ensuring cost effectiveness in the delivery of the project and also leads to availability of labor, raw materials hence ensuring cost effectiveness in the use of labor and raw materials respectively to a greater extent. PPP involvement in geothermal infrastructure projects has also enabled the government and firms involved in accessing new markets increase demand of products/services that leads to economies of scale. It can therefore be concluded that this leads to innovative and less costly designs, overall costs reduction **by applying economies of scale, inventive innovations, obtainments and remuneration courses of action that are more adaptable.**

The study concludes that involvement of PPP in geothermal infrastructure projects ensures use of appropriate technology in terms of; user acceptance; ease of use and ease of maintenance, which greatly affects the effective completion of geothermal infrastructure project.

The study concludes that through PPP the government is able to share financial risk in public private partnership projects, harness additional financial resources and operating efficiencies to cap budget deficit thus meeting budget constraints in those projects. The study found that PPP enables the government to share the responsibility for a given project to reduce the pressures imposed on the public agency while simultaneously acting as a quality control mechanism to a great extent. It is evident that involvement of PPP in geothermal energy infrastructure projects through the funding cost sharing positively affects the completion of such projects to a great extent.

Financial challenges in the completion of geothermal infrastructure projects impose financial constraint which may result in the projects abandonment at the early stage as alluded by Karuingi (2014). To avoid such budget constraint which is likely to result in delays of the project's completion date; most governments have adopted the involvement of PPP which comes along with enough finance in delivering the project at the right time.

Geothermal infrastructure projects done under PPP programmes are delivered on time, delivered on desired quality or specification level, projects meets customer quality requirements, delivered within the budget cost and considers infrastructure design, mitigation strategies to minimize the likelihood of a significant adverse effect on the environment.

5.4 Recommendations

- i. The study recommends that, to ensure Geothermal energy infrastructure projects are completed on time, the stakeholders involved must ensure that there is job security, intrinsic job rewards, and pay and fringe benefits given to employees as they are the motivating factors that leads to quality work delivered at the end of the project life cycle.
- ii. The study also recommends that the government should encourage PPP in not only geothermal infrastructure projects but big infrastructure projects as it comes along with advanced expertise and experience which encourages creativity and innovation when dealing with such projects.
- iii. The government should continue using PPP in infrastructure development as it leads to innovative and less costly designs, overall costs reduction **by applying economies of scale, innovative technologies, procurements and compensation arrangements that are more flexible.**
- iv. The government is able to share financial risk in public private partnership projects to meet budget constraints.
- v. To overcome the financial challenges in the completion of infrastructure projects, the government can use PPP to share financial risk to meet budget constraints.

5.5 Suggestion for Further Studies

The study explored the influence of public private partnership on completion of geothermal energy infrastructure projects in Naivasha Sub-County, Kenya. The study suggested that a further research be conducted on:

- i. Public private partnerships and infrastructure resilience
- ii. Legal and regulatory framework for public private partnerships in infrastructure development
- iii. Delivering transportation infrastructure through public private partnerships

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APPENDICES

Appendix I: Appendix I: Introduction Letter

Dear respondent,

RE: DATA COLLECTION

I am a postgraduate student at the University of Nairobi pursuing a Degree in Master of Arts in Project Planning and Management. As a requisite for the degree award, am carrying out a study on **PUBLIC PRIVATE PARTNERSHIP ON COMPLETION OF GEOTHERMAL ENERGY INFRASTRUCTURE PROJECTS IN NAIVASHA SUB-COUNTY, KENYA.** You and your organization have been selected to participate in this study. The attached questionnaire has been designed to help gather data from respondents. In respect to this you have been identified as one of the respondents.

Therefore, I kindly request you to facilitate the collection of the necessary data by answering the questions as precisely and factually as possible. This information sought is purely for academic purposes and this I assure you of strict confidentiality of the information given.

Yours faithfully

MURIITHI DAVIES MUGOH

MA Student

University of Nairobi

Appendix II: Research Questionnaire

This questionnaire consists of seven major sections (Section A, B, C, D, E, F and G). Kindly respond to all questions by putting a tick [√] in the box matching your answer or write your answer in the space provided if it is not included in the choices. The information given here will only be used for purposes of academic study and will be treated with utmost confidentiality. Your cooperation will be highly appreciated.

SECTION A: BACKGROUND INFORMATION

1) How long have you been involved in PPP infrastructure projects?

- | | | | |
|--------------------|-----|-------------|-----|
| Less than 1 year | [] | 1 – 5 Years | [] |
| 6 – 10 Years | [] | 11-15 Years | [] |
| 20 Years and above | [] | | |

2) What is your highest level of education?

- | | | | |
|-------------------|-----|-----------------------|-----|
| Certificate | [] | Diploma | [] |
| Bachelor's Degree | [] | Masters | [] |
| PhD | [] | Others (Specify.....) | [] |

3) Kindly, indicate the sector you are working in?

- PPP Unit []
- Kenya Electricity Generating Company (KenGen) []
- Energy Regulatory Commission (ERC) []
- Geothermal Development Company (GDC) []

SECTION B: PROVISION OF QUALITY WORK

To what extent do you think provision of quality work influence the completion of geothermal energy infrastructure project in Naivasha Sub-County?

- | | | | |
|-------------------|-----|---------------|-----|
| Very great extent | [] | Great extent | [] |
| Moderate extent | [] | Little extent | [] |
| No extent | [] | | |

4) Please indicate the extent that the following aspects of provision of quality work influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County. Use 1- Very low extent, 2-Low extent, 3-Moderate extent, 4- Great extent, 5- Very great extent.

| Items | Statements | 1 | 2 | 3 | 4 | 5 |
|-------|--|---|---|---|---|---|
| 1. | Pay and fringe benefits to employees by the employer lead to provision of quality work | | | | | |
| 2. | Job security for employees lead to provision of quality work | | | | | |
| 3. | Work intensity ensures employees are committed and leads to quality work | | | | | |
| 4. | Intrinsic job rewards leads to provision of quality work | | | | | |
| 5. | Provision of quality work by employees depends on knowledge and skills | | | | | |

5) In your opinion, how does provision of quality work influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County?

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SECTION C: EXPERTISE KNOWLEDGE AND SKILLS

6) To what extent do you think expertise knowledge and skills influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County?

- Very great extent [] Great extent []
- Moderate extent [] Little extent []
- No extent []

7) Please indicate the extent that the following aspects of expertise knowledge and skills influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County. Use 1- Very low extent, 2-Low extent, 3-Moderate extent, 4- Great extent, 5- Very great extent.

| Items | Statements | 1 | 2 | 3 | 4 | 5 |
|-------|---|---|---|---|---|---|
| 1. | Creativity and Innovation depends entirely on employees knowledge and skills | | | | | |
| 2. | Work ethic enhances expertise knowledge and skills in employment | | | | | |
| 3. | Positive core self-evaluation improves on the expertise knowledge and skills | | | | | |
| 4. | Teamwork and collaboration leads to expertise knowledge and skills | | | | | |
| 5. | Intellectual openness leads to learning and enhances expertise knowledge and skills | | | | | |

8) In your opinion, how does expertise knowledge and skills influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County?

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SECTION D: COST EFFECTIVENESS TO DELIVER INFRASTRUCTURE PROJECT

9) To what extent do you think cost effectiveness to deliver infrastructure project influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County?

- Very great extent [] Great extent []
- Moderate extent [] Little extent []
- No extent []

10) Please indicate the extent that the following aspects of cost effectiveness to deliver infrastructure project influence the completion of geothermal energy infrastructure projects in

Naivasha Sub-County. Use 1- Very low extent, 2-Low extent, 3-Moderate extent, 4- Great extent, 5- Very great extent.

| Items | Statements | 1 | 2 | 3 | 4 | 5 |
|-------|---|---|---|---|---|---|
| 1. | Provision of services / products at a reduced cost ensures cost effectiveness in the delivery of the project | | | | | |
| 2. | Availability of labor ensures cost effectiveness in the use of labor | | | | | |
| 3. | Availability of raw materials guarantees completion of infrastructure project and its cost effectiveness | | | | | |
| 4. | Access to new markets increases demand of products/services that leads to economies of scale hence cost effectiveness | | | | | |
| 5. | Use of modern technology in productivity improvement leads to cost effectiveness | | | | | |

11) In your opinion, how does cost effectiveness to deliver infrastructure project influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County?

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SECTION E: USE OF APPROPRIATE TECHNOLOGY

12) To what extent do you think use of appropriate technology influence completion of geothermal energy infrastructure projects in Naivasha Sub-County?

- Very great extent [] Great extent []
- Moderate extent [] Little extent []
- No extent []

13) Please indicate the extent that the following aspects of use of appropriate technology influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County. Use 1- Very low extent, 2-Low extent, 3-Moderate extent, 4- Great extent, 5- Very great extent.

| Items | Statements | 1 | 2 | 3 | 4 | 5 |
|-------|--|---|---|---|---|---|
| 1. | Use of appropriate technology influences user acceptance of the technology in terms of its intended purpose. | | | | | |
| 2. | Ease of use of adopted technology does not necessarily depend on the use of appropriate technology. | | | | | |
| 3. | Use of appropriate technology ensures selection of technology that is easy to maintain. | | | | | |
| 4. | Affordability of technology influences its sustainability which entirely depends on use of appropriate technology | | | | | |
| 5. | Use of appropriate technology guarantees autonomous technology that functions with little or no human intervention | | | | | |

14) In your opinion, how does use of appropriate technology influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County?

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SECTION F: MEETING BUDGET CONSTRAINTS

To what extent do you think meeting budget constraints influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County?

- Very great extent [] Great extent []
- Moderate extent [] Little extent []
- No extent []

15) Please indicate the extent that the following aspects of meeting budget constraints influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County. Use 1- Very low extent, 2-Low extent, 3-Moderate extent, 4- Great extent, 5- Very great extent.

| Items | Statements | 1 | 2 | 3 | 4 | 5 |
|-------|--|---|---|---|---|---|
| 1. | The sharing of financial risk to meet budget constraints enables both public and private players to focus their strengths and resources for the project’s benefit. | | | | | |
| 2. | Ability to harness additional financial resources and operating efficiencies cap budget deficit thus meeting budget constraints. | | | | | |
| 3. | Availability of additional resources to meet budget constraints leads to debt avoidance. | | | | | |
| 4. | PPP investment to meet budget constraints increase GDP per capita, implying that consistent investment in PPPs will increase GDP levels sizably making it economic viable. | | | | | |
| 5. | Sharing the responsibility for a given project reduces the pressures imposed on the public agency while simultaneously acting as a quality control mechanism thus meeting budget constraints | | | | | |

16) In your opinion, how do meeting budget constraints influence the completion of geothermal energy infrastructure projects in Naivasha Sub-County?

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SECTION G: COMPLETION OF GEOTHERMAL ENERGY INFRASTRUCTURE PROJECTS

17) To what extent do you agree with the following statements with regard to completion of geothermal energy infrastructure projects in Naivasha Sub-County? Use 1- Very low extent, 2-Low extent, 3-Moderate extent, 4- Great extent, 5- Very great extent.

| Items | Statements | 1 | 2 | 3 | 4 | 5 |
|--------------|---|----------|----------|----------|----------|----------|
| 1. | The projects are delivered on time | | | | | |
| 2. | The projects are delivered on desired quality or specification level | | | | | |
| 3. | The projects meets customer quality requirements | | | | | |
| 4. | The projects are delivered within the budget cost | | | | | |
| 5. | The projects considers infrastructure design, mitigation strategies to minimize the likelihood of a significant adverse effect on the environment | | | | | |

Appendix III: Krejcie and Morgan sample size table for determining sample size from a given population

| N | S | N | S | N | S | N | S | N | S |
|----|----|-----|-----|-----|-----|------|-----|---------|-----|
| 10 | 10 | 100 | 80 | 280 | 162 | 800 | 260 | 2800 | 338 |
| 15 | 14 | 110 | 86 | 290 | 165 | 850 | 265 | 3000 | 341 |
| 20 | 19 | 120 | 92 | 300 | 169 | 900 | 269 | 3500 | 246 |
| 25 | 24 | 130 | 97 | 320 | 175 | 950 | 274 | 4000 | 351 |
| 30 | 28 | 140 | 103 | 340 | 181 | 1000 | 278 | 4500 | 351 |
| 35 | 32 | 150 | 108 | 360 | 186 | 1100 | 285 | 5000 | 357 |
| 40 | 36 | 160 | 113 | 380 | 181 | 1200 | 291 | 6000 | 361 |
| 45 | 40 | 180 | 118 | 400 | 196 | 1300 | 297 | 7000 | 364 |
| 50 | 44 | 190 | 123 | 420 | 201 | 1400 | 302 | 8000 | 367 |
| 55 | 48 | 200 | 127 | 440 | 205 | 1500 | 306 | 9000 | 368 |
| 60 | 52 | 210 | 132 | 460 | 210 | 1600 | 310 | 10000 | 373 |
| 65 | 56 | 220 | 136 | 480 | 214 | 1700 | 313 | 15000 | 375 |
| 70 | 59 | 230 | 140 | 500 | 217 | 1800 | 317 | 20000 | 377 |
| 75 | 63 | 240 | 144 | 550 | 225 | 1900 | 320 | 30000 | 379 |
| 80 | 66 | 250 | 148 | 600 | 234 | 2000 | 322 | 40000 | 380 |
| 85 | 70 | 260 | 152 | 650 | 242 | 2200 | 327 | 50000 | 381 |
| 90 | 73 | 270 | 155 | 700 | 248 | 2400 | 331 | 75000 | 382 |
| 95 | 76 | 270 | 159 | 750 | 256 | 2600 | 335 | 100,000 | 384 |

Note: “N” is population size; “S” is sample size.

Source: Krejcie and Morgan, (1970)