
# DETERMINANTS OF EFFECTIVE UTILIZATION OF BROADBAND INFRASTUCTURE PROJECTS IN KENYA: A CASE OF NATIONAL OPTIC FIBRE BACKBONE INFRASTRUCTURE PROJECT PHASE 1

RONALD O. MOENGA, DR. MAKORI MORONGE

The Strategic JOURNAL of Business & Change MANAGEMENT
ISSN 2312-9492 (Online), ISSN 2414-8970 (Print)
Vol. 3, Iss. 2 (22), pp 484-514, May 16, 2016, www.strategicjournals.com, ©Strategic Journals

# DETERMINANTS OF EFFECTIVE UTILIZATION OF BROADBAND INFRASTUCTURE PROJECTS IN KENYA: A CASE OF NATIONAL OPTIC FIBRE BACKBONE INFRASTRUCTURE PROJECT PHASE 1

**[1*] Ronald O. Moenga, [2*] Dr. Makori Moronge**

[1*] Student, Jomo Kenyatta University of Agriculture & Technology (JKUAT), Kenya
[2*] Lecturer, Jomo Kenyatta University of Agriculture & Technology (JKUAT), Kenya

**Accepted May 10, 2016**

**ABSTRACT**

ICT is a key driver of economic growth, providing a boost of GDP growth in developing countries. The investment in broadband promotes competition, innovation and market growth. If well used, Optical fiber infrastructure has the potential to transform livelihoods as an enabler for economic and social growth. In low and middle income economies, a 10% growth in broadband penetration yields an additional 1.38 of GDP growth and for every 1 per cent increase in broadband penetration, productivity grows by 0.13%. Again, ICT broadband penetration has a positive impact on employment creation, data Indicates that employment growth varies widely, from 0.2 per cent to 5.32 per cent for every increase in 1 per cent of penetration. Suffice is to say, underutilization of the optical fiber backbone infrastructure project leaves a lot to be desired. The specific objectives of the study sought to examine how stakeholder participation, human resource capacity, government policy and implementation strategy influence utilization of Optical fiber infrastructure in Kenya. The study adopted a descriptive survey. The study targeted 35 top management staff of Orange telecom involved in maintenance of the optical fiber for backbone connectivity across major towns, 8 county government ICT directors (Kilifi, Mombasa, Kwale, Kitui, Machakos, Makueni, TaitaTaveta and Nairobi), 10 ICT board members involved in development of ICT policy and 20 managers of public and private institutions utilizing the project along Mombasa-Nairobi. A census was carried out by use of questionnaires to collect primary data. Secondary data was obtained from published documents. A pilot study was conducted using data collection instruments and SPSS V21 and Excel were used to analyse the collected qualitative and quantitative data. The study further adopted regression analysis at 5% level of significance to determine strength and direction of the relationship of the variables under study. The analysis showed that stakeholder participation had the strongest positive (Pearson correlation coefficient =.667) influence on effective utilization of ICT infrastructure projects. In addition, human resource capacity, implementation strategy and government policy were positively correlated to effective utilization of ICT infrastructure with Pearson correlation coefficient of .609, .601 and .555 with p-values of .020, .028, .009 and .037 respectively. The study established that stakeholder participation was the most significant factor. The study recommends that human resource capacity needs to enhanced for effective utilization of Optical Fiber infrastructure. There is need to have adequate technical staff to ensure that there is efficiency in theutilization of Optical Fiber infrastructurein the organization.The organizations need to adopt an ICT infrastructure implementation strategic plan for effective utilization of Optical Fiber infrastructure. The national ICT policy should articulate a strategic utilization roadmap for the deployed optical fiber ICT infrastructure.The study recommends that similar studies to be undertaken for other ICT infrastructure projects for generalization of the findings of this study.

***Key Words:*** *Stakeholder Participation, Human Resource Capacity, Government Policy, Implementation Strategy, Effective Utilization Of Broadband Infrastucture Projects*

**Background of the Study**

ICT infrastructure is a critical enabler for trade, local and foreign investment, socio-political progress as it seeks to correct, improve and make more relevant the very processes with which trade and socio-political engagement is conducted within a country (Ong'ang'a, 2012).ICT infrastructural projects play a critical role in supporting socio-economic and political development through spurring productivity and innovation across the various sectors of a country. For proper utilization, ICT infrastructural projects should always take into consideration the varying needs of stakeholders. One of such infrastructural projects is the national optical fiber backbone which is a medium for carrying information from one point to another in the form of Light (Shitole&Ritesh, 2013). This technology provides vast amounts of information to different stakeholders such as homes and offices, as well as access to schools, universities, hospitals and community centres (RoK, 2014). Optical fiber is a major building block in the telecommunication infrastructure (Shitole&Ritesh, 2013).Optical fiber infrastructure is the most important enabling agent in provision of many benefits brought about by ICTs to the developed and developing countries, especially the rural regions (Mulwa, 2013).

ICT infrastructure projects in Africa are yet to influence explosive growth of the Internet and bandwidth intensive applications commonly due to inhibitive government policies, lack of awareness amongst potential stakeholders and lack of sufficient human capital to maintain ICT infrastructure and to develop strategies which can spur growth and innovation to take advantage of existing infrastructure (Ashraf, Sarfraz &Mohsin, 2010). Various studies have been conducted on ICT infrastructure projects to establish if the capacity created by such projects is fully utilized. However, a series studies, (Gartner Report, 2011; Liu, Wu &Meng, 2012; Stoica&Brouse, 2012, 2013) have shown that ICT infrastructure utilization has remained low in developing countries despite the large capital expenditures. (Stoica&Brouse, 2013) stated that due to ICT infrastructure project failures and their impact to the economy, researchers and practitioners are asked to specifically look at the history of how the projects are carried out to find an implementation strategy that is comprehensive to spur usage.

**Global Perspective on ICT infrastructure projects**

Growth in global ICT infrastructure projects spending over the past three decades has been considerable. Avram(2005) outlined that global ICT expenditure was growing at a rate faster than worldwide GDP. In 2005, global ICT spending exceeded $1 trillion per annum (Gwillim et al, 2005). According to Agarwal and Lucas (2005), ICT is one of the most important business driving forces of the 21$^{st}$ century. The reasons for this considerable growth can be linked to the increased realization of ICT's importance in achieving competitive advantage.

The significant increase in ICT's scale, complexity, strategic focus, connectivity and processing power in recent years has further heightened awareness of ICT's potential to positively affect an organization's competitive position (Kohli&Sherer, 2002).Information communication and technology is a multi-trillion dollar industry. It offers potential for significant organizational improvement and competitive advantage. However, ICT investment does not always translate into monetary rewards due to low usage. According to Powell (2010), ICT investment in organizations has grown considerably throughout the past three decades. By 1998, in the developed world, ICT infrastructure projects accounted for more than 50% of organizations annual capital investments and was expected to account for 5% of revenues by 2010.The main driving force behind this large-scale ICT investment is the promise of increased competitive advantage (Hu & Plant, 2001; Piccoli& Ives, 2005), since ICT is regarded as a strategic

weapon that can positively affect economic change (Gregor, Martin, Fernandez, Stern & Vitale, 2006). However low uptake of the massive ICT infrastructure investments has hindered the achievement of organizational potential.

More than two thirds of Fortune 100 companies believed that they did not realize their ICT investment potential (Anandarajan& Wen, 2006). A 2003 Standish Group survey of over 13,000 ICT infrastructure projects revealed that US organizations invested more than $255 billion per annum on ICT, $55 billion of which was spent on failed projects (Al-Shehab, Hughes &Winstanley, 2005). Depending on the project sample studied, authors have reported various ICT infrastructure project failure rates, for example 15% (Al-Shehab et al, 2005) and 25% (Keil, Mann &Rai, 2000). These failures are experienced because stakeholders targeted as potential users of ICT infrastructure projects are not involved right from the onset of the projects. Other organizations lack the human capital to develop innovations and or connect and maintain such ICT infrastructures.

**Local Perspective on ICT Optic Fiber Cable Projects**

The vision of the Kenyan national ICT policy is for Kenya to become a hub of ICT infrastructure and ICT solutions that enhance sustainable socio-economic development and accelerate poverty reduction both nationally and globally. To facilitate universal access to ICT infrastructure and services all over the country the government implemented the NOFBI project phase I, MoICT (2013). The NOFBI infrastructure was constructed using optical fiber technology, giving Kenyans access to 4300 km-length national and regional broadband infrastructure as well as access to the international broadband highway fibers cables landing on Kenyanshores, MoICT(2014). Innovations in broadband backbone coupled with optical fiber technology have the potential to lower the costs of providing ICT services to virtually any location, (Chatwin, 2013) due to enhanced economies of scale.

In Kenya, the ICT sector spending grew to 12.1% of National GDP in 2013, Sly(2014). Utilization of ICT i nfrastructure projects through the development o f human capacity and skills can create immense lo cal, regional and global business opportunities; it c an also create untold levels of dependency and de bt if such investments are delivered without appro priate stakeholder participation (RoK, 2015).

The NOFBI project is one of critical government fla gship project towards realization of the Vision 203 0 ICT milestone. NOFBI Phase1 was a Government of Kenya project implemented through the Ministr y of ICT and funded by the Chinese government. O range Kenya was contracted by the Ministry of ICT as the Project Manager of NOFBI Phase1. NOFBI P hase 1 was implemented between 2007 and 2009 using three main contractors namely; Huawei, ZTE and Sagem. NOFBI Phase 1 involved laying 4300Km s of fiber for backbone connectivity across m ajor towns in Kenya at a cost of $37 Million. The p roject was commissioned in the year 2008, comple ted in the year 2010, and handed over in the year 2011 after one year period of maintenance. The N airobi and Mombasa fiber route has 24 cores equi valent to 192 terabits/second through put of curre nt capacity with potential to upgrade to unlimited capacity. Seven years after completion of the NOF BI project phase1, less than 1% of this capacity is c urrently under use (RoK, 2014).

**Statement of the Problem**

Broadband infrastructure has the potential to tran sform livelihoods as an enabler for economic and s ocial growth. Governments around the world incre asingly view broadband as the “fourth utility” alon gside water, heating and electricity. (Intel, 2015) T he power of broadband has been confirmed by rec ent research, which shows that broadband fosters GDP growth, creates jobs and stimulates innovatio n, while also enabling improvements in education, health care and other social services. The investm

ent in ICT broadband promotes competition, innov ation and market growth (ITU,2014). It is an essen tial tool for empowering people, creating an envir onment that nurtures the technological and servic e innovation, and triggering positive change in bus iness processes as well as in society as a whole (IT U,2014).

The positive effect of broadband infrastructure inf ormed the government to implement NOFBI Phase 1. In low and middle income economies, a 10% gro wth in broadband penetration yields an additional 1.38% of GDP growth and for every 1 per cent incr ease in broadband penetration, productivity grow s by 0.13%. Furthermore, ICT broadband penetrati on has a positive impact on employment creation, available data indicates that employme nt growth varies widely, from 0.2 % to 5.32 % for e very increase in 1 % of Optical Fiber penetration. I n addation, within 12 years after implementation b roadband had been adopted by over 62 per cent o f households in the United States, 80 per cent in th e Netherlands and 95.9 per cent in Korea (ITU, 201 0; OECD, 2010), this uptake was facilitated by well informed government policies and enhanced stake holder participation. In Kenya broadband penetrat ion is less than 1% after 9 years of national fiber o ptic backbone implementation while on average p enetration from developed countries was at 6.6% per annum which would be at about an average o f 62.1% after 9% this meand that the broadband in frastructure is underutilized. This suffice to say, th e underutilization of the National Optical Fiber bac kbone infrastructure has caused a significant leaka ge of opportunities and is a major concern for the Kenyan Government (RoK, 2014). This study aimed to study the factors that has resulted into the low utilization of the broadband infrastructure.

**General Objectives**

The general objective of the study sought to establish the determinants influencing performance of ICT infrastructure projects in Kenya.

**Specific Objectives**

The specific objectives of the study sought to;

- Establish influence of human resource capacity on utilizationof ICT infrastructure in Kenya.
- Examine the influence of internal implementation strategy on ICT infrastructure utilization in Kenya.
- Explore the influence of stakeholder participation on ICT infrastructure utilization in Kenya.
- Determine the influence of government ICT policy on ICT infrastructure utilization in Kenya.

**LITERATURE REVIEW**

This literature review discusses previous studies relevant to the topic of study.

**Theoretical Review**

Theoretical frameworks are explanations about a phenomenon and according to Marriam (2001) theoretical framework provides the study the lens to view the world. Some of the relevant theories discussed include; Stakeholder Theory, Resource Based Theory, Governance Theory and Rogers Innovation diffusion Theory.

**Stakeholder Theory**

Freeman (2004), identifies and models the groups which are stakeholders of a corporation, and both describes and recommends methods by which management can give due regard to the interests of those groups. Agle et al., (2008) argues that the theory has multiple distinct aspects that are mutually supportive: descriptive, instrumental, and normative. The descriptive approach is used in research to describe and explain the characteristics and behaviors of firms, including how companies are managed, how the board of directors considers corporate constituencies, the way managers think

about managing, and the nature of the firm itself in the implementation of projects.

The central idea is that an organization's success is dependent on how well it manages the relationships with key stakeholders such as customers, employees, suppliers, communities, financiers, and others that can affect the realization of its purpose (Freeman & Phillips, 2002).Patton (2008) emphases that the stakeholder models entails all people with legitimate interest to participate in an enterprise do so to gain benefits. Michell et al., (2008) state that the exercise of stakeholder power is triggered by conditions that are manifest in the other two attributes of the relationship i.e. legitimacy and urgency. Power gains importance when it is legitimate and exercised through a sense of urgency. Highly important and powerful stakeholders are located where power, legitimacy and urgency intersect (Freeman & Phillips, 2002). The overall purpose of stakeholder theory is to enable the managers to understand stakeholders and strategically manage them (Patton, 2008).

The theory emphasizes the significance of the relationship between the stakeholder participation and the performance of the ICT infrastructure projects. The success or failure of the projects will be influenced greatly by the participation of various stakeholders which may include the users benefiting from the project and even the project team, (Beach, 2009). Thus, the study seeks to establish whether there existed stakeholder involvement in implementation of NOFBI phase 1, for the success and sustainability of the project. The above theory relates to the stakeholder participation on effective utilization of ICT infrastructure projects in Kenya.

**Human Capital Theory**

From an organizational perspective, the human capital theory hypothesizes that in a perfectly operating labor market, organizational productivity increases as individuals become more highly trained. The overall link between training and development to productivity at the workplace is based on a concept referred to as factor pricing, Maglen (2008). According to Livingstone (1999), human capital theorists insist on the importance of investment in education and imparting of the value of the worker. The theory assumes that organization specific training, such as in the events of changes, is likely to increase the organization long term productivity results on their training investment. The employees are more likely to have a better understanding of the structures resulting from the change and will use them appropriately to ensure productivity to the project Bosworth, Wilson &Assefa (1993). Hence, Maglen (2008) asserts that this leads to employees' satisfaction and will also influence the level of employee engagement thus project performance.

A proper investment in training and development by an organization on its employees increases their understanding of their duties, tasks and obligations. Training also creates a conducive environment for cooperation and collaboration amongst employees in performing their work. Juan (2010).The human capital theory proposes that sustainable competitive advantage is attained when an organization has a human resource pool that cannot be imitated or substituted by its competitors. According to Ngugi(2013), human capital theory emphasizes the value addition that people generate. Investment in people is worthwhileventure as it empowers employees to perform, produce, create flexible and capacity to innovate.The above theory relates to human resource capacity on effective utilization of ICT infrastructure projects in Kenya.

**Resource Based theory**

The quest for effective implementation of a project has long been a central tenet of the field of project management (Pressutti, 2013). Within this field, resource-based theory (RBT) has emerged as a promising new framework for analyzing the

sources and sustainability of monitoring and evaluation (Baily, 2008). According to RBT, utilization measured as economic rent (Caridi et al, 2013) - derives from strategic resources. Such utilization is sustainable to the extent that the resources on which it is based are valuable, rare, inimitable, and non-substitutable (Bales and Fear on, 2009).

Further, RBT rests on the premise that resources controlled by governments are heterogeneous and relatively immobile (Pearcy & Guinipero, 2008). The imperfect mobility of resources (including inimitability and non-substitutability) is due to a variety of isolation mechanisms (Roth, 2011) which include co-specialization of assets (Teo & Benbasat, 2013) unique historical conditions (Berger & Calabrese, 2008), causal ambiguity (Liao et al, 2011), social complexity (Barnes et al, 2012), and tacit knowledge and skills (Puschmann & Alt, 2008).

Utilization derived from such resources might be sustained because other organizations which attempt to duplicate them do not have the necessary organizational knowledge, the learning capability, or the time required to accumulate them. Given the dynamic nature of utilization process, this study believes that the sustainability of such an advantage must be defined in dynamic, time-sensitive terms. In this study RBT informs the study that utilization depends on the resources within the stakeholders organizations such as human capacity and internal policies held by the organization that will affect how the implementation strategy to adopt will be structured. This theory relates to internal implementation strategy how it affects effective utilization of ICT infrastructure projects in Kenya.

**Governance Theory**

The World Bank (1991) defined governance as the exercise of political authority and the use of institutional resources to manage society's problems and affairs. Governance theory is concerned with steering actions of political authorities as they deliberately attempt to shape socio-economic structures and processes (Myantz, 2003). According to Harris (1990), Governance signals how the informal authority of networks supplements and supplants the formal authority of the government by exploring the changing boundary between the state and the society. The theory assumes that at the macro level the government should focus on the formulation of public policy and leave utilization to other bodies, private organizations or non- profit organizations, hence encouraging privatization, outsourcing, agentification and a stronger emphasis on market mechanism (Kickert, 1997).

The assumption that the more the separation from the policy formulation, the more the participation by different actors in the utilization process, and the more the realization of efficiency on the process outcomes.Governance in ICT infrastructure project utilization requires the co-operation of the various stakeholders leading to synergies, information and knowledge sharing, leveraging on each other's strength so as to generate more innovative ways and better products as an outcome of the ICT infrastructure projects objectives. Complementarities with between development partners and governments, clear assignment roles as well as enforcement of good implementation strategies is more likely to lead to improved utilization of ICT infrastructure projects.

**Rogers Innovation Diffusion Theory**

Rogers (1983) revealed that the process of innovation diffusion as one which is dictated by uncertainty reduction behavior amongst potential adopters during the introduction of technological innovations. He decries the process through which new ideas, practices or technologies are spread into a social system. Despite innovations offering its adopters new ways of tackling day-to-day problems, the uncertainty as to whether the new ways will be superior to existing ones presents a

considerable obstacle to the adoption process. (Niederman, Brancheau & Wetherbe, 1990) assert that to counter this uncertainty, potential adopters are motivated to seek additional information, particularly from their workplace peers. According to Rogers (1983), suggests key characteristics of innovation that consistently influence the adoption of new technologies: complexity, which is the degree to which an innovation is perceived as being complicated to use; observability, which is the degree to which the results of an innovation are observable to others; demonstrability, which is tangibility of results of adopting an innovation relative advantage; compatibility, which is the extent to which an innovation is perceived to fit together with potential adopters' habits and practices; and trial ability, which is the degree to which innovation may be susfficiently tested prior to adoption.

Diffusion theory is one of the most commonly-used theories in the social sciences, education, health and marketing, and is standard fare in most communication theory or technology, communication strategy and planning courses (Abbott & Yarbrough, 1999). Diffusion is the process by which an innovation is adopted by members of a certain community. There are four factors that influence adoption of an innovation. These include the innovation itself, the communication channels used to spread information about the innovation, time and the nature of the society to whom it is introduced (Rogers, 1995). While interest in this theoretical area peaked in the late 1950s and 1960s and then declined, it has had a resurgence of sorts due to the current great interest in new communication technologies and how they might affect society (Abbott & Yarbrough, 1999). Diffusion is concerned with the spread of ideas from originating sources to ultimate users. Research concerns have focused on the speed at which an innovation spreads and the factors that facilitate or inhibit this spread.

Several reasons exist as to why organizations may choose to invest in the use of the NOFBI Ph1 project. These reasons include the ability to opening firms to the world; economies of scale hence reduced cost of production hence competitive advantage, assurance of business continuity planning, and a myriad of other opportunities (Olalusi & Jesuloluwa, 2013). Nonetheless, these benefits derived from on boarding to the NOFBI can be undermined by user reluctance to accept and use the new technologies at their disposal (Davis, 1989).

**Conceptual Framework**

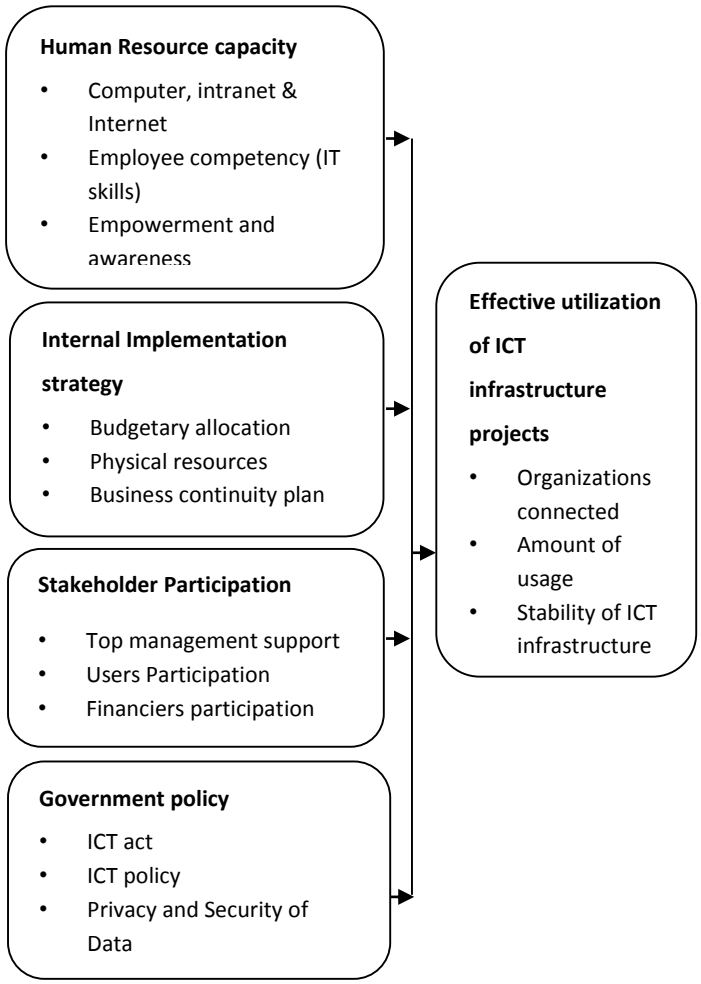


**Figure 1: Conceptual framework**

**Stakeholder Participation**

Freeman (2008) stated that the key idea about capitalism is that the entrepreneur or manager creates value by capturing the jointness of the interests [of the stakeholders]. Sometimes the interests are in conflict, but over time they must be shaped in the same direction. Friedman (2006) stated that the organization itself should be thought of as grouping of stakeholders and the purpose of the organization should be to manage their interests, needs and viewpoints. Freeman (2004) has defined stakeholders as: “those groups who are vital to the survival and success of the organization”.

Participation is a mechanism to promote equality through inclusion (empowerment). Participation as a process captures both expert and lay knowledge in project management. Many shades of participation exist including participation as consultation, as decision-making, as partnerships for utilization, as capacity building, as expressing a need, as covering bases, as ownership, and as a mechanism for decentralization. Given that the effectiveness of each shade of participation may vary across spatial-temporal scales, the critical question is which kind of stakeholder participation is appropriate for a particular setting and what level of intensity is deemed sustainable (Armah et al, 2009). Stakeholder participation occurs across all the different stages of project utilization with varying degree of involvement from various key stakeholders. The type of participation may include all users, or only the representatives of users. And the content of participation may include technical, social, or both (Kairu & Ngugi, 2014).

There are significant relationships between ICT infrastructure utilization and key stakeholder participation: top management committee, user participation, financiers’ participation and the implementation team (Wysocki,2007; Susan &Yumi, 2007; Valedez & Bamberger, 2000). Most ICT infrastructure projects typically have low levels of key stakeholder participation (Valedez & Bamberger, 2013). This constrains their utilization by the prospect stakeholders. These factors were chosen because various studies had found a significant relationship between the factors and utilization of ICT infrastructure projects (Ngalu &Bommett, 2014). According to Mulwa (2007), higher stakeholder participation helps the community to have better knowledge and information, which contribute to the successful uptake of projects.

Lack of top management participation is identified as a cutting edge for enhancing the apathy levels of stakeholders in ICT infrastructural project utilization. Participants argue that providing top management education, as stakeholders, will increase their knowledge level in how to better adopt and tap into the opportunities that the project presents and what role they need to play during the utilization process (Matanda, 2010). This top management committee education on how to identify capacity utilization best practices is very vital for "local stakeholders" (users) who do not normally understand their role in development projects in their communities (Ochieng, 2012).

A project manager is accountable for delivering project outputs for the various key stakeholders of the project. Particularly, the active involvement of senior managers from potential user organizations can help in increasing uptake and hence enhance utilization of ICT infrastructure. Consistently, project management literature has found that top management support positively contribute to project success (Besner and Hobbs, 2008; Zwikael & Globerson, 2004; Johnson et al., 2001; McManus, 2004). These studies show that top management support is considered to be among project management critical success factors (CSFs). The ability of the project manager to effectively manage or meet the expectations of the varying interests of the broad spectrum of key stakeholders at the various stages of ICT

infrastructure projects is fundamental to the adoption of such projects.

**Internal Implementation Strategy**

For any meaningful project success to be realized the internal environment of the firm must be taken into consideration so as to avail resources. These resources include finances, human capital resource, motor vehicles, computers, managerial resources and time (Gwadoya, 2011). Resource allocation comprises a number of different factors that influence utilization of ICT infrastructural projects. These factors include physical, human and financial resources. The effects of these resources on project implementation have been extensively studied with diverse results. Lots of concerns have been raised in theoretical and empirical research in the economics, management and sociology disciplines on whether ICT infrastructure projects are worth investing by allocating these resources (Ghazala & Vijayendra, 2011).With proper resource allocation, project output quality is guaranteed and hence uptake. Monitoring and timely reporting is critical in projects since interventions can be invoked to address any negative deviations to save projects from collapsing (Gichuki, 2012).

Inadequate internal resources compromise on the quality of project outputs. To drive project output adoption, it is critical have an implementation strategy that captures the financial and human resources required for adoption (CIC, 2009). Adoption of Optical fiber backbone infrastructure requires financial and human resources investment on user organizations. These costs should be considered within the overall costs of adopting the project (Gichuki, 2012).Jod Ray (2004) stated that a project is a complex non-routine, one life time effort limited by time, budget and resources to meet customers' needs. Effective funds management in projects is determined by parameters which govern funds control such as auditing (Kaburu, 2012). According to Gasper (1999), availability and adequacy of budgetary allocation plays a key role in the formulation of internal implementation strategy. The financing process, such as raising and maintaining adequate funds for project activities, is clearly of critical importance to the progress of a project. Jack and Samuel (2006) stated that adequate funding need to be devoted to adoption plans for utilization potential to be realized in a project. Insufficient financing is a major factor for poor adoption rate which, in turn, is often cited as a reason for project failure (Jack & Samuel, 2006). In a study done in Zambia, it was found out that in 88 per cent of NOFBI projects sampled, community members raised concerns about some inappropriate projects, the misuse of funds or insufficient adherence to ICT guidelines; nine per cent of completed projects were left lying idle due to lack of effective adoption systems (Carrel ,2006).

According to CIC (2009), it is essential to ensure that sufficient resources are available to support adoption activities. In the planning phase, the organization's resources such as people, money and time should not be neglected. This is because when it comes to identifying indicators and data sources, resources will be required to actually collect and report on the data (Jack & Samuel, 2006).

**Human Resource Capacity**

The ability to identify opportunities and support the Optical fiber infrastructure depends on a well trained human resource. Thus, potential user organizations have a responsibility to create awareness and train staff on emerging technologies (Marchewka 2010). According to Morioka (2009), many top management teams at various organizations are unfamiliar with the use of optical fiber infrastructure hence apathy. In such circumstances, the ability of such managers to pitch for resource allocation to support uptake is compromised. Despite many ICT infrastructure projects containing detailed procedures on

project specification, most are yet to show a good track record of adoption due to lack of technical skills (Marchewka 2010; Remenyi& Money, 2007).

Powell (2010) argued that the most important cause of poor project adoption is as a result of lack of technical knowhow of the users. According to Gregor et al., (2006), employee competency plays a significant role on utilization of a projects' infrastructure. Competency leads to positive delivery of a project in the long run (Harenstrein et al., 2004). Largely, little attention is given to this human aspect and as Hershrem & Smithson (2006) states: Nothing is done as long as nothing goes wrong and yet the cost of doing nothing can be huge to the project. Managers play an essential role in making sure that every employee develops sufficient technical capacity to effectively deliver their scope within the project. The employee needs to understand the importance being technically competent for completeness, collective significance and improvement of project utilization process (Harenstrein et al., 2004).

**Government Policy**

Kenya has made remarkable progress putting in place an ICT policy framework, complete with measurable outcomes and time frames (RoK, 2012). The process has had the benefit of sound advice from officials and stakeholders and, perhaps more importantly, strong leadership from the government. This not withstanding, the level of uptake of the national optical fiber is significantly low.

After several years of effort, Kenya promulgated a National ICT Policy (RoK, 2006) that aims to improve the livelihoods of Kenyans by ensuring the availability of accessible, efficient, reliable and affordable ICT services. The national policy has several sections, including information technology, broadcasting, telecommunications, and postal services. Information technology sets out the objectives and strategies pertaining to ICT development within the republic.

The National ICT Policy embedded this intent as a national priority and provided the impetus for the ministry to develop its sector policy on ICT. Connectivity and network infrastructure, Access and equity, technical support and maintenance, harnessing emerging technologies, digital content, Integration of ICT in education, training (capacity-building and professional development) and research and development can boost effective utilization of ICT infrastructure projects in Kenya(RoK, 2014)

**Effective Utilization of ICT infrastructural projects**

In project management, a project can be said to be successfully if the outcome is consumed to a great extent by stakeholders. We can say that a project is complete if it has the following factors: user involvement, executive management support, and clear statement of requirements, proper planning and realistic expectations (Matanda & Wanyoike, 2014). The stakeholder is entitled to receive the benefits of strategically completed project as intended by the government and other development partners (RoK, 2010).

In the Business Monitor International report, 2010, it is concluded that stakeholder participation, technology, resources allocation and government policy were the elements that were most often pointed to as major contributors to project success. However, these elements alone could never guarantee success. But if these are done well, a project, according to the Standish Group, will have a much higher probability of success. The next category of differentiators from the Standish report deals with projects that proved to be "challenged" that is, they were completed but never utilized.

According to the government of Kenya Third Annual Progress Report (2005-2006), the reason of this problem lies on selected leaders who are

mandated to ensure successful completion of the a fore mentioned projects. In the context of the current study, the NOFBI ICT infrastructure project, the study sought to establish if uptake of the project outcome can be measured as successful (Mungai, 2012).

**Empirical Review**

Various studies have been conducted to establish the role of internal implementation strategy in utilization of ICT infrastructure. According to Musomba (2013), he conducted a study on factors affecting effectiveness in implementation of ICT projects in Changamwe constituency in Kilifi County, Kenya. The objective of the study was to determine the influence of budgetary allocations on implementation of ICT projects. The research purposely targeted 31 respondents, 27 of whom were project management committee members responsible for implementation of ICT projects. The rest were officials charged with responsibilities for prudent management of this fund. A census was done involving all the respondents. The study found that the committee members were not aware of the budgetary allocation or what proportion it was of the total project budget. Surprisingly, they could not tell the current budgets for their projects, too. The study did not show how budgetary allocations influenced implementation of ICT projects in the constituency.

Kang et al., (2013) conducted a study on interaction effects of information technologies and best practices on construction project performance. Building from considerable empirical research in the general business literature, this paper quantitatively explored the view that the benefits of information technologies manifest themselves through improvement in work processes. In turn, better work processes lead to increased project outcome uptake. Using an overall sample of 133 projects (missing data make specific correlation sample sizes smaller) from the Construction Industry Institute Benchmarking and Metrics database, this paper analyzed correlations between use of technology and integration, best practices, and project performance measured with cost, schedule, and rework metrics. The findings showed that there are significant beneficial correlations between information technology use like intranet and internet and performance and slightly more significant beneficial correlations between best practice use and performance. Interaction effects of the combined use of information technologies and best practices against performance are assessed, finding several positive correlations, although limited data availability prevents robust statistical evaluation. Overall, the paper concludes there is evidence that the benefits of information technologies in construction are found through changes in work processes (not ICT infrastructure related).

Bardhan, Krishnan & Shu (2007) did a study on project performance and the enabling role of information technology: an exploratory study on the role of alignment. They argue that as firms focus on new product, process, and service innovations, improving the implementation and productivity of NOFBI projects that help deliver these innovations assumes greater importance. Information technology (IT) has been an enabler of manufacturing productivity improvement, but its effect on improving the productivity of innovation-intensive operational activities has been mixed. In this paper, they explored the pathways through which IT impacts project-level performance measured in terms of speed, quality, and cost. Specifically, in this exploratory study they sought to present a theory of how the fit between enabling IT and the core characteristics of the project impacts project performance. They tested their research hypotheses empirically, using a relatively large, cross-sectional sample of project data. The central contribution is the development and testing of a research model to improve their understanding of the relationship between enabling IT-project alignment, project competencies, and project performance. In doing so, their study clarified the role of information

technologies in project management, providing insights into how to integrate IT into innovation-intensive operational activities for improving project execution competence and productivity.

Durmusoglu (2009) did a study on the role of top management team's IT infrastructure view on new product development: conceptualizing IT infrastructure capability as a mediator. The purpose of this paper was to investigate how sophistication of top management view on IT infrastructure influences the firm's IT infrastructure capability and the effect of IT infrastructure capability on new product development process outcomes such as cost, cycle time, and quality. Drawing from research-based and knowledge-based theories, a conceptual model on how IT infrastructure influences new product development process efficiency is developed. The paper demonstrated that sophistication of top management view on IT Infrastructure enhances utilization of ICT infrastructure. IT infrastructure policy enhances the implementation efficiency by reducing the cycle time and cost of ICT infrastructure projects and improving the implementation quality. However, these studies did not focus on how technology and equipments influence ICT infrastructure projects. Kang et al., (2013) and Bardhan, Krishnan and Shoo (2007) focused on Information technology and project performance. On the other hand, Durmusoglu (2009) focused on IT infrastructure.

**RESEARCH METHODOLOGY**

This chapter describes the research design, population of study, sample size and sampling procedure, data collection tools and procedures, data processing and analysis of the research instruments that was employed during the study.

**Research design**

The study adopted a descriptive survey design. A survey design as described by Mugenda & Mugenda (2008) is an attempt to collect data from members of a population in order to determine the current status of that population with respect to one or more variables. The design allowed for an in-depth investigation of the problem under study.

**Sample and Sampling Technique**

A sample size is a set of observations drawn from a population by a defined procedure (Creswell, 2003). The target population size was manageable and small enough for data collection; therefore study adopted a census survey technique.

**Data Collection Procedure**

This study collected primary data from the respondents through questionnaires. According to Kothari (2004) questionnaires give a detailed answer to complex problems. Questionnaires were administered on the entire sample through personal delivery. The study employed telephone calls and personal visits to follow up on the respondents to ensure that they completed the questionnaires. The study also relied on library and desk research, study of various books, Scholarly journals and articles, reports, internet and publications on the subject matter and related topics for collection of secondary data.

**Data Analysis**

According to Kothari, (2004), data analysis is the process of bringing order, structure and meaning to the mass of information collected. The data was collected by use of the questionnaire, thoroughly edited and checked for completeness and comprehensibility. Both qualitative and quantitative data analysis methods were used. The tabulated data was analyzed using simple regression analysis. A regression model was used to assess the collective effect of the four independent variables. The study was guided by the following regression model:

$$Y_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \acute{\varepsilon}$$

Where;

$Y_i$= Effective utilization of ICT Infrastructure projects;
$X_1$ = Human resource capacity;
$X_2$=Implementation Strategy;
$X_3$ =Stakeholder participation;
$X_4$ =Government Policy;
**ɛ́ =** is the error term

To test the level of significance of each independent variable against dependent variable the study used the model summary ANOVA and Coefficient Regression. According to the model summary Table, R is the correlation coefficient which shows the relationship between the independent variables and dependent variable. It is notable that there existed a relationship between the indepedent variables and depedent variable as shown by R value The coefficient of determination ($R^2$) explained the extent to which changes in the dependent variable was explained by the change in the independent variables or the percentage of variation in the dependent variable and the four independent variables that were studied to explain effective utilization of broadband Infrastructure projects as represented by the $R^2$. This therefore means that other factors not studied in this research contributed to a certain percentage determined on effective utilization of broadband Infrastructure projects.

Further, the study revealed the significance value as thus the model was statistically significant in predicting how human resource capacity, internal implementation strategy, government policy and effective utilization of broadband Infrastructure projects. This show whether the overall model was significant in the ANOVA table.The study run the procedure of obtaining the regression coefficients, and the results show relationships between effective utilization of broadband Infrastructure projects and the four variables. Finally the findings were presented using tables, charts and graphs to facilitate comparison and for easy inference.

## RESULTS AND DISCUSSIONS

This chapter discusses the interpretation and presentation of the findings obtained from the field.

### Response Rate

The study targeted a sample size of 88 respondents from which 73 filled in and returned the questionnaires making a response rate of 82.95% . This response rate met the requisite threshold to make conclusions for the study.

### Gender of the Respondents'

The study sought to determine the gender composition of the respondents. From the findings, it was established that 58% of the respondents, the majority, were male whereas 42% of the respondent were female.

### Age Distribution of the Respondents

The study requested the respondents to indicate their age category. From the research findings, the study revealed that 36% of the respondents were aged between 41 to 50 years, 17% of the respondents were aged between 18 to 30 years, 19% were above 50 years whereas 28% of the respondents were aged between 31 to 40 years. This implies that respondents all ages were represented during the study.

### Educational Level of Respondents

The study sought to establish the educational background of the respondents. From the study findings, 47% of the respondents indicated that they held bachelors certificates, 31% of the respondents had diploma certificates, 21% indicated to have reached postgraduate level and 1% of the respondents had reached secondary level and this implies that most of respondents were well educated and that they were in a position to respond to research questions with ease.

**Human Resource Capacity**

The study sought to establish the influence of employee competency (IT skills) on the effective utilization of the project. From the study findings, it was established that employee competency influence effective utilization of NOFBI project,67% of the respondents indicated that it could increase the number of organizations/ individuals connected, 55% of the respondents stated that it could lead to increase on the usage by organizations and individuals and 65% of the respondents agreed that it enhances successful completion/ delivery of the projects. Powell (2010) argues that the most important cause of poor project adoption is due to lack of technical knowhow of the users which partly may be attributed to the skills of the human resource in an organization. This implies that lack of employee competency affect effective utilization of ICT infrastructure in the organizations.

**Internal Implementation Strategy**

The study sought to establish the influence of business continuity plan on the effective utilization of the project. From the study findings, it was established that of business continuity plan influence effective utilization of the NOFBI project. 67% of the respondents indicated that it could increase the number of organizations/ individuals connected, 86% of the respondents stated that it could lead to increase on the usage by organizations and individuals and 66% of the respondents agreed that it enhances successful completion/ delivery of the projects. The findings of the study collates with literature review by Gichuki (2012) who states that with proper internal implementation strategy on allocation and utilization of these resources; there will be efficiency and effectiveness in implementation and thus increased output and effective utilization of the project. This will make the projects to be easily monitored with reports and feedback given on time.

**Stakeholder Participation**

The study sought to establish the influence of top management support on the effective utilization of the project. From the study findings, it was established that top management influence effective utilization of the NOFBI project. 68% of the respondents indicated that it could increasethe number of organizations/ individuals connected, 76% of the respondents stated that it could lead to increase on the usage by organizations and individuals and 65% of the respondents agreed that it enhances successful completion/ delivery of the projects. According to Morioka (2009), many top management teams at various organizations that are unfamiliar with the use of optic fiber ICT in are resistant to incorporating such technologies into their established organization information systems. To succeed utilization of ICT in infrastructure needs to be supported by well-trained human resource.

**Government Policy**

The study sought to establish the influence of ICT Act on the effective utilization of the project. From the study findings, it was established that of ICT Act influence effective utilization of NOFBI project. 75% of the respondents indicated that it could increasethe number of organizations/ individuals connected, 56% of the respondents stated that it could lead to increase on the usage by organizations and individuals and 55% of the respondents agreed that it enhances successful completion/ delivery of the projects. The National ICT Act embedded this intent as a national priority and provided the impetus for the ministry to develop its sector policy on ICT. Connectivity and network infrastructure, Access and equity, technical support and maintenance, harnessing emerging technologies, digital content, Integration of ICT in education, training (capacity-building and professional development) and research and development ( RoK, 2013).

**Effective Utilization of ICT Infrastructure projects.**

This section of the study sought to find out the causes of ineffective utilization of ICT infrastructure projects from year 2010-2015. The results of the study revealed that 32% of the respondents said that the lack of stakeholder participation, 25% of the respondents attributed challenges regarding human resource capacity, 23% indicated government policy 20% of the respondents stated due to poor internal implementation strategy. These results reveal that reasons behind their failure are either attributed to internal weakness or factors which can be controlled. Thus lack of proper stakeholder participation, implementation strategy, human resource capacity and government policy prolonged the ineffective utilization of ICT infrastructure projects.

**Correlation Analysis**

Pearson correlation was used to measure the degree of association between variables under consideration i.e. independent variables and the dependent variables. Pearson correlation coefficients range from -1 to +1. Negative values indicates negative correlation and positive values indicates positive correlation where Pearson coefficient <0.3 indicates weak correlation, Pearson coefficient >0.3<0.5 indicates moderate correlation and Pearson coefficient>0.5 indicates strong correlation.

**Table 1: Correlation Coefficients**

| | | Effective utilization of ICT infrastructure | Human resource capacity | Implementation Strategy | Stakeholder participation | Government policy |
|---|---|---|---|---|---|---|
| Effective utilization of ICT infrastructure projects | Correlation Coefficient | 1.000 | | | | |
| | Sig. (2-tailed) | | | | | |
| | N | | | | | |
| Human resource capacity | Correlation Coefficient | .699 | 1.000 | | | |
| | Sig. (2-tailed) | .021 | | | | |
| | N | 73 | | | | |
| Internal Implementation Strategy | Correlation Coefficient | .655 | .765 | 1.000 | | |
| | Sig. (2-tailed) | .017 | .546 | | | |
| | N | 73 | 73 | | | |
| Stakeholder participation | Correlation Coefficient | .756 | .142 | .432 | 1.000 | |
| | Sig. (2-tailed) | .011 | .001 | .102 | | |
| | N | 73 | 73 | 73 | | |
| Government policy | Correlation Coefficient | .602. | .037 | .046 | .543 | 1.000 |
| | Sig. (2-tailed) | .020 | .000 | .001 | .005 | |
| | N | 73 | 73 | 73 | 73 | |

The analysis of correlation results in Table 1 illustrates that between human resource capacity and effective utilization of ICT infrastructure projects show a positive coefficient .699, with p-value of .021. It indicates that the result is significant at α =5% and that if the human resource capacity increases it will have a positive impact effective utilization of ICT infrastructure projects. The correlation results between implementation strategy and effective utilization of ICT infrastructure projects also indicates the same type of result where the correlation coefficient is .655 and a p-value of .027 which significant at α = 5%. The results also show that there is a positive association between stakeholder participation and effective utilization of ICT infrastructure projects where the correlation coefficient is 0.756, with a p-value of .011. Further, the result shows that there is a negative association between government policy and effective utilization of ICT infrastructure projects where the correlation coefficient is .602 with a p-value of .040. This therefore infers that stakeholder participation contributed most effective utilization of ICT infrastructure projects followed by human resource capacity in effective utilization of ICT infrastructure projects, then implementation strategy while government policy had the least influence on effective utilization of ICT infrastructure projects in the county. The correlation matrix implies that the independent variables are very major challenges of effective utilization of ICT infrastructure projects as shown by their strong and positive relationship with the dependent variable; effective utilization of ICT infrastructure projects.

**Multiple Regression Analysis**

In addition, the researcher conducted a multiple regression analysis so as to test relationship among variables (independent) on the on effective strategic change management. The study applied the statistical package for social sciences (SPSS V. 21) to code, enter and compute the measurements of the multiple regressions for the study. According to the model summary Table 2, R is the correlation coefficient which shows the relationship between the indepedent variables and depedent variable. It is notable that there extists strong positive relationship between the indepedent variables and depedent variable as shown by R value (0.866). The coefficient of determination ($R^2$) 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 and the four independent variables that were studied explain 75% of the effective utilization of ICT infrastructure projects as represented by the $R^2$. This therefore means that other factors not studied in this research contribute 25% of the effective utilization of ICT infrastructure projects. This implies that these variables are very significant therefore need to be considered in any effort to enhance effective utilization of ICT infrastructure projects. The study therefore identifies variables as critical determinants of effective utilization of ICT infrastructure projects in Kenya

**Table 2: Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| **1** | .866 | .750 | .234 | .023 |

Further, the study revealed that the significance value is 0.028 which is less that 0.05 thus the model is statistically significance in predicting how human resource capacity, implementation strategy, stakeholder participation and government policy affect the effective utilization of ICT infrastructure projects. The F critical at 5% level of significance was 9.120. Since F calculated (15.599) is greater

than the F critical (value = 9.120), this shows that the overall model was significant.

**Table 3: ANOVA**

| Model | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 2.446 | 4 | .6115 | 15.599 | .008 |
| Residual | 2.666 | 68 | .0392 | | |
| Total | 5.112 | 72 | | | |

**NB:** F-critical Value = 9.120

**Predictors: (Constant):** Human resource capacity, implementation strategy, stakeholder participation and government policy

The study ran the procedure of obtaining the regression coefficients, and the results were as shown in the Table 4. Multiple regression analysis was conducted as to determine the relationship between effective utilization of ICT infrastructure projects and the four variables. As per the SPSS version 21 generated table above, the equation ($\mathbf{Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon}$) becomes:

$Y= 54.335+ 0.609X_1+ 0.601X_2+ 0.667X_3+ 0.555X_4$

According to the regression equation established, taking all factors into account (human resource capacity, implementation strategy, stakeholder participation and government policy) constant at zero effective utilization of ICT infrastructure projects was 54.335. The data findings analyzed also shows that taking all other independent variables at zero, a unit increase in human resource capacity will lead to a 0.667 increase in effective utilization of ICT infrastructure projects.; a unit increase in implementation strategy will lead to a 0.609 increase in effective utilization of ICT infrastructure projects, a unit increase in stakeholder participation will lead to a 0.667 increase in effective utilization of ICT infrastructure projects and a unit increase in government policy will lead to a 555 decrease in effective utilization of ICT infrastructure projects. This infers that stakeholder participation contributed most to effective utilization of ICT infrastructure projects. At 5% level of significance, human resource capacity had a 0.002 level of significance; implementation strategy showed a 0.008 level of significance, stakeholder participation showed a 0.001 level of significance and government policy showed a 0.009 level of significance hence the most significant factor was stakeholder participation.

**Table 4: Coefficient Results**

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | P-value. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | 54.335 | 1.223 | | 2.615 | .000 |
| Human resource capacity | .609 | .303 | .562 | 4.223 | .002 |

| | | | | | |
|---|---|---|---|---|---|
| Internal Implementation strategy | .601 | .349 | .554 | 2.724 | .008 |
| Stakeholder participation | .667 | .217 | .616 | 5.036 | .001 |
| Government policy | .555 | .493 | .463 | 3.144 | .009 |

**SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

The study sought to establish determinants of effective utilization of ICT infrastructure projects in Kenya. The study examined theoretically and empirically how various variables contributed to effective strategic change management. In assessing the challenges, the study focused on how select factors (Implementation strategy, Stakeholder participation, Human resource capacity and Government policy) influenced the effective utilization of ICT broadband infrastructure projects. This chapter captures the summary of findings, from which conclusions were drawn and recommendations made.

**Summary of the Findings**

**Human Resource Capacity**

The study sought to establish whether human resource capacity influence effective utilization of ICT NOFBI projects. From the descriptive analysis, the study results revealed that majority of the respondents indicated that to a small extent that they did have adequate technical staff to ensure that there is efficiency on the effective utilization of the NOFBI project in the organization, the technical staff engaged on planning and implementation of the effective utilization of projects; to a small extent indicated that they had qualified and trained technical staff to implement the effective utilization of the NOFBI project in the organization. The respondents stated to a great extent lack of proper leadership in the project team responsible for the initiation, execution, monitoring and controlling affected effective utilization of the NOFBI project in the organization; to a small extent they did have training program for effective utilization of NOFBI project in the organization. The respondents also stated that to a moderate extent sometimes theorganizationreliesheavilyonexpertsto runtheutilization of the project Finally, the study revealed that the variable (Pearson correlation coefficient =.609) and p-value (.020< 0.05) statistically, moderately and significantly correlated to effective utilization of ICT infrastructure projects at 5% level of significance as it had a positive relationship with the dependent variable. This reveals that human resource capacity is an important factor that can boost effective strategic change management in the organization. This also reveals that an increase in human resource capacity levels the more effective the utilization of ICT infrastructure projects. Therefore, from these quantitative results it can be deduced that the study which sought to establish the influence of human resource capacity on effective utilization of ICT infrastructure projects was achieved because it established that human resource capacity influences effective utilization of ICT infrastructure projects in the organizations.

**Internal Implementation Strategy**

From the study results, majority of the respondents indicated that to a moderate extent that they had a strategic plan for effective utilization of the NOFBI project. The respondents

to a great extent indicated that there was framework used to guide on how the plan can be realized. The study results reveals that lack of proper systems approach in planning, scheduling and training within strategic plan may have contributed to non-performance of effective utilization of NOFBI projects in the organization. Further, the study revealed that the variable (Pearson correlation coefficient =.601) and p-value (.028 < 0.05) statistically, strongly and significantly correlated to effective strategic change management in the organization at 5% level of significance as it had a positive relationship with the dependent variable. This reveals that internal implementation strategy is an important factor that can enhance effective utilization of ICT infrastructure projects. This also reveals that a solid implementation strategy enhances effective utilization of ICT infrastructure projects in the organization. Therefore, from these quantitative results it can be deduced that the study which sought to establish the influence of implementation strategy on effective utilization of ICT infrastructure projects was achieved. The study established that implementation strategy influences effective utilization of ICT infrastructure projects.

**Stakeholder Participation**

From the descriptive analysis, the study results revealed that majority of the respondents indicated that stakeholder participation is an important element in effective utilization of the NOFBI projects; to a moderate extent the respondents cited that the organization incorporates 'information sharing' with stakeholders as a key factor in its the effective utilization of the NOFBI project; to small extent did the respondents to a great extent that the organization employs top management frame work in the project to see commitment of management towards the utilization of projects; to a small extent they stated that the organization recognizes and invests in users involvement in the effective utilization of the NOFBI project. To a moderate extent the respondents indicated that the organization has formally introduced financier's participation practices in the effective utilization of NOFBI projects. Finally, the study revealed that the variable(Pearson correlation coefficient =.667) and p-value (0.009< 0.05) statistically, moderately and significantly correlated to effective utilization of ICT infrastructure project in the organization at 5% level of significance as it had a positive relationship with the dependent variable. This reveals that stakeholder participation is an important factor that can boost effective utilization of ICT infrastructure projects in the organizations. Therefore, from these quantitative results it can be deduced that the study which sought to establish the influence of stakeholder participation on effective utilization of ICT infrastructure projects was achieved because it established that stakeholder participation influences effective utilization of ICT infrastructure projects.

**Government Policy**

From the research findings, majority of the respondents indicated that to a small extent that the national ICT policy is not clear on ICT infrastructure utilization within the project objectives and goals; to a moderate extent the respondents cited that the government has not allocated adequate funding to implement initiatives that will spur uptake and equally, lack of incentives to encourage uptake of government funded ICT infrastructure initiatives; to a small extent the national ICT policy does not translate into guidelines for implementation and management of government ICT infrastructure. To a small extent the ICT policy has integrated training (capacity building and professional development) research and development to identify opportunities for utilization of ICT infrastructure. Finally, the study revealed that the variable Pearson correlation coefficient = 555) and p-value (0.037< 0.05) statistically, moderately and

significantly correlated to effective utilization of ICT infrastructure projects at 5% level of significance as it had a positive relationship with the dependent variable. This reveals that government policy is an important factor that needs to be carefully crafted to anchor effective utilization of public ICT infrastructure project. Therefore, from these quantitative results it can be deduced that the study which sought to establish the influence of government policy on effective utilization of ICT infrastructure projects was achieved because it established that government policy influences positively effective utilization of ICT infrastructure projects.

**Conclusions**

The study established that human resource capacity influence effective utilization of ICT infrastructure projects. The staff did not have adequate technical staff to ensure that there is efficient and effective utilization of the NOFBI project in the organization. The technical staff engagement during planning and implementation of ICT infrastructure utilization planning initiatives is low. Moreover, the employees are not adequately trained to effectively participate in developing initiatives that will lead to effective utilization of NOFBI project in the organizations.

Additionally, lack of implementation strategic plans greatly affects the ability to spur usage of the NOFBI project resource. This is made worse by lack of no roadmap towards enhancing utilization of NOFBI from the government. Key potential user organizations did not have adequate project team involved to guarantee quality implementation and cite lack of incentives to onboard into the government project has slowed uptake. The study established to a great extent that there was no framework used to guide on how usage of the fiber would enhance their competitive advantage.

Further, the study results revealed that stakeholder participation was important element the effective utilization of ICT infrastructure projects. The findings showed that to a moderate extent the respondents cited that the government incorporates 'information sharing' with stakeholders as a key factor in its the effective utilization of projects; to a great extent that the organization employs top management frame work in the project to see commitment of management towards the utilization of projects; to a small extent they stated that the organization invests in users involvement to stimulate effective uptake of ICT infrastructure projects.

Finally, the national ICT policy does not provide a very clear roadmap towards enhancing utilization of government ICT infrastructure projects. Lack of adequate funding to enhance access to ICT infrastructure compounded by lack of incentives to help sustain low utilization of the NOFBI project.Equally, to a small extent the ICT policy has integrated training (capacity building and professional development) research and development for the utilization of the project resulting in low levels of innovation and public private partnerships.

**Recommendations**

The study recommends that human resource capacity needs to enhance for effective utilization of ICT infrastructure projects. There is need to have adequate technical staff to ensure that there is efficiency on the effective utilization of NOFBI project in the organization. The technical staff should be engaged on planning and implementation of the effective utilization of projects. Stakeholders engagement through seminars and training is critical is spurring innovation and uptake of the opportunities the NOFBI project presents to the Kenya population.

Additionally, the national government needs to adopt an implementation strategic plan for spur effective utilization of NOFBI project. These can be achieved through the development of a utilization roadmap within which the requisite initiatives to stimulate innovation and create competitive

advantage to onboard organizations can be achieved. A roadmap will also present a tool to track uptake.

Further, Potential user organizations should be adequately involved by government in the development of a framework to be used to guide on how utilization of the NOFBI can be enhanced. The top management support is required to boost effective utilization of ICT infrastructure projects. Organizations investment in employee and equipment is necessary in order to get access to the NOFBI infrastructure.

Finally, the national ICT policy should articulate the opportunities that exist on the NOFBI infrastructure and create incentives for usage. The policy secretariat should develop a roadmap to take full advantage of the existing infrastructure.

**Recommendations for Further studies**

Since this study sought to establish the determinants of effective utilization of ICT infrastructure projects in Kenya, it was established that there are no rich studies available on effective utilization of ICT infrastructure projects specifically in Kenya. Therefore, study recommends that similar studies to be undertaken for other ICT infrastructure projects for generalization of the findings of this study.

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