DETERMINANTS OF SUCCESSFUL TECHNOLOGICAL INNOVATION IMPLEMENTATION IN ROAD CONSTRUCTION PROJECTS IN KENYA: A CASE OF KENYA URBAN ROADS AUTHORITY

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ABSTRACT

Road construction industry plays a major role in development and achievement of goals of the society. Construction is one of the largest industries and contributes to the gross national product (GNP) in industrialized countries. The literature abounds with studies that have attempted to devise prescriptions for effective implementation of technological innovation. The purpose of the study was to establish the determinants of effective implementation in road construction projects in Kenya. The study adopted descriptive research design and targeted 100 projects. The census survey design was used and primary data was collected through the use of questionnaires. Secondary data was obtained from published documents. Data was analyzed with help of SPSS version 21 and Excel and presented in charts and graphs to facilitate comparisons and conclusions. The study variables were regressed at 5% level of significance to establish the strength and direction of their relationship. The study established that all the four independent variables significantly and positively influenced successful implementation of technological innovation in road projects. It is notable that there exists a strong positive relationship between the indepedent variables and depedent variable as shown by R value (0.788). The study concluded that that effective leadership in the project team facilitates implementation effectiveness, influence budgetary allocation for implementation of the technological innovation and involved and decision making on planning, promotion training and pilot testing of the technological innovation. The leadership increases the number of equipment for use for the technological innovation especially on the funding. The study revealed that the logical framework increase the number of trainings for project team using the technological innovation as development of plan, development of milestones, development of budgeting and project control. The study recommends that the top management support especially on the leadership need to be enhanced to enhance successful technological innovation implementation in road projects. There is need to enhance government funding. Further, study contributed to the body of knowledge by establishing that resources allocation, monitoring and evaluation, projects culture and top management support affect successful implementation of technological innovation in road projects.

Key Words: *Top Management Support, Resources Allocation, Monitoring and Evaluation, Organizational Culture*

Background of the Study

Road construction projects are a mix of very complex processes that seldom go according to the implementation plan. Technological innovation implementation is the stage where all the planned activities are put in to action, the project is produced and the performance capabilities are verified. A project is generally considered to be successfully implemented if it comes in on-schedule, comes in on budget, and achieves basically all the goals originally set for it and is accepted and used by the clients for whom it is intended (Mbaluku & Bwisa, 2013).The significance of technological innovation in road construction projects cannot be overstated. Technological innovation has become a non-negotiable aspect of construction industry. Jhurree (2005) asserted that technological innovation has the potential to drive economic, social, political and educational transformations. Jhurree (2005) advised that developing countries could not ignore technological innovation if they were to remain competitive and relevant within the globalization trend. On the other hand, study indicated that though there was a degree of use of technological innovation in road construction, this use was not equal to technological innovation use in administration and social circles.

Technological innovation can improve the accuracy of planning in management of road projects by providing managers with the data they need to make effective decisions. Technological innovation solutions gather data from internal and external sources store them in a data warehouse and provide managers with access via a network. Collaboration tools enable managers to work together to plan operations and make joint decisions during construction period. Hassanpour and Zhao (2011) noted that in developing countries the emphasis was on technological innovation capabilities, rather than on the educational issues requiring technological innovation support. Kamal (2010) reported on a high-priority technological innovation project in Kenya, which after four years of implementation, realized only 9 out of 44 requirements. Innovations that are introduced in public sector agencies in Africa can only be characterized as challenged.

Global Perspective of Effective Implementation

Kizza (2009) attributed this sorry state of technological innovation failure to the late start by African countries in adopting technological innovation. The World Economic Forum and INSEAD (2013) noted that ICT usage in Sub-Saharan Africa was on a slow rise, observed that the impact of technological innovation was too low. A report by Dutta and Mia (2011) supported findings by the Economist Intelligence Unit (2010) where only Nigeria appeared in the top 70 countries in the e-readiness ranking. Kizza (2009) noted that “African countries, and universities, face barriers in the use of ICT”. These barriers, which had earlier been enumerated by Ahadzie & Olomayie(2008) included: difficulty in equipment acquisition, lack of capacity and skills development, limited study and development resources, and lack of investments in ICTs. Such studies tend to link the failure of projects to lack of capacity.

Traditionally in most African countries road building has been given a higher priority than road maintenance, with scant attention to the imperatives of recurrent costs of road management once the road has been constructed. In a study on road deterioration in developing countries (Seboru,2006) estimated the annual maintenance expenditure required to prevent road deterioration. On average, expenditures for 1986–1990 varied from 0.2% of GDP for countries in East Asia and the Pacific to 1% for countries in West Africa. They estimated that the backlog of maintenance work

varied from 1.6% of GDP in East Asia and the Pacific to 3.5% in South Asia.

Kenyan Perspective of Effective Implementation

Infrastructure is a prerequisite for effective utilization. Lessons from global experience suggest that infrastructure development provides an important lever through which a nation can enhance its level of technological development. This is through its contribution to effective utilization technological innovation. It will also enhance potential positive impact on enhancing the technological learning process. Clearly, therefore, the inadequate state on infrastructure and the services thereof in Kenya presents an important opportunity through which Kenya can leap-frog in its application of science technological innovation and innovation (GoK, 2008).

The existence of good and well-functioning road network is vital for economic growth, poverty reduction, and wealth and employment creation. Thus the Ministry of Roads plays an important role in the attainment of "Kenya vision 2030" goals, Millennium Development Goals (MDGs) and Kenya's Economic Recovery Strategy for wealth and Employment Creation Strategy (ECS) through the provision of basic infrastructure facilities to the public by developing, maintaining, rehabilitating and managing of road networks in the country (Mbaabu, 2012). Due to the importance of roads in socio-economic development of the country, the government has in the recent past steadily increased budget allocation to the road sub-sector. However, road projects in Kenya have been facing various challenges as result of ineffective implementation, which include delay in completion, cost overruns, demolition of residential and businesses houses and abortive works (Maina, 2013).

In Nairobi County, most contractors, particularly road contractors have shown lot of interest in the sector. However, most of these firms have been performing minimally on technological innovation. From the records available with the City Engineers department, Nairobi County, the total road network is 2,968km out of which 1,331.1km have been paved with bituminous surface, 504.1km are of gravel standards and 1,133.6km have earth surface. The responsibility of maintaining this road is vested with the Kenya Urban Roads Authority, KURA, who get the funding from the Kenya Roads Board, KRB. However, KURA delegates maintenance of the roads by engaging road contractors. There are 34 fully registered road contractors under the National Contraction Authority (NCA) (Ministry Road and Public Works, 2013). The Road Contractors are registered and categorized according to their experience, capability both in technical and financial. The governments on the other hand strive to allocate enough funds to ensure the road are maintained and improved.

Statement of the Problem

Road construction industry plays a major role in development and achievement of the goals of society. Construction is one of the largest industries and contributes to about 10% of the gross national product (GNP) in industrialized countries (Gituthu, 2015). The literature abounds with studies that have attempted to devise prescriptions for effective implementation of technological innovation. The prescriptions have been in an attempt to reverse the trend of high failure rate in implementing technological innovation in road construction (Deramann,et al., 2012; Abdesalam & El Kadi, 2012; Ochieng & Price, 2010; Macharia&Nyakwende, 2009). There is evidence that successful technological innovation implementation in road construction projects in Kenya is inadequate (Ochieng & Price, 2010). This has led to poor time

and cost performance of road projects in Kenya and is poor to the extent that, over 70% of the projects initiated are likely to escalate in time with a magnitude of over 50%. In addition over 50% of the projects are likely to escalate in cost with a magnitude of over 20%.

According to Shen, Hao and Yao(2007) the most serious source of cost and time risks in road projects during the construction period is 'extra work' (technically termed as variations), which normally occurs in 73.50% of the road projects in the population whereas defective materials accounted for 38.20% for observed unacceptable quality work cases. Studies have shown that, although cost performance was not better, time performance was comparatively the worst (Berthelot, 2012). He recommended that efforts should be directed to the technological innovation of the key participants in road construction projects. However, this study focused on the determinants of effective technological innovation implementation in road construction projects in Kenya in order to determine why technological innovation in road projects has not been effectively implemented and therefore fill the knowledge gap.

General Objective

The general objective of the study was to establish the determinants of successful implementation of technological innovation in road construction projects in Kenya

Specific Objectives of the Study

The specific objectives of the study included the following;

- To determine how top management support affect successful implementation of technological innovation in road construction projects in Kenya
- To establish how monitoring & evaluation influence successful implementation of technological innovation in road construction projects in Kenya
- To examine how organizational culture affect successful implementation of technological innovation in road construction projects in Kenya
- To examine how resources allocation influence successful implementation of technological innovation in road construction projects in Kenya

LITERATURE REVIEW

This chapter reviews relevant literature on determinants of effective implementation in road construction projects.

Theoretical Framework

This section examined relevant theories to the study variables. Theory is a set of interrelated concepts, definitions and propositions, which provide systematic view of a phenomenon. Theory therefore guides practice and study, which then enables testing of the postulated theory. Through theory, a study is also able to generate questions for study. The theoretical framework attempts to answer the following questions; what is the problem and why the study's approach is the feasible solution to the problem (Anfara & Mertz, 2006). Chigona and Licker (2008) indicated that a specific framework makes it possible to make predictions, and sets out a procedure for conducting the study in a systematic way, looking only at the things the study needs to measure.

Top management team theory

The emerging field of strategic decision-making - top management team theory (TMTT) has raised widespread concern in the academic community (Hijzen, Görg & Hine, 2005). Different from traditional strategic management theory, which emphasizes on purely economic and technological

processes or information process, TMTT studies the strategic choice and projects performance determinants from the process of cognitive psychology of top management team (TMT), which overturns the economic man hypothesis in traditional theory and proposes the hypothesis of limited rationality proposed by the Carnegie school (Müller & Jugdev, 2012). As the cognitive psychological process of TMT is too complicated, TMTT invokes prior marketing study on demography to suggest that managerial characteristics and its heterogeneity (such as age, work experience, educational background, etc.) are reasonable proxies for underlying differences in cognition, values, and perceptions process, which could be good predictor to predict projects outcome (such as strategic choice, projects performance, among others) (Dvir, Sadeh & Malach-Pines, 2006). In relation to this study, the skills and the support of the top management is paramount in the success of development projects. It reduces the timeline of projects as it helps to smoothen the communication process. The theory supports top management support on effective implementation of technological innovation in road construction projects.

Resource Based Theory

The core premise of the resource-based view is that organizational resources and capabilities can vary significantly across firms, and that these differences can be stable (Hijzen, Görg & Hine, 2005). If resources and capabilities of a firm are mixed and deployed in a proper way they can create competitive advantage for the firm. Firms with higher competitive advantage tend to create a sense of confidence in stakeholders that their support, whether financial or otherwise, will be valued and put into action. The resource-based view in outsourcing builds from a proposition that an projects that lacks valuable, rare, inimitable and organized resources and capabilities, shall seek for an external provider in order to overcome that weakness (Müller & Jugdev, 2012).

The focus of the resource based theory originally was on the relationship between managers and stakeholders (Hair *et al*, 2006), but had spread over the time on explaining the relationship between two inter-firm subjects. In that context we associate the agency theory to understanding the relationship between the firm and the outsourced resources (Dvir, Sadeh & Malach-Pines, 2006). Stakeholders will want to be involved in projects that have the resources available well managed. Outsourced resources tend to facilitate the reduction of costs of the entire project. Thus, stakeholders can be convinced that the project managers are working towards the achievement of the project at minimum costs for maximum utility and benefit. The theory supports resources allocation on effective technological implementation of road construction projects

Classical Theory

According to this theory by Chandler (1962), two main approaches to strategy have emerged over time: the Design School and the Process School. Under the Design School of thought strategy formulation is a formal process that is de-linked from strategy implementation. Strategy is carefully crafted by senior management and then implementation begins, with the aim of maximizing profits of the projects. Chandler (1962) a major proponent of the design school, defines strategy as the determination of basic, long term goals of the enterprise, and the adoption of courses of action and allocation of resources necessary for those goals. This definition clearly shows strategy formulation as separate from strategy implementation. The design school is consistent with the classical theory, which, according to

Landau(2013), sees strategy formulation as formulation of plans of attack by the general, and these preconceived plans are executed according to commands transmitted through obedient hierarchies to officers and their men at the front. This approach to strategy places great confidence in the readiness and capacity of managers to adopt profit maximization strategies through long term planning. It views strategy as an economic rational process and primarily restricted to issues related to market share and profitability. The process school lays less confidence in the ability of top management to plan and act rationally. It advocates that whatever methods managers adopt, it will only be the best performers that survive. According to Mintzberg (1987), crafting strategy is a continuous and adaptive process, with formation and implementation inextricably entangled. Thus, process school advocates are inclined towards incremental adjustment of strategy and cultivating of core competences. The process school views strategy as an outcome of a process where the emphasis is not on construction of detailed plans but on organizational and social aspects of strategy formations. Capabilities of an projects in terms of structure, system, technological innovation, and management styles restrict the range of options an projects can pursue. The theory supports top management on effective implementation of technological innovation in road construction projects.

Control Theory

Control theory, invented by Ouchi (1979) and Eisenhardt (1985) uses the notion of modes of control to describe all attempts to ensure that individuals in organizations act in a way that is consistent with organizational goals and objectives (Kirsch, 1997). The concept of control is based on the premise that the controller and the controlee have different interests. These different interests will be overcome by the controller's modes of control (Tiwana, 2009). Modes of control may distinguish between formal and informal mechanisms. Formal modes of control are defined as Behavior control and Outcome control. Behavior control consists of articulated roles and procedures and rewards based upon those rules. Outcome control is mechanisms for assigning rewards based on articulated goals and outcomes. The informal modes of control are carried out by the control modes labelled as clan and self. Clan are the mechanisms of a group sharing common values, beliefs, problems, and these mechanisms work through activities as hiring & training of staff, socialization etc. The control mode of the self is about individually defined goals and can be carried through the mechanisms of individual empowerment, self-management, self-set goals, et cetera. (Kirsch, 1997).

In the context construction project management the project manager and the project teams have different interests. In order for the project manager to control cost and schedules during the project execution phase, he has to come up with different modes that ensure that teams are compliant. The control mechanisms and rules must also be aligned with the overall construction goals as well as the goals of individual teams. Based on this understanding, this study used control theory to focus on modes of monitoring and evaluation on effective implementation of technological innovation in road construction projects

Rogers Innovation Diffusion Theory

(Rogers, 1983) considers the process of innovation diffusion as one which is dictated by uncertainty reduction behavior amongst potential adopters during the introduction of technological innovations. 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 and 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 sufficiently tested prior to adoption.

Moreover, Moore & Benbasat,(1991) add image and visibility to key features of innovation that consistently influence the adoption of new technologies. Image refers to the self-perception that adopting an innovation could result in enhanced social status for individual amongst his/her peers. Visibility on the other hand, refers to the degree to which prospective users see an innovation as being visible in the adoption context.

Several reasons exist as to why projects may choose to invest in monitoring and evaluation (M&E). These reasons include quicker response on current project, better financial control, better communications, flexibility to satisfy beneficiaries, possibility of sharing common information, easier to use lots of data and possibility of telecommunicating (Olalusi &Jesuloluwa,2013). Nonetheless, these benefits derived from M&E can be undermined by user reluctance to accept and use the new technologies at their disposal (Davis, 1989). However, M&E promises can only be realized if the intended users of technological innovation utilize it in manner that will contribute both to the strategic and operational objectives of the projects. One recent finding, for example, is that the organizations with more slack resources and higher levels of managerial ownership innovate less when projects performance declines (Latham, Braun 2009). Another finding is that the network density of organization's partners strengthens the influence of technological diversity, which in turn increases the firm's innovation performance (Phelps 2010). The theory of innovation diffusion supports the effective implementation of technological innovation in road construction projects.

Conceptual Framework

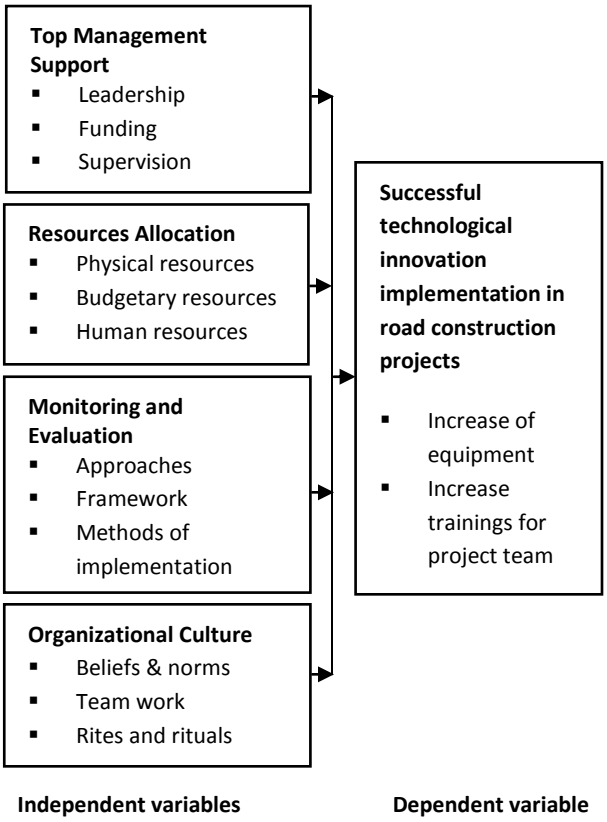

Figure 1: Conceptual Framewo

Top management Support

Top management on technological innovation enables adoption and handing it to team that would see its use. Thus it is the stage after primary decision to adopt an innovation has been made.

Thus, while top management makes decision to adopt, the middle level, or affected department implements the innovation. Implementation effectiveness results when an innovation has been put to use by users (Young & Jordan, 2008) work defined implementation as a "course of action to put into use an idea, decision or program. Friend (2011) further posited that during implementation, the immediate outcome of interest was initial or early use. In vouching for adoption of an organizational theory, Ifinedo (2008) gave three reasons: that organisations had authority-based innovation decision process, meaning decision on whether to adopt or not was based on the projects.

Arkson and Hadikusummo (2008) viewed implementation as a complex undertaking. This is because human attention to budgetary and technical variables is involved. According to Ifinedo (2008), how adoption takes place would make implementation either easier or more difficult. For example, top management makes the decision to adopt an innovation but the manager/s at the lower level/s are tasked with seeing the project succeed. Friend (2011) argued that leadership plays a key role in times of change, because in order to succeed a project will need commitment at organizational level. It is the leadership that provides sponsorship; for example, avails finances, appoints a team, and appoints team leaders. Young & Jordan, 2008 contend that top leadership also assists in getting user support in system implementation.

Ifinedo (2008) argued that the organizational structure produced the different levels of implementers and also introduced the organizational dynamics; they noted implementation process was a collective undertaking, not a one-man show. This was by observing that the activities in the implementation, viz: planning, promotion, training, resource allocation, pilot testing " must be coordinated and synchronized for training working in different functional departments, work shifts and work locations" finally that senior managers expected that the innovation implementation process would lead to collective benefits to the projects.

Monitoring & Evaluation

Citing Ngacho and Das (2014) argued that evaluation should not be encouraged in the following circumstances: when a program is unstable, unpredictable and/or has not achieved a consistent routine; when those involved cannot agree about what the program is trying to achieve; and when a funder and/or manager refuse to include important and central issues in the evaluation. Kandiri (2014) in their online publication, defined evaluation as the critical examination of a program. Montgomery and Int posited that evaluation involves collecting and analyzing information on program activities, characteristics and outcomes. Montgomery and Zint saw the purpose of evaluation as making a judgment so as to improve the program's effectiveness, thus informing programming decisions.

Project implementation requires considerable financial, human and other resources. The project sponsor defines the project characteristics. Investment in these resources is key to the project success. It is incumbent on the investors – whether these resources are international, national, regional or even local – to assess the impact and success of the activities and outcomes according to the description of the project to be implemented. Tranche (2012) noted that the success rate for projects with high levels of quality monitoring and evaluation (QME) was 93%, compared to a 3% success rate for those with low levels of QME. Brauers *et al* (2008) noted that effective supervision was necessary for project success. The following can

be regarded as important in effective M&E: it allows actors to specify the determinants of success, it provides points of unity for adjustments, it identifies best practices, and it encourages the improved use of resources and capacities.

Resources Allocation

A resource can be referred to as an organization's means of supporting itself or becoming wealthier, as represented by its tangible and non-tangible assets. It is a source or supply from which benefit is produced (Marjanyan, 2011). Projects in Kenya operate with very limited resources. This has led to weak operational preparedness, and a lack of equipment and logistical capacity. In addition, Buchan and Swann (2007) identified resources as an important part of technological innovation implementation. In fact, adequate resources refer to the availability and accessibility of resources needed to implement the innovation. Resources comprise the existing infrastructure as well as an organisation's finances, hardware, software, materials, personnel, and support structures (Marjanyan, 2011). Ali and Ferdig (2012) found that many institutions still struggled with the cost of keeping technological innovation up-to-date such as for lab updates, improved networks, web-based course software, and video/data projection. Nearly half of the respondents in Adams' (2011) study still perceived availability of educational software, instructor computers, and student computers as barriers to integrating technological innovation.

Similarly, Button (2016) emphasized on the crucial role of leaders in the successful implementation of educational innovations and that leaders should provide multiple forms of support , rewards and incentives; tie incentives to desired outcomes; supplement technical support with peer support and well trained student assistants, cultivate strong administrative support; involve faculty in decision-making to secure buy-in, and use faculty models to increase the rate of technological innovation adoption in schools.

Organizational Culture

According to Plitz (2014) organizational culture can be defined as a pattern of behavior developed by an projects as it learns to cope with its problem of external adaptation and internal integration that has worked well enough to be considered valid and to be taught to new members as the correct way to perceive, think, and feel. Organizational culture can also be referred to as the world view and behavioral patterns shared by the members of the same projects(Button, 2016). As people within an projects interact and share experiences with one another over an extended period of time they construct a joint understanding of the world around them. This shared belief system will be emotionally charged as it encompasses the values and norms of the organizational members and offers them an imperative filter with which to make sense of the constant stream of uncertain and ambiguous events around them. As this common ideology becomes stronger and becomes more ingrained, it will channel members' actions into more narrowly defined patterns of behaviour. As such organizational culture can strongly influence everything from how to behave during meetings to what is viewed as ethical behavior(Frost 2014).

Organizational culture manifested in a variety of human resource practices, is an important predictor of organizational change management success. Numerous studies have found positive relationship between positive organizational culture and various measures of organizational success in change implementation, most notably for metrics such as sales turnover, staff retention, productivity, customer satisfaction and profitability. Like all other organisations the culture in that all members of the institution are familiar with and accept as part of their way of doing things in within the service. it is believed that the project managers still cling to one

of the most outdated and rigid culture that may hinder any meaningful change management process. The managers here should understand and plan carefully the staffs' attitudes towards a particular new concept before implementing it(Omane, 2016).

Potosky and Ramakrishna (2011) argue that organizational culture clearly influences the success of an projects change management process. organizations often build positive organizational culture through communication, values, norms policies and rules, programs and leadership. Key indicators of organizational culture to be studied here include organizational attitudes, values and beliefs, history and norms and symbols and rituals. Stokes and Hester (2010) said organizational culture significantly affects organization decisions and, thus, must be evaluated during an internal strategic-management audit. If strategies can capitalize on cultural strengths, such as a strong work ethic or highly ethical beliefs, then management often can implement changes swiftly and easily. However, if the firm's climate is not supportive, strategic changes may be ineffective or even counterproductive. An organisations culture can become antagonistic to new strategies, with the result being confusion and disorientation. An organization's culture should infuse individuals with enthusiasm for implementing and managing change (Omane, 2016).

Mechanistic type of projects defends against change but they are less open to it. They are however unlikely to support, without serious trauma, the transformational or revolutionary types of change. Structural characteristics as well as attitudes, beliefs and values are more likely to act as barriers to an effective change management program. Assessing cultural risk helps management pinpoint where resistance to change could occur because of incompatibility between strategy and culture this allows managers to make choices regarding whether to ignore the culture, manage around the culture, change the culture to fit the strategy or change the strategy to fit the culture (Senior and Swailes 2010).

Technological Innovation Implementation In Projects

Manley (2008) argued that technological innovation implementation is the process followed and the series of activities undertaken to ensure an idea or product has been put to productive use. The innovation implementation is a process that comes after adoption of an innovation. The innovation would be deemed as effective and a success if the users appreciate the innovation, gain the necessary skills to use it, appreciate it, and thus integrate the innovation into their work process. In the context, innovation users become part of the system and acknowledge their role. In attempting to define innovation implementation, For Blayse and Manley(2009), implementation is the phase between the time that the decision is made to adopt an innovation and the time that the innovation becomes institutionalized; that is, users take it and start using it in their daily business. Implementation can thus be seen as a deliberate and sequential set of activities, which are directed towards putting an adoption proposal into effect, making it occur. Implementation is synonymous with: achieving; fulfilling; setting in motion; establishing; accomplishing; finishing; realizing, actualizing or even deployment for projects.

Peng and Kurnia (2010) defined innovation implementation effectiveness as the perceived benefits that and projects realizes from an innovation. They are not succinct; however, when it comes to what IS implementation effectiveness is. According to Peansupan & Walker (2006), implementation effectiveness is the "overall, pooled or aggregate consistency and quality of innovation use in an projects". Implementation effectiveness can be viewed from a general project management

perspective. For example, Peng and Kurnia (2010) posited project implementation success as comprising several variables: developed on time, developed within budget, achieves originally set goals, and finds acceptability by users (intended clients). Efficiency ensures that processes and controls are correctly implemented, working as intended and meeting the desired function. One needs to look at implementation through the lens of the stakeholders, who therefore determine if implementation has been effective or not(Manley, 2008).

Empirical Review

This section presents a review of empirical studies conducted in the past on top management support, monitoring and evaluation, resource allocation and organizational culture. Critical studies have been conducted concerning various aspects of effective implementation of technological innovation in road construction projects. It is worth mentioning findings of some of those studies at this point for this study having a well-founded advocacy for the intended intervention measures that was established. The study by Pearman (2006) indicated that engineering and construction projects need project managers with qualities such as conscientiousness and transactional styles leadership. Burn (2008) mentions that, transactional leadership is all about the exchange between the leader and subordinate. This appears suitable for short term benefits which are more valued in constructions. However, Gyula (2008) mentions that "transactional leadership is not at all a leadership, but just a managerial quality" cited in Al-Momani (2010), mentions that effective leaders change their decision making styles and their research indicated that in complex situation, decision making involves, probing, respond, and create environments, increase levels of interactions for achieving goals. The study by Karim & Marosszeky (2009), also mentions that top management support through the written communication constitutes 52% time, Meetings constitutes 28%, Electronic communication constitutes 20%. Functional division shows construction instructions as 30%, materials & equipment 11%, quality management 13%, allocation of manpower 30%, cost control 16%. in construction projects.

Jackson (2010) had elaborated the details of controls are various knowledge areas, there is always a need to understand the key success factor, which when implemented effectively will enhance the control procedures in any projects. Lewis (2008) mentions that efficient monitoring and control systems in construction projects will enable project participants to receive relevant and accurate information in a consistent and timely manner. Marasini and Dawood (2006) mentions that a typical report include executive summary, bar chart, variations to time, cost and scope including risks. However the quality of information is important. As, Jackson (2008) mentions that the work sites are busy and do not provide monitoring personal with much needed information. So, getting complete and accurate data from flied is very important and is also a weak link in the project control process. Lewis (2008) also mentions that monitoring report should focus on project targets, vulnerable work sections, productivity growth/decline, projected completion date and budget and outcome. Lucia and Lepsinger (2009) mentions that a typical project reporting to be produced at regular intervals to project manager and other senior management and client and further mentions that reports should be made in a way which can be understood by non-specialists. However, there it is necessary to know how much quality information is being produced by the project controllers and how much time is being spent on data collection and what kinds of skills are required for such activity.

Application of technological innovation with the help of top management support in construction projects such as sometimes the detailing become complicated and cannot be explained by simple tools such as bar charts, CPM charts, EV curve et cetera. So, the construction companies should use modern project management tools based on Information technology for effective monitoring. Similarly, DiMaggio (2008) mentions that factual and quantitative information should be computerized to speed preparation, collation and assimilation. However, construction is technology shy and does not extensively use information technology. Polonsky and Waller (2005) mentions that construction sector uses extensive information for decision making process, but does not use much information available elsewhere for example internet and other software products. Shandler (2006) mentions that there are large varieties of software project management product, which can be used effectively for monitoring process. Apart from stochastic SS his, monitoring is starting stage of 'Project controls' and involves report generation. Lewis (2008) mentions that efficient monitoring and control systems will enable project participants to receive relevant and accurate information in a consistent and timely manner. Marasini and Dawood (2006) mentions that a typical report include executive summary, bar chart, variations to time, cost and scope including risks. However the quality of information is important. As, Jackson (2008) mentions that the work sites are busy and do not provide monitoring personal with much needed information. So, getting complete and accurate data from flied is very important and is also a weak link in the project control process.

Strenman (2012) noted that "Construction projects are inherently complex and dynamic". Also, every construction project is unique having its own set of stakeholders and unique environment. Construction industry is diverse with projects ranging from small to large and very large contracts such as $14.7 billion Channel Tunnel Project and $20billion Hong Kong International Airport (Chan & Mohan 2009). The environment governing every project changes rapidly and cannot be compared to each other. So, the governing principle connecting all construction projects can be said as 'Project Management Practice'. Collis and Hussey (2009) indicate that "Management in construction, on the other hand, has always been based on experience and projectsal talent". In most of the construction projects, technicalities are frozen during design phase. Dai, Cao and Su (2006) mentions that the important category in constructions is construction firm i.e. Contractor because; Contractor gives real shape to the product following the design. So, the main issue lies in managing resources, material, equipment, stakeholders effectively by the contractor.

RESEARCH METHODOLOGY

This chapter gives the methodology that was adopted in this study.

Research Design

The study adopted a descriptive research design and case study design which is a blue print that facilitates the smooth sailing of the various research operations, thereby making research as efficient as possible hence yielding maximum information with minimal expenditure of effort, time and money (Mugenda, 2008).

Target population

The target population for the study was 100 road construction projects within Nairobi City County implemented by Kenya Urban Roads Authority in the last 10 years.

Data collection Tools and Procedure

The study used questionnaire to collect primary data. A questionnaire is an instrument that is used

to gather data and allows measurement for or against a particular viewpoint.

Data Analysis and Presentations

This study gathered quantitative data which was coded and analyzed using Statistical Package for Social Sciences (SPSS) computer software version 22. The analyzed data was presented in the form of frequency distribution tables, pie charts and bar graphs where necessary. Descriptive statistics was used to analyze the data in frequency distributions and percentages which were presented in tables and figures.

Multiple regression analysis was used to test relationships between the variables. The study also used Analysis of Variance (ANOVA) to analyze the degree of relationship between the variables in the study.

DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION

Response Rate

100 questionnaires in total were administered to the respondents from which 70 filled in and returned the questionnaires making a response rate of 70%. This response rate was satisfactory to make conclusions for the study

Gender Balance

The respondents indicated their gender in order to establish if there was gender balance, majority (55%) were male respondents with (45%) being females' respondents. The results indicate that the two genders were adequately represented in the study

Respondents' Age Distribution

The findings revealed that; most of the respondents 42% were aged between 41 to 50 years, 30 % of the respondents 30 to 40 years, 16% of the respondents were aged below 30 years, whereas 12% of the respondents were aged above 50 years. This implies participants were well distributed in terms of their age.

Respondents' Level of Education

The study results revealed that majority of the respondents as shown by 34% of the respondents held bachelor's degrees, 27% of the respondents were holders of college diploma certificates, 25% of the respondents were holders of masters degrees whereas 14% of the respondents held Doctor or Philosophy, this implies that majority of project managers are well educated which enables them to perform their duties

Duration of Service

In establishing the period of working in the road projects, the respondents indicated that majority of them (54%) had worked in the road projects for duration of 5-10 years. 23% had worked for a period of 1-5 years, 15 % had worked for more than 10 years whereas 8% had worked for not more than a year. This implies that majority of the project managers had worked in road projects for a considerable period of time and thus they were in a position to give credible information relating to this study.

Top Management Support

The respondents were requested to indicate whether the leadership increases the number of training for project team using the technological innovation. The study findings showed that 60% of the respondents stated that it enables adoption and handling technological innovation to the project team, 64% stated it facilitates implementation effectiveness, 66% stated that it influence budgetary allocation for implantation of the technological innovation and 45%indicated that it involved and decision making on planning, promotion training and pilot testing of the technological innovation. This infers that leadership

increases the number of training for project team using the technological innovation in the projects.

Monitoring & Evaluation

Respondents (77%) indicated that it enables adoption and handling technological innovation to the project team on whether approaches M& E increase the number of trainings for project team using the technological innovation 68% posited it facilitates implementation effectiveness, 60% stated that it influence budgetary allocation for implantation of the technological innovation. This can be concluded that approaches M& E is an important factor in the projects to increase the number of trainings for project team using the technological innovation.

Resources Allocation

On the reasons the projects were not able to access funding from the government for effective implementation of the technological innovation. It was established that 85% of the respondents indicated due to stringent conditions, 54% of the respondent's posited lack of security, 76% of the respondents stated corruption in giving out funds and 68% stated that the process was too technical. The study results is an indication that effective implementation of the technological innovation in the projects could only be realized if the conditions were not too stringent, required security, existence of corruption in giving out funds and process was not being too technical.

Organizational Culture

The respondents were requested the extent to which the statements relating to organizational culture. A scale of 1-5 was used. The scores "To a very small extent" and "To a small extent" were represented by mean score, equivalent to 1 to 2.5 on the continuous Likert scale (1 ≤ Small extent ≤ 2.5). The scores of 'Moderate' were represented by a score equivalent to 2.6 to 3.5 on the Likert scale (2.6 ≤ Moderate ≤ 3.5). The score of "To a large extent" and "To a very large extent" were represented by a mean score equivalent to 3.6 to 5.0 on the Likert Scale (3.6 ≤ Large extent ≤ 5.0). The mean was generated from SPSS version 22. From the study findings, majority of the respondents indicated to a moderate extent that; The projects values, norms and policies enhance technological innovation in the projects a mean of 3.00; The work ethics and beliefs affect management to effectively implement technological innovation in the projects with a mean of 3.01; the projects culture infuse the individuals with enthusiasm for implementation and managing change in then projects in regard to technological innovation in projects with a mean of 4.01 and to a very low extent there are new strategies being provided by the organizational policies which enhance technological innovation in projects by a mean of 2.10. The findings of this study concurs with literature review by Graham (2006) that there is a growing recognition that organizational culture affect performance of the projects being implemented by the projects Basically, organizational culture factors affect the quality of work life, individual quality of work life outcomes, and organizational outcomes in implementation of projects.

Implementation of Technological Innovation in Road projects

The respondents were asked to indicate the number of trainings for project teams in the road projects for the successful implementation of the technological innovation in the last three years. The study established that 33% indicated the number of trainings for project team were 5 in year 2013 while 45 % showed that that the number of trainings for project team were 10 trainings in year 2014 and 40% of the respondents indicated that number of trainings for project team were 5 trainings in year

2015. This can be concluded that there was a very low number of trainings for project team for technological innovation implementation in the projects. This indicates that technological innovation implementation in the projects.

Multiple Regression Analysis

Multiple regression analysis explains or predicts variation in a dependent variable because of the independent variables and this is assessed using the coefficient of determination known as R square and the larger the coefficient, the larger the effect of the independent variable upon the dependent variable. According to the model summary Table 1, R is the correlation coefficient which shows the relationship between the independent variables and dependent variable. It is notable that there exists a strong positive relationship between the independent variables and dependent variable as shown by R value (0.788). 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 62.10% of the successful technological innovation implementation in road projects as represented by the R^2. This therefore means that other factors not studied in this study contributed 37.90% to the successful technological innovation implementation in road projects. This can be concluded that the variables are very significant therefore need to be considered in any effort to enhance successful technological innovation implementation in road projects. The study therefore identifies variables as key determinants of successful technological innovation implementation in road projects in Kenya.

Table 1: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.788	.621	.022	0.01

From findings in Table 2, the study established the regression model had a significance as the significance value is .003 and the value of F-calculated (55.7971) is large enough to F critical(12.876) we conclude that the set of independent variables; top management support, monitoring & evaluation, resources allocation and projects culture influence successful implementation of technological innovation in road projects. The table shows that the independent variables statistically significantly predict the dependent variable, F (4, 65) = 55.7971>12.876 and p-value =.003 < .005, this shows that the overall model was significant.

Table 2: ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	12.543	4	3.1358	55.7971	.003[a]
Residual	3.654	65	.0562		
Total	166.914	69			

NB: F-critical Value = 12.876;

The study conducted a multiple regression analysis so as to determine the relationship between the dependent variable and independent variables. The general form of the equation was to predict Successful implementation of technological innovation in road projects from top management support, monitoring & evaluation, resources allocation and projects culture is: ($\mathbf{Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon}$) becomes: $Y= 52.453+ 0.765X_1+ 0.555X_2+ 0.5678X_3 + 0.603X_4$. This indicates that Successful implementation of technological innovation in road projects = 52.453 + 0.765 x (Top management support) + 0.555 x (Monitoring & Evaluation) + 0.678 x (Resources allocation) + 0.603 x (Organization culture). From the study findings on the regression equation established, taking all factors into account (independent variables) constant at zero successful implementation of technological innovation in road construction projects will be 52.453. The data findings analyzed also shows that taking all other independent variables at zero, a unit increase in top management support will lead to a 0.765 increase in successful implementation of technological innovation in road projects; a unit increase in monitoring & evaluation will lead to a 0.555 increase in successful implementation of technological innovation in road projects, a unit increase in resources allocation will lead to 0.678 increase in successful implementation of technological innovation in road projects and a unit increase in projects culture will lead to 0.603 increase in successful implementation of technological innovation in road projects. This infers that top management contributed most to successful implementation of technological innovation in road projects. At 5% level of significance, top management support had a .001 level of significance; monitoring & evaluation showed a .009 level of significance, resources allocation show a .002 level of significance and projects culture show a .008 level of significance hence the most significant factor was top management support among the four independent variables.

Table 3 Coefficient Results

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	52.453	.223		7615	.000
Top management support	.765	.065	.777	8.098	.001
Resources allocation	.678	.087	.698	6.222	.002
Organization culture	.603	.173	.542	5.546	.008
Monitoring & Evaluation	.555	.207	.354	2.087	.009

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The study sought to answer the four questions relating to how independent variables (top management support, monitoring & evaluation, resources allocation and projects culture) influenced successful implementation of technological innovation in road construction projects. This chapter presents a summary of the findings, conclusions and recommendations. It also gives suggestions for areas of further study arising from the gaps identified.

Summary of the Findings

Top Management Support

From the descriptive results, the study established that leadership increase the number of trainings for project team using the technological innovation as it enables adoption and handling technological innovation to the project team, facilitates implementation effectiveness, influence budgetary allocation for implantation of the technological innovation and involved and decision making on planning, promotion training and pilot testing of the technological innovation. The study also found out that funding increase the number of trainings for project team using the technological innovation enables adoption and handling technological innovation to the project team, facilitates implementation effectiveness and influence budgetary allocation for implantation of the technological innovation. Further, the study revealed that supervision increase the number of trainings for project team using the technological innovation as it enabled decision making on the technological innovation, planning, of the technological innovation, promotion of the technological innovation and training of the technological innovation and pilot testing of the technological innovation. The leadership increases the number of equipment for use for the technological innovation especially on the funding for equipment, procurement of the equipment, ensure there is availability of equipment and decision making on planning, promotion training and pilot testing of the technological innovation. Further, the funding increase number of equipment's for use for the technological innovation as it enables adoption and handling technological innovation to the project team, facilitates implementation effectiveness and influence budgetary allocation for implantation of the technological innovation.

Monitoring & Evaluation

The study revealed that approaches M& E increase the number of trainings for project team using the technological innovation as enables adoption and handling technological innovation to the project team, facilitates implementation effectiveness, influence budgetary allocation for expertise of the technological innovation. The logical framework increase the number of trainings for project team using the technological innovation as development of plan, development of milestones, development of budgeting and project control. The methods of implementation increase the number of trainings for project team using the technological innovation as decision making of the technological innovation, planning, of the technological innovation, promotion of the technological innovation, training of the technological innovation and pilot testing of the technological innovation. The methods of implementation increase the number of trainings for project team using the technological innovation as enables adoption and handling technological innovation to the project team, facilitates implementation effectiveness and influence budgetary allocation for expertise of the technological innovation.

Resources Allocation

The study established that reasons the projects do not access funding from the government for effective implementation of the technological innovation included conditions are too stringent; require Security, corruption in giving out funds, process too technical. For projects which are unable to access funds from the alternative financial institutions for effective implementation of the technological innovation, the respondents stated that the tough conditions for projects, process too technical, the process being too procedural and unfavourable bank policy. The study revealed that the total budget in the projects they spent on increase of trainings for the implementation of technological innovation for projects last year was inadequate and projects that fund the technological innovation for the projects included the international donor agencies, government bodies, corporate companies and private individuals. The contribution in percentage of donors to the total budget spent on equipment to enhance the technological innovation last year was low and for effective implementation of the technological innovation, the projects had no separate budget with a special vote. The hiring of experts and equipment's are not normally allocated a percentage of the total project budget.

Organizational Culture

From the study findings, majority of the respondents indicated to a moderate extent that the organizations values, norms and policies enhance technological innovation in the projects, the work ethics and beliefs affect management to effectively implement technological innovation in the projects the organization culture infuse the individuals with enthusiasm for implementation and managing change in then projects in regard to technological innovation in projects and to a very low extent there are new strategies being provided by the organizational policies which enhance technological innovation in projects

Conclusions of the study

The study established that leadership increase the number of trainings for project team using the technological innovation as it enables adoption and handling technological innovation to the project team, facilitates implementation effectiveness, influence budgetary allocation for implantation of the technological innovation and involved and decision making on planning, promotion training and pilot testing of the technological innovation. The leadership increases the number of equipment for use for the technological innovation especially on the funding for equipment, procurement of the equipment, ensure there is availability of equipment and decision making on planning, promotion training and pilot testing of the technological innovation. The emerging field of strategic decision-making - top management team theory explains the need to have effective leadership to ensure strategic choice and projects performance determinants support of the top management is paramount in the success of technological innovation in road construction projects.

The study revealed that the logical framework increase the number of trainings for project team using the technological innovation as development of plan, development of milestones, development of budgeting and project control. According to control theory, modes of control such as monitoring and evaluation to describe all attempts to ensure that individuals in projects act in a way that is consistent with project goals and objectives The outcome control is mechanisms for assigning rewards based on articulated goals and outcomes. The projects require control mechanisms to foster successful technological innovation The methods of implementation increase the number of trainings

for project team using the technological innovation as decision making of the technological innovation, planning, of the technological innovation, promotion of the technological innovation, training of the technological innovation and pilot testing of the technological innovation. The methods of implementation increase the number of trainings for project team using the technological innovation as enables adoption and handling technological innovation to the project team, facilitates implementation effectiveness and influence budgetary allocation for expertise of the technological innovation.

From the study findings road construction projects do not access funding from the government for effective implementation of the technological innovation as the conditions are too stringent; require Security, corruption in giving out funds, process too technical. The study revealed that the total budget in the projects they spent on increase of trainings for the implementation of technological innovation for projects last year was inadequate The contribution in percentage of donors to the total budget spent on equipment to enhance the technological innovation last year was low and hiring of experts and equipment's are not normally allocated a percentage of the total project budget. According to Resource Based Theory the core premise of the resource-based view is that projects require resources and capabilities deployed in a proper way they can enhance successful adoption and application of technological innovation.. The resource-based view in outsourcing builds from a proposition that an projects that lacks valuable, rare, inimitable and organized resources and capabilities, shall seek for an external provider in order to overcome that weakness. From the study findings, the organizations values, norms and policies enhance technological innovation in the projects, the work ethics and beliefs affect management to effectively implement technological innovation in the projects the organization culture and organizational policies infuse the individuals with enthusiasm for implementation and managing change in then projects in regard to technological innovation in projects According to Rogers diffusion theory considers the process of innovation as one which is dictated by uncertainty reduction behavior amongst potential adopters during the introduction of technological innovations. According to the theory 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 culture of the organization in implementation of the projects. The ethics and beliefs, image and visibility to key features of innovation that consistently influence the adoption of new technologies.

Recommendations of the study

The top management support especially on the leadership need to be enhanced so that the projects can increase the number of trainings for project team using the technological innovation in the project team, implementation, budgetary allocation, decision making on planning, promotion training and pilot testing of the technological innovation. There is need to enhance effective leadership in funding, procurement and ensure availability of equipment and decision making on planning, promotion training and pilot testing of the technological innovation.

The monitoring and evaluation in the projects on implementation of technological innovation especially on the logical framework through the development of plan, milestones, budgeting and project control is necessary to enhance successful technological innovation implementation in road projects.

There is need to enhance government funding and challenges need to be addressed as the conditions were too stringent; require security, corruption in giving out funds, process too technical. The budget spent in the projects on the implementation of technological innovation for projects should be adequate. There is need for the management to increase a portion of the total budget to enhance technological innovation implementation in the projects.

The study recommends for organizational policies, projects values and norms which can enhance technological innovation implementation in the projects, the work ethics and beliefs affect management and require management of projects to change strategies being used in the adoption and implementation technological innovation in the road projects

Recommendations for Further Study

The study established that the available literature has shown that are scanty studies in relation to the study. The study has contributed to the body of knowledge by establishing that resources allocation, monitoring and evaluation, projects culture and top management support affect successful implementation of technological innovation in road projects. Further, very little has been undertaken to explore determinants of successful implementation of technological innovation in road projects in Kenya the reason the study recommends for similar studies to be undertaken in other projects for generalization of the findings of this study.

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