DETERMINANT OF REGULATIONS ON GROWTH OF ELECTRICITY PROJECTS IN KENYA: A CASE STUDY OF RURAL ELECTRIFICATION AUTHORITY

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CITATION: Mwangi, C. I & Ngugi, K. (2014). Determinant of Regulations on Growth of Electricity Projects In Kenya: A Case Study of Rural Electrification Authority**.** *European Journal of Business Management, 1* (11), 336-352.

ABSTRACT

Electricity market involves a complex system where economic, technical, institutional, financial, social, political and environmental factors interact to influence the demands of the different consumers. Among all these factors, the institutions for the delivery of electricity services and the provision of reliable services particularly to household customers probably exert the greatest effect on these markets. This study sought to investigate the determinants of regulations on growth of electricity projects in Kenya with special focus to Rural Electrification Authority. The study focused on reviewing four variables i.e. stakeholders influence, technology, cost of capital, and research & development. The target population of this study was management staff at REA working in head office units. The study targeted 450 respondents while employing a simple random sampling technique in coming up with a sample size of 45 respondents. The study generated both qualitative and quantitative data where quantitative data was coded and entered into Statistical Packages for Social Scientists (SPSS Version 21) and analyzed using descriptive statistics. The study found out that top management practices, policy planning and execution are key in establishment and growth of electricity projects in Kenya. Study findings also revealed that REA has developed IT policies that assist the organization in managing projects. Similarly, the study also found out that there is mobilization of capital from donors' hence effective electrification growth. In addition the study found out that Innovation, project research and programme development are broad organisational concerns relating to performance.

Keywords: *Regulations on Growth of Electricity Projects in Kenya.*

Introduction

A project is considered successful if the project is delivered on time, on schedule and acceptable quality. However, measuring project success is a complex task since success is tangible and can hardly be agreed upon (Xiao & Proverbs, 2003). According to African Development Bank (ADB) the key challenges facing Africa's power sector are inadequate generation capacity, limited electrification, low power consumption, unreliable services, high costs, and a financing gap of approximately $23 billion a year. These challenges call for a paradigm shift in the development of the power sector that seeks to use the vast renewable resources of the continent, including hydro-potential.

It is estimated that 40% of the Kenya's population is urban and nearly half of the entire population will be urban by the year 2020(GoK, 2007; GoK, 2008; KNBS, 2010). Kenya aspires to be a middle level economy buoyed by the economic pillar under the Vision 2030 blueprint aimed at improving the living standards in Kenya (GoK, 2012). To achieve this goal, the country needs to successfully pursue disciplined and ambitious policies that will confront the many domestic and external policy challenges it now faces. The country is expected to achieve a gross domestic product (GDP) growth rate of 10% by the year 2030 as well as provide electricity connectivity to 40% of the rural population by 2020 (RoK, 2012) The contribution of the energy sector to the overall tax revenue is about 20%, equivalent to 4% of GDP (MoE, 2011). According to Cabraal et al, (2002) the production of energy should not be limited to activities related to income generation, but should also include application of energy to support important development goals such as education, health, communication and women and youth empowerment.

The county is experiencing major challenges in the energy sector due to the high expectations and demand in the manufacturing, agricultural, tourism, transport and other sectors being sharply due to increasing population, rural urban migration and the economic growth (GoK, 2010). Statistics from Kenya Institute of Public Policy and Analysis (KIPPRA) shows that the electricity demand is projected to grow from 5035Gwh in 2003/04 to 8561 Gwh in 2013/14 (KIPPRA,2012) Further surveys by World Bank (WB) shows that it takes approximately 66

days to obtain electricity connection in Kenya compared with an average of 18 days in Mexico, China and South Africa (WB,2011) The country needs to realign its strategies and investment plans in order to secure sustainable and efficiently available supply of energy to serve the growing demand (KIPPRA, 2012) According to Kenya National Bureau of Statistics (KNBS) 68% of energy needs in Kenya are met by traditional biomass (wood fuel and charcoal), while 22% consists of fossil fuels (crude oil, liquefied petroleum gas), hydropower at 9%, while geothermal, wind and solar energy each at minimally below 1% (KNBS,2011) The problem of access to modern energy is most severe in rural areas. The World Bank report (WB) shows that some areas in the Sub Saharan Africa lag far behind in the connectivity to the national grid with statistical representation of 46% and 4% representation in urban and rural centres respectively (WB, 2011) Kenya embarked on progressive and fundamental structural and regulatory reforms in the energy sector after mid-1990's following the enactment of the Electric Power Act, 1997 and later the Section 66 of the Energy Act 12 of 2006 (Kenya Energy Policy, 2012) According to Newbery, 2004 the challenge for many countries is the establishment of effective regulatory infrastructures capable of playing complementary roles in fostering success in competitive markets and safeguarding consumer welfare.

In the energy sector, the structural reforms were aimed at introducing competition in commercial segments of electricity and petroleum sub-sectors in order to attract private sector investments. The legislations include the separation of generation from transmission and distribution in the electricity sector and the liberalization of the procurement, distribution and pricing of electricity and petroleum products in the country. The Energy Act 2006 consolidated all laws relating to energy and provided for the establishment of the Energy Regulatory Commission (ERC) as a single sector regulatory agency with responsibility for economic and technical regulation of electric power, renewable energy and petroleum sub-sectors. The removal of state involvement in the day to day operation of sector utilities creates unfavourable conditions which justify efficient regulations necessary to restore efficiency and quality of service provision (Stern, 2000). In Kenya there exists monopoly in the energy utility with only the government owned companies providing for generation and distribution of electricity. The opening up to private sector may create room for investing and competition leading to more projects and increased economic growth.

Responding to the limited access to electricity, many governments have adopted the rural electrification programs. The Rural Electrification Authority (REA) charged with the mandate of implementing the rural electrification programme came into operation in July 2007. This is expected to increase the speed of implementation of several projects that are lined up for implementation throughout the country and developing a comprehensive rural electrification master plan which shall provide crucial information for selecting projects for funding at a given time. In most developing countries', rural electrification programmes (REPs) rank and prioritize locations to receive electricity (Barnes and Foley, 2004) The Kenya Power and Lighting Company (KPLC) projects 150,000 connections annually (MoE, 2010) This is generally affected by the high grid expansion costs, high connection costs, upfront investments, low threshold demand and low population densities thereby proving expensive to start. The current sources of electrical power generation are hydro 3,025 Gwh (51.2%), thermal oil 1,819 Gwh (30.8%), geothermal 1,046 Gwh (17.7%), cogeneration 6 Gwh (0.09%), wind 0.3 Gwh (0.01%) and imports 11 Gwh (0.2%). The challenges facing the power sub-sector include a weak power transmission and distribution infrastructure, maintenance and losses, high cost of power, low per capita power consumption and low countrywide electricity access.

Statement of the Problem

According to Deutshe Bank (DB) Climate Change Advisors, energy is critical for growth of gross domestic product and engine for economic development (DB, 2013).Globally and across regions, renewable energies represent promising responses to energy security and energy mix diversification of all countries whilst responding to their responsibility to their sustainability ambition (DB,2013). Kenya like any other developing countries is not an exception in facing an energy problem. With respect to the overall electricity access rates in SSA in 2008 these have been estimated at 28.5%, with the urban and rural area figures standing at 57.5% and 11.9%, respectively (International Energy Agency (IEA), 2008). Inadequate electricity generation capacity and an unreliable power supply have been perennial problems in Kenya for over a decade (Nyoike, 2002). According to the Ministry of Environment and Natural Resource (2005) indicated that over 70% of total population in Kenya derive their source of energy from wood based where more than 93% of rural households depend on this source. KPLC (2006) electrification in Kenya's is below the SSA average with 15% overall access and a breakdown of 51.3% and 5% for urban and rural areas respectively. According to International Energy Agency

(IEA) there remain 1.6 billion people globally without access to electricity (IEA, 2010). Reports from the World Bank (WB) estimated that in 2012 around 92% of the rural population (370 million people) in Sub-Saharan Africa lacked access to electricity; 70% (690 million) in South Asia; 48% (60 million) in Latin America; 22% (30 million) in North Africa (WB, 2012).

Studies by the National energy policy, 2012 revealed that Kenya with a population of over 41million has a poor electricity supply with a supply of 1500MW compared to Finland with a population of roughly around 5.5M (RoK, 2012). The National Energy Policy of Kenya (NEPK) shows 83% of the rural population has no electricity and the people who are connected experience power cuts now and then due to reliance on hydro power which is affected by climate (NEPK, 2012). Further studies by the Kenya institute of public policy research and analysis (KIPPRA) on energy consumption shows that most of households (52%) use kerosene for lighting and 60% of households use biomass for cooking (KIPPRA, 2012).

The statistics inform that there is a slow growth of electricity in Kenya (WB, 2013).Reports from the Republic of Kenya (RoK) further show that the slow growth of electricity leads to slow economic growth hindering the realization of the Vision 2030 (RoK, 2013). Empirical evidence shows that the national electrification rate increased from 35.5% in 2002 to 40% in 2010 despite the governments' ambition target to increase connectivity to at least 65% by 2022 (RoK, 2012) Further statistics from Rural electrification Authority (REA) show that rural electrification has increased from 4 per cent in 2003 to 28 per cent in June 2012 (REA, 2012). The connectivity to electricity also varies from region to region; Nairobi 53.47%, Central 42.4%, North Eastern 14.5% and Western 14.7% (Kioko,2013). The GoK objective is to increase rural electrification to 55% by 2020 and 90% by 2030 (RoK, 2012) Despite this ambition, Kenya's rural population access to electricity is considerably lower than that of the urban population (more than 80%), with some 99.5% of rural households not having access to electricity (Rabah, 2005). Therefore the study seeks to establish the determinants of regulations on the growth of electricity projects in Kenya with reference to a case study of the Rural Electrification Authority.

Objectives of the Study

General Objective

The overall objective of this study was to establish the determinant of regulations on growth of electricity projects in Kenya.

Specific Objectives

The study was based on the following research objectives:

1. To determine how stakeholders influence affect the growth and establishment of electricity in Kenya.
2. To find out whether technology influences the growth of electricity in Kenya.
3. To determine if the cost of capital affects the establishment of electricity projects in Kenya.
4. To find out if research and development influences the growth and establishment of electricity projects in Kenya.

Literature Review

Instrumental Stakeholder Theory

The instrumental stakeholder theory focuses on how stakeholders' value can be applied to improve corporate performance and efficiency. It treats stakeholders as "means to an end". This theory legitimizes the claims of stakeholders on the grounds of stake holding as an effective means to improve efficiency, profitability, competition and economic success. This view is expressed by Campbell who posits that "I support stakeholder theory not from a leftwing reason of equity, but because I believe it to be fundamental to understanding how to make money in business" (Letza et al., 2002). Authors argue that the cooperation of stakeholder groups such as employees, customers, suppliers, lenders, stockholders and management are increasingly and vitally important in determining business success and corporate survival, corporate strategy must ensure that stakeholder interests are incorporated into, rather than ignored (Freeman and Evans, 1993). A number of recent theories adopt an instrumentality orientation in advocating stake holding. (Freeman and Evans', 1993) stakeholder theory, as a business strategy, has an

instrumental orientation. (Turnbull's, 1997) corporate governance theory, based on information technology (cybernetics), also has an instrumental orientation. The inclusion of stakeholders in governance as argued for by Michael Porter in order to improve US competitiveness is also reflective of instrumentalism (Clarke & Clegg, 1998).

According to Peter and Waterman (1982) being close to the customer leads to success with other stakeholders and that a distinguishing characteristic of some companies that have performed well is their emphasis on the customer. By paying attention to customers' needs management automatically address the needs of suppliers and owners. The stakeholder theory therefore provides background to the development of project success in line with the stakeholder decision and effect where inductive thematic analysis investigates which factors stakeholders, involved in projects, perceived as key to project success. It provides a better understanding of project success and identifies perceptions by senior management, project core team and project recipient stakeholder groups. The main issue highlighted by the research was a lack of agreement in perceptions of project success factors between these three groups, highlighting discontinuity between them and provides a case for empirical research into multiple stakeholder groups' perceptions of project success. The approach selected employed a combination of a systematic integrative literature review, coding framework and thematic analysis.

Research and Development Theory

Research and development is one of the means by which business can experience future growth by developing new products or processes to improve and expand their operations. Commercial sectors need to drive growth, innovation and balancing risk. Investing on their gross revenue (not profit) into research and development without expecting a direct return usually has a long term effect. This approach has delivered outstanding results leading to an increase in revenue. The effects of regulation and firm structure on research and development (R&D) expenditures shows the behavior of a firm under a rate-of-return regulation on stringent rate-of-return constraint.

Firms are reluctant to reveal their innovative ideas to the marketplace and the fact that there could be a substantial cost to revealing information to their competitors reduces the quality of the signal they can make about a potential project (Bhattacharya and Ritter, 1983; Anton and Yao, 1998).

Pure Theory of Capital

The Pure Theory of Capital is a dynamic theory of economic change as a process in historical time. The cost of capital is the minimum return demanded by investors to invest in a new project. The cost of capital is often viewed as a metric that captures how well financial disclosure achieves its primary function of providing value-relevant information to users of financial statements. Hayek critiqued the theory and employed an improved version illustrating it to a river analogy to deliver a revealing insight into the complex time-lapse relationships that may exist between investments and the output of final consumption goods. (Hayek, 1983), tributaries' flowing into the upper reaches of a river delivers ever-changing volumes of water. These are analogous to flows of new and replacement investment that are determined by relative factor prices, technological change and the interest rate. While Hayek acknowledges the validity of Keynes's analysis under certain conditions, his own theory demonstrates why it is that liquidity preference cannot determine the volume of real investment in all cases whatsoever, but rather why under conditions resembling full employment, an inflation-fed boom must ultimately be self-reversing. In this sense, Hayek and Keynes could be said to have merely been theorizing on opposite sides of the same, Wicksellian theory of analogous to a constant rainfall (but changing dispersion) within the catchment of the river and its tributaries, are variations in the allocation of investment funds to diverse projects of different life duration.

Diffusion Technology Theory

According to Basu et al, most cross-country differences in per capita output are due to differences in total factor productivity (TFP), rather than to differences in the levels of factor inputs (Basu et al, 1997) The studies concluded that these cross-country TFP disparities can be divided into two parts: those due to differences in the range of technologies used and those due to non-technological factors that affect the efficiency with which all technologies and production factors are operated. In order to advance its technology, a firm must make an investment. The size of the investment depends on the size of the technology adoption barriers in the firm country.

Diego & Bart defines a technology as a group of production methods that is used to produce an intermediate good or service (Diego & Bart, 2008). Each production method is embodied in a

differentiated capital good. A potential producer of a capital good decides whether to incur a fixed cost of adopting the new production method. If he does, he will be the monopolist supplying the capital good that embodies the specific production method. This decision determines whether or not a production method is used, which is the extensive margin of adoption.

Technological diffusion is the process by which innovations (be they new products, new processes or new management methods) spread within and across economies. According to Parente & Prescott (1991) most industry studies suggest that the adoption of a new technology requires investment in capital, with a substantial fraction taking the form of investment in intangible capital ,Parente & Prescott (1991) A poorer country has the potential to realize large increases in productivity once the institutional arrangements of that country change so as to allow individuals to keep more of the returns on their investments, and these new institutional arrangements are expected by individuals to survive into the future. This is because poorer countries are most likely to adopt technologies that already have been successfully adopted in richer countries. Consequently, poorer countries will have available to them more information of what to do for successful adoption.

Empirical Review

Stakeholders Influence

A stakeholder is an individual or group that can heavily influence the performance of the business – i.e., whose support the business needs if it is to be successful. These people, in turn, have certain expectations from the company, and assessing the degree to which these expectations are currently being satisfied in a balanced fashion provides a valuable indicator of current and future performance.

Stakeholders will almost always include the "big three": Customers, Employees, and Owners. For most commercial enterprises, these three are by far the most important, and the scope of the performance measurement is usually focused on them. In other situations, the scope may need to be broadened. Stakeholders should be clearly defined, particularly if there is any potential question of who is included or excluded in each group.

Technology

The technology infrastructure refers to the combination of hardware such as computers system with the organization. These networks used to link this software or hardware and software used to deliver the works within an organization and also to its partners and customers were reviewed. To the selection of the software components of information are systematic. Understanding the jargon of technology involved in the selection of information and communication technology is major challenge for non-literate office staff and business managers.

According to Terry (2007) says technology simplifies and reduces task needing manual skill and strengths especially in factories and either forms of production property applied can increases productivity. The use of re-programmable robots for such tasks as welding spraying material handling and other helps to eliminate dirty or harassers and repetitive work robots and computer aided manufacturing (CAM) as well as reducing costs improving quality and the consistency of finished quality and the consistency of finished products. The unused technology requirements enhance problem solving skills and the ability to interpret, and is thus likely to lead to widening guilt between skilled and non-skilled workers.

Cost of Capital

The cost of various capital sources varies from company to company, and depends on factors such as its operating history, profitability, credit worthiness, etc. In general, newer enterprises with limited operating histories will have higher costs of capital than established companies with a solid track record, since lenders and investors will demand a higher risk premium for the former. The cost of capital thus becomes a critical factor in deciding which financing track to follow – debt, equity or a combination of the two.

According to research done by (Sodhi and Lee, 2007), any business strategy which aims at reducing the vulnerability to disruption in the supply chain needs to consider all dimensions of risk. To assess risk in a supply chain context, companies must not only concentrate on direct risks of their own operations, but also the risks which are caused by other members in the supply chain. Organization needs to look at all risk sources which cover entire operations of the supply chain to ensure that they work seamlessly. The risk associated with one type of industry could be unique and can be distinct from the risks to another type of industries since they work in

different environment. The magnitudes of risk for firms which fall under the same category are usually similar in nature. All these significant risk sources of a similar industry need to be identified and incorporated in the instrument which will be used for assessment of risk in the supply chain. The present supply chain risk related literature devoted little attention for addressing the above problem. Even though a number of risk sources are addressed in diverse literature under various risk constructs, few researchers have approached the supply chain risk management issues for a specific type of industry in a more holistic manner. The existing literature which address the risk of specific industry are as automotive industry (Blackhurst et al., 2008), consumer electronics industry (Sodhi and Lee, 2007), EPC supply chain (Micheli et al., 2008), transport operations (Sanchez-Rodrigues et al., 2008), pharmaceutical (Enyinda et al., 2009).

Research and development

Research and development is usually associated with the invention of new products. The development of existing products is of equal significance because consumer preferences are continually changing. The task of product research and development is to come up with the goods and services that meet the needs of tomorrow's customers. The development of existing products is of equal significance because consumer preferences are continually changing. The task of product research and development is to come up with the goods and services that meet the needs of tomorrow's customers.

Data Analysis/Findings

Regression analysis

The researcher conducted a multiple regression analysis so as to establish the determinant of regulations on growth of electricity projects in Kenya. The researcher applied the statistical package SPSS, to enter and compute the measurements of the multiple regressions for the study as presented below.

Table 4. 1: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	**0.76223356[a]**	**.58100**	**.411**	**.48101**

Source: Research, 2013

a.Predictors: (Constant) stakeholder (s) influence, technological skills, research and development and cost of capital.

b. Growth of Electricity Projects

Coefficient of determination explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable (Growth of Electricity Projects) that is explained by all the 4 independent variables (stakeholder (s) influence, technological skills, research and development and cost of capital)**.** The four independent variables that were studied, explain 75.2% of variance to establish the determinant of regulations on growth of electricity projects in Kenya as represented by the R^2.This therefore means that other factors not studied in this research contribute 24.8% of variance in the dependent variable. Therefore, further research should be conducted to establish the determinant of regulations on growth of electricity projects in Kenya.

Table 4. 2:ANOVA[a]

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.686	4	2.671	16.478	.000[b]
	Residual	81.193	317	.256		
	Total	91.879	321			

a.Predictors: (Constant) stakeholder (s) influence, technological skills, research and development and cost of capital.

b. Growth of Electricity Projects

The F critical at 5% level of significance was 3.56.since F calculated is greater than the F critical (value 16.478), this shows that the overall model was significant. The significance is less than 0.05, thus indicating that the predictor variables, explain the variation in the dependent variable which is Growth of Electricity Projects. If the significance value of F was larger than 0.05 then the independent variables would not explain the variation in the dependent variable.

Table 4. 3: Multiple Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.978	.984		8.110	.000
	Stakeholder (s) influence	.270	.117	.272	2.302	.005
	Technological Skills	.032	.165	.025	.195	.004
	Research & Development	.305	.148	.256	2.065	.003
	Cost of Capital	.391	.180	.275	2.175	.001

The regression equation (**$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4$**) was interpreted to mean

$Y= 7.978+.270X_1+.032X2+.305X_3+.391X_4$

Y= Growth of electricity projects in Kenya

X_1 is Stakeholder (s) influence X_2 Technological Skills, X3 is Research & Development and X4 is the Cost of Capital.

According to the equation, taking all factors (Stakeholder (s) influence, Technological Skills, Research & Development and Cost of Capital.) constant at zero, overall Growth of electricity

projects in Kenya will be 7.978. The data findings also show that a unit increase Stakeholder (s) influence will lead to a 0.270 increase Growth of electricity projects in Kenya; a unit increase Technological Skills will lead to a 0. 032 increase in Growth of electricity projects in Kenya; a unit increase in Research & Development, will lead to a 0. 305 increases in Growth of electricity projects in Kenya and a unit increase in Cost of Capital Will lead to a 0.391 increase in Growth of electricity projects in Kenya. This means that the most significant variable is Stakeholder (s) influence followed by Technological Skills.

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