

## DETERMINANT OF SUCCESSFUL COMPLETION OF RURAL ELECTRIFICATION PROJECTS IN KENYA: A CASE STUDY OF RURAL ELECTRIFICATION AUTHORITY

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**CITATION:** Wambugu, D. M. (2013), Determinant of successful completion of rural electrification projects in Kenya: A case study of Rural Electrification Authority, *International Journal of Social Sciences and Entrepreneurship*. Vol.1, Issue 2, 2013, 1 (2), 549-560

### ABSTRACT

*Construction management procedures guide managers about how the resources can be best used during construction process and aims for the timely and efficient application of the resources in construction projects. Delay contributes to the non-completion of the project within the original or the stipulated or agreed contract period. The study targeted a population of 96 management employees working at Rural Electrification Authority (REA) in Nairobi. Regression models were used to determine the relative importance of each of the four variables in relation to the study which sought to understand the determinant of successful completion of rural electrification projects in Kenya. Descriptive statistics and inferential data analysis method was to analyze the gathered data. The findings indicated that supply of quality materials, coordination, planning, effective management of projects contributed to timely completion of rural electrification projects in Kenya.*

**Key Words:** Rural Electrification, Material, Planning, Management, Construction.

### Introduction

Planning and control of resources within the framework of a project is the main target of construction management. Construction management procedures guide managers about how the resources can be best used during construction process and aims for the timely and efficient application of the resources in construction projects. Many issues should be carefully thought in order to conduct a project successfully (Westerveld, 2003). Construction site activities are only the second part of the whole construction process. The first part is comprised of all kinds of office work. The planning, designing, estimating, negotiating, purchasing, scheduling, controlling, accounting, etc. should be done carefully in the office before the work starts on the site to accomplish the objective of a quality project within budget and on schedule. Aibinu & Jagboro (2002) contends that delay is a situation where a contractor and the project owner jointly or severally contribute to the non-completion of the project within the original or the stipulated or agreed contract period. Besides that, Sambasivan (2007) stated that delay is an act or event that extends the time required to perform the tasks under a contract. Delay is actually a

postponement of time from the original estimated completion time which might be caused by contractor, owner or consultant as well as by external factors (Koushki & Kartam, 2004).

### Statement of the Problem

According to Energy Act No. 12 of 2006 show that Rural Electrification Authority (REA) was mandated to increase access of electricity in the rural areas from the current 63 percent to 100 percent by 2012 and 100 percent connectivity by 2030 (RoK, 2007). Statistics available from World Bank (WB) show that REA connected 50,000 rural customers per year (WB, 2012). This show a shortage of 30,000 connectivity per year (World Bank, 2012). Further statistics show that it is estimated that the realization of the above connectivity targets will result in additional national power demand of about 325 MW and 2,150 MW and 4,155 MW by 2012, 2022 and 2030 respectively (ERC, 2012).

GOK recognizes the critical role of Energy in driving our development Agenda which aims at transforming Kenya to a middle income country by 2030. Over the last three years Energy has received over 30% of the Physical Infrastructure Development Budget and the sub-sector accounts for over 12% of the total external outstanding loans. Projects in the subsector are undertaken through Kenya Electricity Generating Company (KenGen), Kenya Power & Lighting Company Ltd (KPLC), Kenya Transmission Company Ltd (Ketraco), and Geothermal Development Company Ltd (GDC).

### Research Objectives

To establish the factors determining of timely completion of rural electrification projects in Kenya

### Literature Review

#### Constraints management theory

The roots of CM can be traced to the development of a production scheduling software package known as Optimized Production Technology (OPT) in the late 1970s. Since then, CM has evolved from a manufacturing scheduling method to a management philosophy that can be used to understand and improve the performance of complex systems. Eliyahu Goldratt, the founder of CM, claimed that it is a theory of managing manufacturing organizations (Fellows,2008). Love (2005) argues that the scientific methods of CM have provided a theory to communicate and enhance organizational performance. Although aspects of the theory of CM have been made explicit (Danity, 2003), underlying constructs of CM have not been identified. Patrick (2004) argued that if CM is to be accepted as a general theory, then the theory must be empirically developed and tested.

The central construct of the theory we refer to as throughput orientation, described below. In essence, the theory says that the higher the degree of throughput orientation, the greater organizational performance will be. The three dimensions of throughput orientation are

organizational mindset, performance measurement systems, and decision making. Companies that are high on all three dimensions would be expected to have better performance than companies that are low on one or more of the dimensions

### Max Weber Theory

Bureaucracy in this context is the organisational form of certain dominant characteristics such as a hierarchy of authority and a system of rules. Bureaucracy in a sense of red tape or officialdom should not be used as these meanings are value-ridden and only emphasize very negative aspects of the original Max Weber model. Through analyses of organisations Weber identified three basic types of legitimate authority: Traditional, Charismatic, Rational-Legal. Authority has to be distinguished from power in this discussion. Power is a unilateral thing - it enables a person to force another to behave in a certain way, whether by means of strength or by rewards. Authority, on the other hand, implies acceptance of the rules by those over whom it is to be exercised within limits agreeable to the subordinates that Weber refers to in discussing legitimate authority.

Weber presented three types of legitimate authority: Traditional authority: where acceptance of those in authority arose from tradition and custom. Charismatic authority: where acceptance arises from loyalty to, and confidence in, the personal qualities of the ruler. Rational-legal authority: where acceptance arises out of the office, or position, of the person in authority as bounded by the rules and procedures of the organization.

It is the rational-legal authority form that exists in most organisations today and this is the form to which Weber ascribed the term 'bureaucracy'. The main features of bureaucracy according to Weber were: a continuous organisation or functions bounded by rules; that individuals functioned within the limits of the specialisation of the work, the degree of authority allocated and the rules governing the exercise of authority; a *hierarchical* structure of offices; appointment to offices made on the grounds of technical competence only; the separation of officials from the ownership of the organisation; the authority was vested in the official positions and not in the personalities that held these posts. Rules, decisions and actions were formulated and recorded in writing.

### Henri Fayol's theory

Henri Fayol's administrative theory mainly focuses on the personal duties of management at a much more granular level. In other words, his work is more directed at the management layer. Fayol believed that management had five principle roles: to forecast and plan, to organize, to command, to co-ordinate, and to control. Forecasting and planning was the act of anticipating the future and acting accordingly. Organization was the development of the institution's resources, both material and human. Commanding was keeping the institution's actions and processes running. Co-ordination was the alignment and harmonization of the group's efforts. Finally, control meant that the above activities were performed in accordance with appropriate rules and procedures.

Fayol developed fourteen principles of administration to go along with management's five primary roles. These principles are: specialization/division of labor, authority with responsibility, discipline, unity of command, unity of direction, subordination of individual interest to the general interest, remuneration of staff, centralization, scalar chain/line of authority, order, equity, stability of tenure, initiative, and esprit de corps. Fayol clearly believed personal effort and team dynamics were part of an "ideal" organization.

Fayol's five principle roles (Plan, Organize, Command, Co-ordinate, and Control) of management are still actively practiced today. The concept of giving appropriate authority with responsibility is also widely commented on and is well practiced. Unfortunately, his principles of "unity of command" and "unity of direction" are consistently violated in "matrix management", the structure of choice for many of today's companies.

### Empirical Review

The availability of materials on site is crucial for the smooth flow of activities. Al-Kharashi and Skitmore (2009) identify a lack of strategic planning for materials and labour as a major cause of delays on project delivery. The basic elements needed for construction activities are: cement, gravel, and sand. These materials should be available at all times to avoid stoppage of work. Chan *et al.* (2004) identify the non-availability of materials as an impediment to the productivity of a worker. Nima *et al.* (2001) state that the non-availability of materials dampens the morale of workers and hampers productivity, while Faridi *et al.* (2006) assert that materials shortages and wastage cause low productivity amongst workers. This factor is directly linked to materials requisition and stock taking, which should be done regularly to avoid running out of stock of any material. Koushki and Kartam (2004) found that nearly a quarter of the 450 projects studied experienced delays, and the reasons for this could be traced to late delivery of materials, the period of selection, the type of construction materials and their availability at the local market. All of these affect the quantity of time-delays.

In a construction project, there are many parties involved such as contractor, consultant, sub-contractor and client. Often, it may be difficult for these various separate parties to coordinate well in order to complete the project. In one study conducted by Assaf *et al.* (1995) it was found that difficulty in coordination between the parties is one of the factors that contributes to delay. In addition, Leung (2004) also agreed that coordination problems will contribute to delay.

Al-Kharashi *et al.* (2009) stated that lack of coordination between contractors and subcontractors will lead to delay, for example in the situation that newly revised construction drawings of a project may be issued later by the contractors to the subcontractors. This leads to construction mistakes and the work requiring to be redone. Reconstruction work takes additional time, therefore impacting upon the completion time of the project.

Ever since project management has become a formal discipline, the quality and importance of project planning has been considered a major cornerstone of every successful project. Numerous empirical studies of project management success factors suggested planning as one of the major contributors to project success (Skitmore *et al.*, 1974).

This means planning is a necessary but not a sufficient condition for project success. Planning is not a one-time task. Eisenhower's historical dictum: "*Plans are nothing, planning is everything*" points out the importance of the planning process itself. Most authors agree that projects are complex, time restricted, unique endeavors and special tasks that have not been done before. Consequently, it is very difficult or even impossible at the initial planning stage to know precisely which activities have to be carried out in order to complete the project, and what their cost and duration parameters are (Andawei, 2003). Adding to that the high uncertainty associated with projects, the traditional emphasis on project planning in the industry as well as the unequivocal empirical results are even more surprising.

According to Harris *et al* (2006), support from senior management is a factor that positively influences the success of a project. This category of staff provides direction, guidelines and control in a project. The majority of the skilled operatives need to be told what to do, either daily or weekly. The lower management staffs supervise the work of the skilled workers while the top management oversees the entire system in terms of time, quantity of materials, workmanship and cost. Kagioglou *et al.* (2000) identify seven demotivating factors that hinder workers' productivity, and delay in inspection ranks among them. When there is inadequate supervision/inspection of work it might result in rework, increased project cost, delay and abandonment. Sambasivan and Soon (2007) conclude that poor site management on the part of the contractor ranks among the ten most common influencing factors causing delays on project delivery.

### Critical Review

The current literature is mainly on the contractor's and client aspects which delay projects. There is no specific literature on determinant of timely completion of rural electrification projects in Kenya. Most of the literature on delay of project has been descriptive and isolated in terms of context. The few studies that have been comparative are not comprehensive in their outlook. The literature has been keen to point out specific issues while wearing a blind eye on others.

There is thus a need to conceptualize and systematize the analysis framework of the determinant of determinant of timely completion of rural electrification projects in Kenya, and their interactions, in the few schemes that are successful, and in the many others that fail to yield the expected results. Such inductive research, carried out in a variety of settings, could lead to a level of knowledge that would be helpful to policy makers' and REA management in their decision-making process on project management and lead to effective performance of REA in Kenya.

### Research Gaps

This study intends to bridge the knowledge gap of lack of clear determinant of timely completion of rural electrification projects in Kenya. There is no empirical evidence of determinant of timely completion of rural electrification projects in Kenya, more so in Kenyan context in REA. Thus the researcher envisions filling this research gap. In this regard, the researcher poses the

following research questions; how does supply of quality materials, coordination, planning and supervision and inspection timely completion of rural electrification projects in Kenya.

## Methodology

The study adopted a descriptive survey research design. A descriptive study is concerned with establishing the what, where and how of a phenomenon (Cooper & Schindler, 2003). The study population constituted 96 management employees working at Rural Electrification Authority (REA). The primary research data was collected from the employees using a questionnaire. A pilot study was undertaken on to test the reliability and validity of the questionnaire. Data analysis was done with the help of software programme SPSS version 21 which is the most current version in the market and microsoft excel to generate quantitative reports.

## Results and Findings

### Supply of Quality Materials

The study found out that majority of the respondents indicated that supply of quality materials affected the timely completion of rural electrification projects in Kenya and that non-availability of materials dampened the morale of workers and hampers productivity.

These findings relate with the literature review where Burke (2006) state that the non-availability of materials dampens the morale of workers and hampers productivity, while Ayman (2000) assert that materials shortages and wastage cause low productivity amongst workers. This factor is directly linked to materials requisition and stock taking, which should be done regularly to avoid running out of stock of any material.

### Coordination

The study also found out that majority of the respondents indicated that coordination affected the timely completion of rural electrification projects in Kenya and that difficulty in coordination between the parties was one of the factors that contribute to delay. These findings relate with the literature review where Austin *et al* (2000) stated that lack of coordination between contractors and subcontractors will lead to delay thus affecting the timely completion of projects.

### Planning

Moreover, the study found out that majority of the respondents indicated that planning affected the timely completion of rural electrification projects in Kenya and that the quality and

importance of project planning had been considered a major cornerstone of every successful project .

These findings are in line with the literature review where Andawei, (2003) postulates that it is very difficult or even impossible at the initial planning stage to know precisely which activities have to be carried out in order to complete the project.

### Effective Management of Projects

Finally, the study found out that majority of the respondents indicated that effective management affected the timely completion of rural electrification projects in Kenya and that inadequate supervision/inspection of work resulted in rework.

These findings are in line with the literature review where Austin *et al* (2000) found out that when there is inadequate supervision/inspection of work it might result in rework, increased project cost, delay and abandonment.

### Regression Analysis

#### Model

Model	R	R Square	Adjusted Square	R Std. Error of the Estimate
1	.837 <sup>a</sup>	.768	.677	.534

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#### ce: Research, 2013

a. Predictors: (Constant), supply of quality materials, coordination, planning, effective management of projects.

b. Dependent Variable: Timely Completion of 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 (timely completion of projects ) that is explained by all the 4 independent variables (supply of quality materials, coordination, planning, effective management of projects).

The four independent variables that were studied, explain 76.8% of variance in building competitive advantage as represented by the  $R^2$ . This therefore means that other factors not studied in this research contribute 23.2% of variance in the dependent variable. Therefore, further research should be conducted to establish the factors determining of timely completion of rural electrification projects in Kenya.





**ANOVA**

Model		Sum Squares	of df	Mean Square	F	Sig.
1	Regression	70.238	6	.169	44.0	.001 <sup>a</sup>
	Residual	10.345	90	.110		
	Total	80.583	96			

**Source: Research, 2013**

a. Predictors: (Constant), supply of quality materials, coordination, planning, effective management of projects.

b. Dependent Variable: Timely Completion of Projects

The F critical at 5% level of significance was 5.44. Since F calculated is greater than the F critical (value = 44.0), this shows that the overall model was significant. The significance is less than 0.05, thus indicating that the predictor variables, (supply of quality materials, coordination, planning, effective management of projects). Explain the variation in the dependent variable which is timely completion of projects. Subsequently, we reject the hypothesis that all the population values for the regression coefficients are 0. Conversely, 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. 1: Multiple Regression Analysis**

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.721	.77		5.654	0.000
	supply of quality materials	0.453	0.241	0.237	0.567	0.004
	coordination	0.233	0.296	0.534	0.256	0.003
	planning	2.254	0.437	0.356	0.199	0.001
	effective management of projects	1.967	0.656	0.323	0.198	0.002

**Source: Research, (2013)**

From the regression findings, the substitution of the equation ( $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4$ ) becomes:

$$Y = 2.721 + 0.453 X_1 + 0.233X_2 + 2.254X_3 + 1.967X_4.$$

Where Y is the dependent variable (timely completion of projects),  $X_1$  is supply of quality materials variable,  $X_2$  is coordination variable,  $X_3$  is planning variable and  $X_4$  is the effective management of projects variable.

According to the equation, taking all factors (supply of quality materials, coordination, planning, effective management of projects) constant at zero, timely completion of projects will be 2.721. The data findings also show that a unit increase in supply of quality materials will lead to a 0.453 increase in timely completion of projects; a unit increase in coordination will lead to a 0.233 increase in timely completion of projects; a unit increase in planning will lead to a 2.254 increase in timely completion of projects; and a unit increase in effective management of projects variable will lead to a 1.967 in timely completion of projects. This means that the most significant factor is planning followed by effective management of projects.

At 5% level of significance and 95% level of confidence, supply of quality materials had a 0.004 level of significance; coordination had a 0.003, planning had a 0.001 level of significance while effective management of projects had 0.002 level of significance implying that the most significant factor is planning followed by effective management of projects.

**Conclusions**

The study concludes that non-availability of materials dampened the morale of workers and hampers productivity and that availability of materials on site was crucial for the smooth flow of activities. The study also concludes that difficulty in coordination between the parties was one of the factors that contribute to delay and that lack of coordination led to construction mistakes and the work requiring to be redone and that organization activities must be coordinated to achieve stated objectives. Moreover, the study concludes that the quality and importance of project planning had been considered a major cornerstone of every successful project and that plans is nothing, planning is everything. Finally, the study concludes that inadequate supervision/inspection of work resulted in rework and that inadequate supervision/inspection of work resulted in increased project cost.

**Recommendations**

The study recommends that it is very important for the supplier to deliver materials on time because supplier failure to deliver on time can disrupt operations and delay the completion of a project. The study also recommends that organizations should come up with effective coordination of projects because lack of coordination between contractors and subcontractors

will lead to delay, for example in the situation that newly revised construction drawings of a project may be issued later by the contractors to the subcontractors.

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