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Factors Affecting Successful Implementation of Fiber Optic Cable Projects in Kenya: A Case of Nairobi City County

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Abstract
This study sought to establish the factors affecting successful implementation of fiber optic cable projects in Kenya. The Specific Objectives were: financial investment, Fiber optic cable Vandalism, Fiber Optic cable Regulation and Fiber Optic cable Expertise . This study further explored how the independent variables affected the dependent variable and sub variables as well in the conceptual framework. The study used cross sectional survey design. A sample of 150 respondents out of 1500 target population was used in the study. Regression results revealed that Financial investment a significant affecting implementation of fiber optic cable projects as indicated by β_1= 0.565, p=0.002<0.05. Fiber optics vandalism had a significant negative influence on implementation of fiber optic cable projects in Kenya as indicated by β_2=0.375, p=0.011<0.05. The study revealed that there existed a significant relationship between fiber optic cable regulation and implementation of fiber optic cable projects as indicated by β_3=.401, p=0.000>0.05. Further, it indicated that there existed a significant relationship between fiber optic cable expertise and implementation of fiber optic cable projects as indicated by β_4=0.213, p=0.003<0.05.
Keywords: Financial investment, vandalism, regulation and expertise.

Introduction

In the United States many bodies are involved in the lifecycle of fiber optic projects. In Virginia State, one has to follow the laid down specifications by International Telecommunication union (ITU), Rural Utility services and advice of Society of Cable Telecommunications Engineers (SCTE). The Local governments also in most cases provide trenches within which the cables will be laid in different conduits upon payment of some fees, though it is not the case in all states. The overall standards are provided by American National Standards Institute (ANSI) (Mauriello, 2012).

European countries have used different approaches in fiber optic cable deployment. United Kingdom, Netherlands and Sweden have largely regulated the last mile with an aim of availing superfast connectivity to the consumer. This is mainly providing incentives to enable new entrants offer excellent service to the consumers. Spain and France have a requirement that fiber optic providers have connections to the base of buildings and share infrastructure within the buildings (Godlovitch, Henseler-Unger, & Stumpf, 2015).

Broadband connection has become an essential part of everyday life. It is no longer a result of economic growth but a key contributor. Most of the functions within organizations both private and public are supported by Information communication technology. This ranges from interoffice connectivity to city linkages amongst users across the world. There are also other firms which are purely based on the internet and contribute to billions of dollars to the world economy. Averagely, over 75% of the population in Sub Saharan Africa does not have access to broadband (GoR, 2013). This therefore presents a great potential of growth in this section of the telecommunication sector. Local companies and government having noticed the need for faster communication channels have commissioned projects to build fiber optic systems covering the whole country. For instance, the government of Kenya has initiated expansion of the National optic fiber backbone to all county headquarters. This would increase the project's footprint from 4300KM to 6400KM and also include metro sections to increase connectivity (MoICT, 2016)

1.2. Statement of the Problem

In Kenya, successful implementation of fiber optic cable projects has been hindered by several things. One of the main hindrances has been the high cost of capital expenditure involved in the implementation of the projects (Ndungu, 2010). The financial investment required to implement the projects is huge as demonstrated by investment of 130 million dollars for the TEAMS project. The acquisition of KDN Ltd by Altech Ltd was partly linked to the financial losses occasioned by the investment of around 50 million US dollars into its fiber project which did not achieve the projected return on investment (Okuttah, 2012).

Implementation of fiber optic cable projects in Kenya has also been hindered by numerous losses

incurred due to vandalism. This has affected telecommunication firms with losses amounting to billions shillings annually according to the Communication Authority of Kenya. In the year 2010, Orange Telkom incurred a loss of 2 billion Kenya shillings from fiber cuts. Resultantly, the ongoing project was slowed down due to diversion of the project funds into maintenance to restore service (TKL, 2010). Providers have to shoulder the losses because of weak legislation that hardly prosecutes offenders.

Lack of fiber optic specific regulation in the telecommunication sector also hinders success in implementation of fiber optic cable projects (Kerretts-Makau, 2012). Regulation is supposed also to take care of guidelines on how fiber infrastructure should be done, yet it is not the current state. fiber optic cable projects is the scarcity of skilled personnel in the area of fiber optics. Though it has not caused stalling of projects, it has shifted the costs upwards because expatriates are hired to perform the technical tasks. These skills are key to the success of such technical projects. The outcome of poor design of networks is usually poor and unreliable service. These skills include transmission; design and project management (Kerretts-Makau, 2012).The study has accomplished its mission. Since it has created new knowledge and the same will be used to fill the existing research gap. Meaning there is no gap now.

1.3. Specific Objectives of this study were:

a.To examine the influence of financial investment on successful implementation of fiber optic cable projects in Kenya.

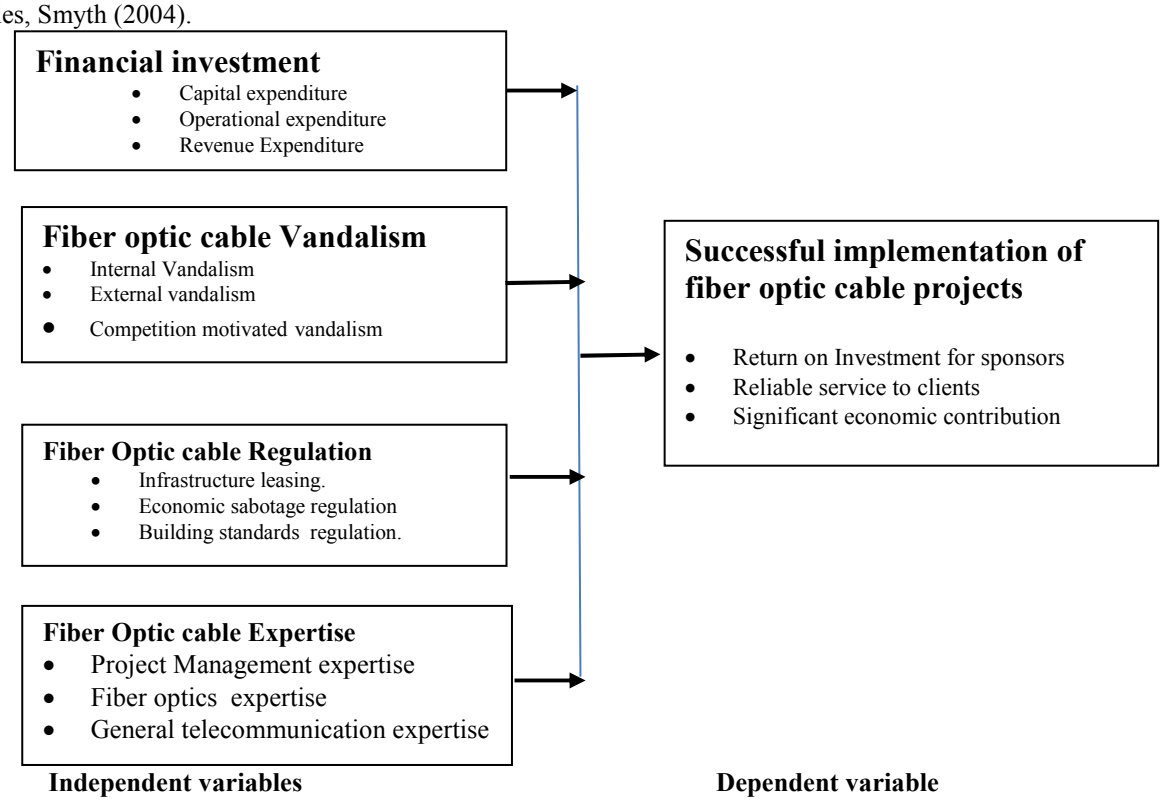
b.To assess how vandalism affects successful implementation of fiber optic cable projects in Kenya.

c.To evaluate the influence of regulation on successful implementation of fiber optic cable projects in Kenya.

d.To examine the influence of expertise on successful implementation of fiber optic cable projects in Kenya.

1.4 Conceptual Framework

The diagrammatic representation captures a research area in a way that is easy to apply and recall. The dependent variable which is the starting point of the research and points to the research goal is related to the independent variables. According to Kothari (2004), conceptual framework provided clear concepts of the areas in which meaningful relationships are of variables were likely to exist. In addition, a concept, according to Kombo and Tromp (2009), is an abstract or general idea derived or inferred from a specific instance. Therefore, when clearly articulated, conceptual framework has potential usefulness as a tool to assist in making meaning of subsequent findings, alternatively, conceptual framework forms part of agenda for negotiation to be scrutinized, tested, reviewed and reformed as a result of investigation and explanation of possible connection between variables, Smyth (2004).



Fugure 1.1 Conceptual Framework

2. Financial Investment

Financial investment is the commitment of monetary resources into an undertaking (Khan, 2007). For big project to be successful, money is required to remunerate employees, buy raw materials as well as services. This is also true for fiber optic cable deployment projects in Kenya. It has been estimated that the total investment into fiber optic projects from the start of the millennium in Kenya is over seventeen billion shillings (CAK, 2015). The sources are diverse including reinvestment of profits and loans.

The financial investment goes into capital injection, operational financing and can as well be revenue expenditure. Capital expenditure is the initial amount put into the projects to start it up. For the fiber optic cable deployment, the financial investment goes into the initial hiring of staff, buying of equipment and paying up for licenses to the government. Upon completion of the project, capital financing is closed. Capital expenditure therefore determines the quality of final product which is handed over to the sponsors. On the other hand operational expenditure is the financial investment put into the running of the project (Khan, 2007). This includes closing any unforeseen loopholes, developing maintenance procedures and schedules, on boarding customers and repair in the event of a fault on the network. Revenue expenditure is the amount that is used up in the financial year and recorded in the books of account therefore never become profits (Pratt, 2009). This is mainly in the maintenance of the network.

2.1 Fiber Optic Cables Vandalism

Vandalism is described as the deliberate destruction of property (Skogh, 2009).In fiber optic cable deployment, vandalism is the destruction of fiber optic cables, or the terminal equipment used in making up the network. In Kenya this has cost many service providers a lot of money in losses due to disconnection of services. This leads to massive refunds to the customers and loss of service to the end clients. Resultantly, the service providers have jointly called for classification of fiber optic cable vandalism as an economic crime.

Vandalism in the industry has manifested itself in several forms. It is at times done by staff of the service providers as a way of protest during employment disagreements. Though not very common it is used as a bargaining tool (Savory, 2012). The destruction of fiber infrastructure is also done by competitors. This is an anticompetitive behavior that aims to sabotage their competitors by vandalizing their infrastructure. This motivated Kenyan service providers to join in calling for the government to legislate and make it an economic crime which has yet to happen. There are situations where vandalism is motivated by financial gain like the sale of equipment so as to benefit from the money (Savory, 2012).

2.2 Fiber Optic Cables Regulation

Regulation is described as the rules maintained by authorities. Regulations are drafted, maintained and enforced by the government or its bodies. The aim of regulations is to provide order and a fair playing ground for all citizens and organizations (Emerson, 2009). The fiber optic network projects space also need regulation. In the developed countries like the United States of America, have put fair play regulation in place so as to enable all interested and able investors get into the industry. Further, there are common policies in most of the states to make sure that only the local governments own the infrastructure and lease out to providers. Moreover, there are building regulations that make it compulsory for all property developers to have provision for telecommunication cabled in the buildings (Mauriello, 2012).

In Kenya, regulation of the telecommunication industry exists but it is not specific to fiber optic cable networks. Electromagnetic spectrum and telephony is regulated as well as the content in broadband communication. This has left loopholes which can be exploited by unethical competitors to harm each other. It also raises the barriers of entry because each of the providers has to lay separate infrastructure so as to care of the customer needs (Kerretts-Makau, 2012). The study seeks to establish the impact it has to the success of fiber optic implementation projects.

2.3 Fiber Optic Cables Expertise

Expertise is described as expert knowledge or skill in a particular field. Expertise is acquired through studies and experience (PMI, 2013). In the field of telecommunication, there are different sub sections which one can study and fiber optic transmission is one of them. However, for one to be an expert in fiber optic networks, deployment and maintenance, it is important to have telecommunication skills to start with. Specialization in fiber optic networks requires one to acquire certification as a practitioner with telecommunication knowledge as a prerequisite. Fiber optic deployment projects have had challenges in finding the right staff leading to delays in project delivery or hiring expatriates (FOA, 2015).

Fiber optic deployment projects also require project managers to aid in managing the project through the lifecycle. It is a key knowledge area that has a likelihood of affecting the delivery periods of the projects. Project management handles the project from initiation to closure managing the risks and opportunities (Savory, 2012). The resources, human and material are all optimized by the project manager to achieve the maximum

benefits. It is the case for fiber optic projects in Kenya.

2.4 Successful Implementation of Fiber Optic Cable Projects

Success of any project depends on a many factors. They range from availability of resources to how risks are managed. Again, there are different ways in which the success or failure is measured depending on the objective of the project (PMI, 2013). For fiber optic cable deployment projects, some of the measures are return on investment to the sponsor, reliability of services provided and the contribution the project makes to the national economy. These are some of the ways by which success can be measured.

Return on investment is a key measure for successful implementation of fiber optic projects. This is because the donor has to recover the investment put into the project. Depending on the business case, the measure of return on investment is usually expected within a specified period of time (ALD, 2007). If returns are not actualized within the stated period in the business case, then it is deemed a failure. The customer experience is also a key measure whether a fiber optic cable deployment project has succeeded or not. A satisfied customer shows that the project is meeting its objectives. Consequently, the contribution of the project to the national economy gives an indication as to whether a fiber optic project has succeeded.

Research Methodology

3. Research Design according to MCneill (2009), is the plan used to select data collection procedures, research sites and the subjects involved. The ultimate goal of this is usually to provide answers to a research being undertaken. Research design is also described as the overall plan to obtaining answers from a research as well as the means by which a researcher handles difficulties encountered in the course of the undertaking. Therefore, the overall goal of a research design is to ensure that the process of undertaking a research is made effective and efficient as much as possible. This means that the aim is to get maximum information at the minimum cost and time (Trochim, 2006).

A population is the group of individuals or objects that possess the characteristics required for the study. These could be in terms of age, profession or people who share a common locality amongst many others (Dougherty & Estafani, 2014). This study is wide as the unit of analysis comprised of people and bodies which includes the national government, county government and telecommunication companies. The unit of observation is therefore the employees in government and telecommunication companies involved in fiber optic cable implementation projects. The total numbers is 1500, and represent the unit of observation. These are the stakeholders and therefore the target population for the study.

Pilot Testing: Prior to conducting the survey, 15 questionnaires were distributed for pre-testing. This represented 10 % of the sample. The reliability of the final questionnaires was improved by pre-testing the pilot samples with the supervisor. According to Sekaran (2003), pre-testing helps in determining the time it takes respondents to complete the questionnaire, if questions are clear, if the major objectives are covered, and clarity of the layout. This is usually a very important step before conducting the study.

Data for the research was compiled, sorted and analyzed using Statistical Package for Social Science (SPSS) version 22 and Microsoft excel. Descriptive statistics were used to analyze the results from the SPSS which help describe, show and summarize data in a meaningful way. This was used to show the relationship patterns of variables and assist in drawing inferences. Collected data and the final results are presented in form of charts because it is an easy to interpret and pick data from where relativity is involved. According to Mugenda and Mugenda (2008), this is an effective means of presentation which is easy to analyze and understand. This study used multiple regressions model to test the analyzed data and to determine the variances in the dependent variable that is explained by the independent variable. Where the following formula was applied: $Y=\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta x_4 + e$

3 .1Reliability and Validity Results

In this study, reliability was ensured through pilot testing on a sample of 15 respondents. This represents 10% of the sample as recommended by Mugenda and Mugenda (2008). These were however not included in the study. The 15 respondents were selected from employees in government and telecommunication companies involved in fiber optic cable implementation projects. From the findings, the coefficient was 0.8422 as shown in table 3.1, which was higher than the threshold of 0.70. This means that the instruments were reliable. Validity shows the degree to which a test measures what it purports to measure. The language used on the questionnaire was kept simple to avoid any ambiguity and misunderstanding. The validity of the instrument was established by expert input.

Table 3.1: Reliability Results

Variable	Cronbach's
Financial investment	0.8019
Vandalism	0.7689
Regulation	0.8149
Expertise	0.7576
Overall	0.8122

3.2 Whether vandalism is a hindrance in delivering fiber optic projects

The respondents were requested to indicate whether vandalism is a hindrance in delivering fiber optic projects. From the findings as shown in Figure 3.1, a majority at 68% of the respondents indicated that vandalism is a hindrance in delivering fiber optic projects, while 32% of the respondents indicated that vandalism is not a hindrance in delivering fiber optic projects. Respondents further stated that vandalism is a major hindrance as it increases the cost of laying new fiber and employing personnel to take care of the same. Respondents further stated that there are a lot of occurrences of destruction of fiber optic cables and this costs the service providers a lot of money in losses due to disconnection of services. It implies that vandalism has been a hindrance to successful implementation of fiber optic projects and also leads to huge losses for the government and private institutions. The findings agree with Omwenga (2009), who stated that vandalism is a real threat to development of fiber optics in Africa. He provides an example of The East African Marine Systems (TEAMS) cable which had to skirt around Somalia's territorial waters so as to avoid vandalism.

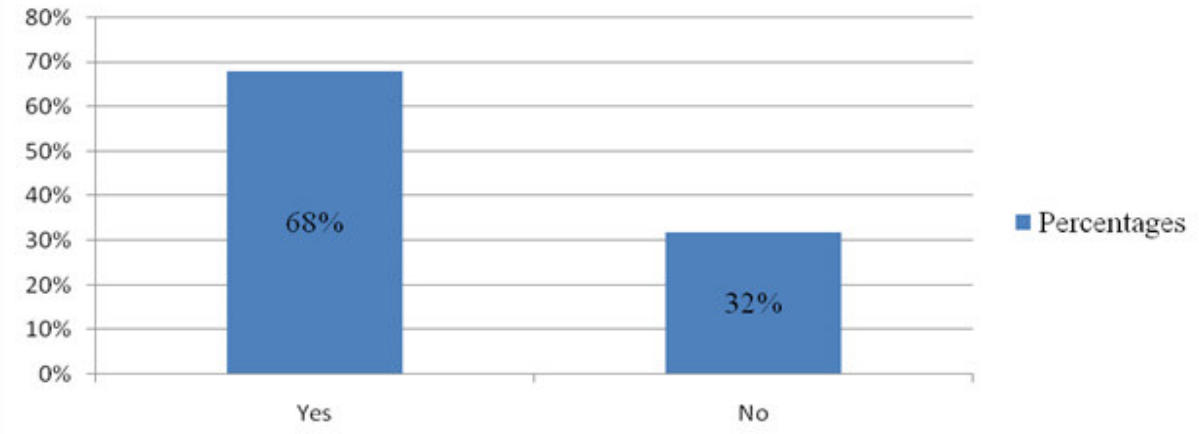


Figure 3.1: Whether vandalism is a hindrance in delivering fiber optic projects

3.2 Coefficient Analysis

From the results on table 4.16, $\beta_{0=}$ 4.132 represented the constant which predicted value of successful implementation of fiber optic cable projects in Kenya. Financial investment, fiber optic cable vandalism, fiber optic cable regulation and fiber optic cable expertise were constant at zero (0). The results revealed that financial investment as significantly affecting implementation of fiber optic cable projects as indicated by β_1= 0.565, p=0.002<0.05. This implies that a unit change in financial investment will lead to 0.565 increase in successful implementation of fiber optic cable projects.

The results revealed that fiber optics vandalism has a significance negative influence on implementation of fiber optic cable projects in Kenya as indicated by β_2=0.375, p= 0.011<0.05. This implies that a unit change in vandalism will lead to a 0.375 increase in successful implementation of fiber optic cable projects.The study revealed that there existed a significant relationship between fiber optic cable regulation and implementation of fiber optic cable projects as indicated by β_3= =.401, p = 0.000<0.05. This implies that a unit change in regulation will lead to a 0.401 increase in successful implementation of fiber optic cable projects. Further, the results indicated that there existed a significant relationship between fiber optic cable expertise and implementation of fiber optic cable projects as indicated by β_4=0.213, p= 0.003<0.05. This implies that a unit fiber optics expertise will lead to a 0.213 increase in successful implementation of fiber optic cable projects.

3.3 Anova

The total variance (41.525) was the difference in the variance which can be explained by the independent variables (Model) and the variance which was not explained by the independent variables (Error). The study established that there existed a significant goodness of fit between financial investment, fiber optic cable vandalism, fiber optic cable regulation and fiber optic cable expertise and successful implementation of fiber

optic cable projects since F-test (F=19.763, P=0.029< 0.05) as indicated on table 4.25. The calculated F_{cal}=19.763 exceeds the F-critical of 13.874. This implies that the model was suitable to explain the relationship between financial investment, fiber optic cable vandalism, fiber optic cable regulation and fiber optic cable expertise and successful implementation of fiber optic cable projects was significant at 95% confidence level.

Table 3.2: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.785	1	.696	19.763	.029[a]
	Residual	7.640	119	.336		
	Total	**10.425**	**120**			

Predictors: (Constant Financial investment, fiber optic cable vandalism, fiber optic cable regulation and fiber optic cable expertise

Dependent Variable: Successful implementation of fiber optic cable projects

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The study revealed that there existed a significant relationship between fiber optic cable regulation and implementation of fiber optic cable projects as indicated by β_3= =.401, p = 0.000<0.05. This implies that a unit change in regulation will lead to a 0.401 increase in successful implementation of fiber optic cable projects.Further, the results indicated that there existed a significant relationship between fiber optic cable expertise and implementation of fiber optic cable projects as indicated by β_4=0.213, p= 0.003<0.05. This implies that a unit fiber optics expertise will lead to a 0.213 increase in successful implementation of fiber optic cable projects.

Table 3.2 Coefficient Analysis

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		β	Std. Error	Beta		
1	(Constant)	-1..132	.361		9.301	.000
	Financial investment	..565	.082	.478	7.021	.002
	Fiber optics vandalism	..375	.033	.210	5.870	.011
	Fiber Optic cable Regulation	..401	.065	387	4.657	0.000
	Fiber Optic cable Expertise.	..213	.086	.169	3.658	.003

Predictors: (Constant financial investment, fiber optic cable vandalism, fiber optic cable regulation and fiber optic cable expertise

Dependent Variable: Successful implementation of fiber optic cable projects: The optimal regression model is therefore=$1.132 + 0..565x_1 + 0..401x_2 + 0..375x_3 + 0..213\,x_4 + e$

4.1 Conclusion

The study concluded that financial investment that goes into capital expenditure; operational financing and revenue expenditure affect successful implementation of fiber optic cable projects. The study also shows that both capital and operational expenditure finances are sourced externally and internally as well. For fiber optic cable projects to be successful, money is required to remunerate employees, buy raw materials, buy tools and implement processes. From the finding, the study concluded that vandalism has been a hindrance to successful implementation of fiber optic projects and also leads to huge losses for the government and private institutions.. Destruction of optic cables was found to significantly increase maintenance costs. The study also revealed that fiber optic deployment projects have had challenges in finding the right staff leading to delays in project delivery or hiring expatriates. The study finally recommended the following can be used as measures of successful implementation of fiber optic cable projects in Kenya: return on investment and the contribution the project makes to the national economy. This is so because return on investment is an objective of profitable ventures, and for profits to be realized, customer satisfaction is key. However, the various factors that affect successful implementation of fiber optic cable projects are within the provider's scope such as planning, financial allocation, proper and reliable implementation process, monetary resources allocation and employee skills set.

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