INFLUENCE OF PROJECT MANAGEMENT PRACTICES ON CONSTRUCTION COST CONTROL OF PROJECTS IN MOMBASA COUNTY

Ngwai, F. M., Simba, F., & Oyoo, J. J.

The Strategic JOURNAL of Business & Change MANAGEMENT
ISSN: 2312-9492 www.strategicjournals.com
Vol. 6, Iss. 3, pp 314 - 330, August 4, 2019. www.strategicjournals.com, ©Strategic Journals

INFLUENCE OF PROJECT MANAGEMENT PRACTICES ON CONSTRUCTION COST CONTROL OF PROJECTS IN MOMBASA COUNTY

Ngwai, F. M.,[1*] Simba, F.,[2] & Oyoo, J. J.[3]

[1*]Msc. Candidate, Jomo Kenyatta University of Agriculture & Technology [JKUAT], Kenya
[2]Ph.D, Lecturer, Jomo Kenyatta University of Agriculture & Technology [JKUAT], Kenya
[3]Jomo Kenyatta University of Agriculture & Technology [JKUAT], Kenya

Accepted: August 1, 2019

ABSTRACT

This study's general objective was to examine the influence of project management practices on construction cost control of projects in Mombasa County. The specific objectives were: To examine the influence of project management competencies on construction cost control of projects in Mombasa County; to determine the influence of project planning on construction cost control of projects in Mombasa County; to assess the influence of project monitoring on construction cost control of projects in Mombasa County; and, to evaluate the influence of project technological innovation on construction cost control of projects in Mombasa County. The study was informed by the theory of change, theory of constraints, technological fusion innovation theory, project management competencies theory and control theory. The study targeted the 1,873 NCA registered construction companies in the county, and sampled 138. A modified Likert scale questionnaire was developed and self-administered, while a pilot study was carried out to refine the instrument. Data analysis was performed using SPSS 23. Quantitative data was analyzed using quantitative statistics, while descriptive data was analyzed using descriptive techniques and conclusions made before publishing. The findings of correlation analysis indicated that the project management practices had positively significant relationship with construction cost control. The study, thus, concluded that thoroughness in project management practices enhances cost control by construction organizations in Mombasa County: Perfection in project management competencies, project planning, project monitoring and project technological innovation, being the corner stone are imperative. The study recommended that construction firms adopt and invest in the same. Consequently, management practices, precisely embraced in construction firms, enhance efficiency in construction cost control, hence the delivery, success and performance of projects in Mombasa County.

Key Words: *Competencies, Project Planning, Project Monitoring, Technological Innovation, Project Management*

CITATION: Ngwai, F. M., Simba, F., & Oyoo, J. J. (2019). Influence of project management practices on construction cost control of projects in Mombasa County. *The Strategic Journal of Business & Change Management,* 6 (3), 314 – 330.

INTRODUCTION

Successful construction projects are those delivered safe and sound to the required quality standards, on time, within budget and desired scope (Nibyiza, 2015; & Siguroarson, 2011). The effective management of costs is a vital element in achieving these objectives. Clients rightly expect that the final cost of their projects should not exceed the approved budget, and indeed for some, cost control and certainty is their main priority (Zenger, 2017). The underlying challenge in controlling costs stems from the fact that many clients have limited funds, and budgets are often set at the limit of what is affordable (Gachithi, 2010). Cost overruns during the construction phase may seriously over-extend the client financially, to a point where the project may not be finished to the expected standards or may even have to be abandoned (Cunningham, 2017).

In Malaysia, to control construction costs in projects, various procurement strategies are commonly adopted (Chong, 2014). Many factors are responsible for cost overruns such as underestimation of costs, addition of scope during later stages of project planning and even during construction, and changed conditions (Vandevoorde & Vanhoucke, 2016). One of the most important contributing factors to the magnitude of cost overruns in construction projects is the project schedule. Besides, the project size and time length of project development phase from planning to construction seems to be a major factor in the extent of cost overrun (Markenson, 2016). The problem of cost overruns is critical in both developing and developed countries and should be mitigated courtesy of construction cost control (Rahman, 2013).

In Zimbabwe, the construction industry is key to economic growth, providing shelter for economic and social activities including on-site and off-site infrastructure to facilitate the smooth functioning of these activities. The industry does not only touch on the lives of virtually everyone on a daily basis; it occupies a fundamental position in many national economies - the bellwether of economic growth (Clough, Sears & Sears, 2015). As a result of the sizeable nature of projects executed; the industry requires substantive injection of capital and any loss through failure or abandonment has a crippling effect on the capabilities of the investors and financiers (Nkwachuku, Ibeawachi & Okoli, 2016). Notwithstanding, the complex nature of the work undertaken by the construction industry, cost and time need to be effectively monitored and controlled if the anticipated profit margin has to be realized for the contractor and, for the project to be completed within the budget cost of the client (Chigara, 2013). To this end, financiers and executors (contractors) of construction works are bound to be cost conscious if their business objectives are to be realized from the project. Irrespective of the economics generated through effective cost management, most projects are delivered over-budget. Nine out of ten projects faced cost overrun in the range of 50 to 100%. The problems of project cost overrun are considered to be more severe in developing countries where they sometimes exceed 100% of the anticipated cost of projects, thus, the need for cost control (Momon, Rahma &Azis).

In Kenya, the number of public roads construction projects is increasing from time to time (Bulle, 2015). However, it becomes difficult to complete projects in the allocated cost budget. Considering the scarce resources of the country, cost control is one of the major problems in Kenya (Dillon, 2018). Statistics from the Republic of Kenya report show that KeNHA has been experiencing cost overruns in its roads projects. For instance, in the construction of Thika super highway, the cost escalated from Kes.26.44 billion to Kes.34.45 billion. In addition, the initial deadline of the Thika super highway project was July 2011, which was later revised to July 2013 (World Bank, 2014).

Statement of the Problem

The output of the construction industry has a profound impact on our lives as seen in the provision of basic infrastructure, such as: The

The Strategic Journal of Business & Change Management. ISSN 2312-9492 (Online) 2414-8970 (Print). www.strategicjournals.com

houses, factories and offices we live and work in (Burger, 2016); the supply of water which forms 50 to 75% of the human body (Helmenstine, 2018); and electricity that makes our lives and work conveniently bearable and cozy (Pizzimenti, 2018). Road networks facilitate the travelling of people and transportation of goods from one destination to another (Ford, 2015). By 2020, the construction industry will account for 13.2% of world GDP (Mike et al., 2011) and grow Kenya's by 10% annually, courtesy of vision 2030 (Competition Authority of Kenya, 2017); subject to a backdrop cognisant of construction cost control.

There are many challenges however, especially in the delivery criteria of scope, cost, time, quality (Alexander, 2015; & ProofHub, 2018) and customer satisfaction (Agarwal, 2014), thus, cost control being most critical in Kenya. House construction cost is directly related to the final selling price (Taylor, 2011) with the current levels being too low and too expensive (World Bank, 2011) resulting in a market deficiency and inaccessibility to majority of Kenyans (Marakia, 2012). Time and cost performance in Kenya are poor such that over 70% of projects initiated escalate in time with a magnitude of over 50% (Talukhaba, 2016; Mbeche, 2015; & Mbatha, 2014), and a further 50% of projects in cost magnitude of over 20% (Auma, 2014). Poor communication impedes project implementation in MPW (Nyamwaro, 2015); and efficiency at 59% is deemed unsatisfactory in donor funded road projects in Kenya (Hassan, 2017). Power construction projects in this country are not implemented on schedule either, and are above the planned budget (Ocharo & Kimutai, 2018). These disorders repudiate construction cost control.

Wanting project management competence influences the performance of construction projects in Mombasa County repugnantly besides time and client's demands during construction stage (Kaniaru, 2014). In the power plant construction at Kenya Petroleum Refineries Ltd, Mombasa; the project cost increased by 16.82% and completion time by 58.3% (Omondi, 2013). On the other hand, defective designs cause 30% of cost and time overruns in construction projects (Andi & Minato, 2003). Poor top management rated at 76%, lack of training for employees 67%, failure to allocate resources and time for risk planning 58.7% are obviously detrimental to construction projects in Mombasa County (Nyambura, 2015). Skewed technical resources, monitoring and evaluation impinge water and sanitation projects in Mombasa slums (Kikuvi, 2016), including Kisauni (Njuguna, 2014). 94.5% of public building projects suffer cost overruns in their execution in the county (Nyamoki, 2012); thus, devastation to construction cost control.

Despite many previous studies partially, variably and intermittently engaging on project costs; none had comprehensively focused on the influence of project management practices on construction cost control of projects in Mombasa County.

Objectives of the Study

The general objective of the study was to examine the influence of project management practices on construction cost control of projects in Mombasa County. The specific objectives were:-

- To examine the influence of project management competencies on construction cost control of projects in Mombasa County.
- To determine the influence of project planning on construction cost control of projects in Mombasa County.
- To assess the influence of project monitoring on construction cost control of projects in Mombasa County.
- To evaluate the influence of project technological innovation on construction cost control of projects in Mombasa County.

Hypotheses

- H_{01} : Project management competencies have no significant influence on construction cost control of projects in Mombasa County.
- H_{02} : Project planning has no significant influence on construction cost control of projects in Mombasa County

The Strategic Journal of Business & Change Management. ISSN 2312-9492 (Online) 2414-8970 (Print). www.strategicjournals.com

- H_{03} : Project monitoring has no significant influence on construction cost control of projects in Mombasa County
- H_{O4} : Project technological innovation has no significant influence on construction cost control of projects in Mombasa County

LITERATURE REVIEW

Theoretical Framework

Theory of Change

The theory of change in planning (TOC-P), is a philosophy that was initiated by Carol Weiss in 1972 (Setlhako, 2016). It offers an approach for critical reflection and meditation about the internal or implicit mental models (Manrique, 2015), and, testing them against our own life experiences and lessons learnt (Gooding, 2018). It forces us to make our implicit rationale and assumptions explicit as we articulate how we think change will happen; how we can contribute to it; and the sequence of changes we expect to result from our activities and efforts (Harries, 2014). Thus, the TOC(P) pattern is a conceptual and learning process as well as a product (Maini, 2018), adding real value by its ability to facilitate reflection. In project planning, as in life, we are generally guided by our own internal and implicit images, or mental models, of how the world works. The TOC(P) is an approach to planning, learning, and documenting the changes project planners and practitioners anticipate (Fokus, 2015). It is a theory, in the sense that it represents the best idea we have, about how we can create and support changes and recognise that these ideas need to be constantly tested and refined. In that way we develop a stronger theory next time, which will also need to be tested. The theory is a critical tool in the contemplation of our interventions (Paina, 2017).

Theory of Constraints

The theory of constraints in monitoring (TOC-M), is a paradigm that was developed in 1984 by Eliyahu Goldratt (Nieminen, 2014). Premised on the belief that every project system has a constraint, limiting factor or bottleneck that hinders performance (Nyaoga, 2015); prudence is bound to find and manage the drawback and evaluate performance with the improvements in place (Anastasia, 2017). The theory of constraints is often associated with the adage; “A chain is as strong as its weakest link,” because the process of identifying and mitigating a weak link in a chain is very similar to that of a hitch or shortcoming in a project (Holzhey, 2018). The TOC(M), in monitoring, demonstrates how managers can effectively run projects premised on the assumption of project system thinking and constraint management. Based on management philosophies, TOC(M) focuses on transformation at three levels; mind set of the project, measures that drive the project, and methods employed within the project (Breuer, 2016).

Technological Fusion Innovation Theory

Technological fusion, an innovation model that was proposed in 1991 by Fumio Kodama (Yamazaki, 2013), is an emerging methodology that integrates potential technologies from different disciplines so as to evolve the dynamics in the construction industry, thus, viewed as a game changer in assisting construction firms respond effectively to the difficult environment in which they operate (Thurn & Gebhardt, 2017). By fusing technologies, companies create new products, markets, industries and control costs thereby underscoring their competitive edge over contenders (Abusalah & Tait, 2018). This fusion blends several previously separate fields of existing technology. Three fundamental principles that can help companies implement a fusion strategy are: Market driven research and development (R&D), not the other way round, through a process called "demand articulation." Develop a strong intelligence gathering capability both as a defensive mechanism against competitors and as a source of new ideas.

Project Management Competency Theory

The work of McClelland and McBer in the 1980s established this competency approach. The authors defined competence as the underlying characteristics, encompassing knowledge, skills, attitudes and behaviours of an individual that are

The Strategic Journal of Business & Change Management. ISSN 2312-9492 (Online) 2414-8970 (Print). www.strategicjournals.com

casually related to criterion-referenced effective and/or superior performance in a job situation (Arbabisarjou, 2016). Since then a number of competency frameworks have been developed by different project management institutes (Ahsan, Khan & Ho, 2018). Big Nebraska (2019) contends that competencies are job related and; put a model of competence integrates knowledge, skills, demonstrable performance and core personality characteristics, noting that the last personality characteristics, as challenging to develop and assess through training. Jacobides (2017) arguably found out that project managers do not necessarily have the required competence or perform the full activities required to promote and implement the changes that they are leading as part of their projects.

Control Theory

The control theory, a pattern 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 (Kreutzer, Cardinal & Walter). The concept of control is predicated on the maxim that the controller and the controllee have different interests. These different interests will be overcome by the controller's modes of control (Ishizaki, 2016). Modes of control may distinguish between formal and informal mechanisms. Formal modes of control are defined as behaviour control and outcome control (Wisdom Jobs, 2018). Marien (2013) concurs that behaviour control consists of articulated rules and procedures and rewards based upon those rules. Outcome control is mechanisms for assigning rewards based on articulated goals and outcomes. Haustein (2014) agrees that the informal modes of control are carried out by the control modes labelled as clan and self. Clans are the mechanisms which work through activities as hiring and training staff, socialization, etc.

Conceptual Framework

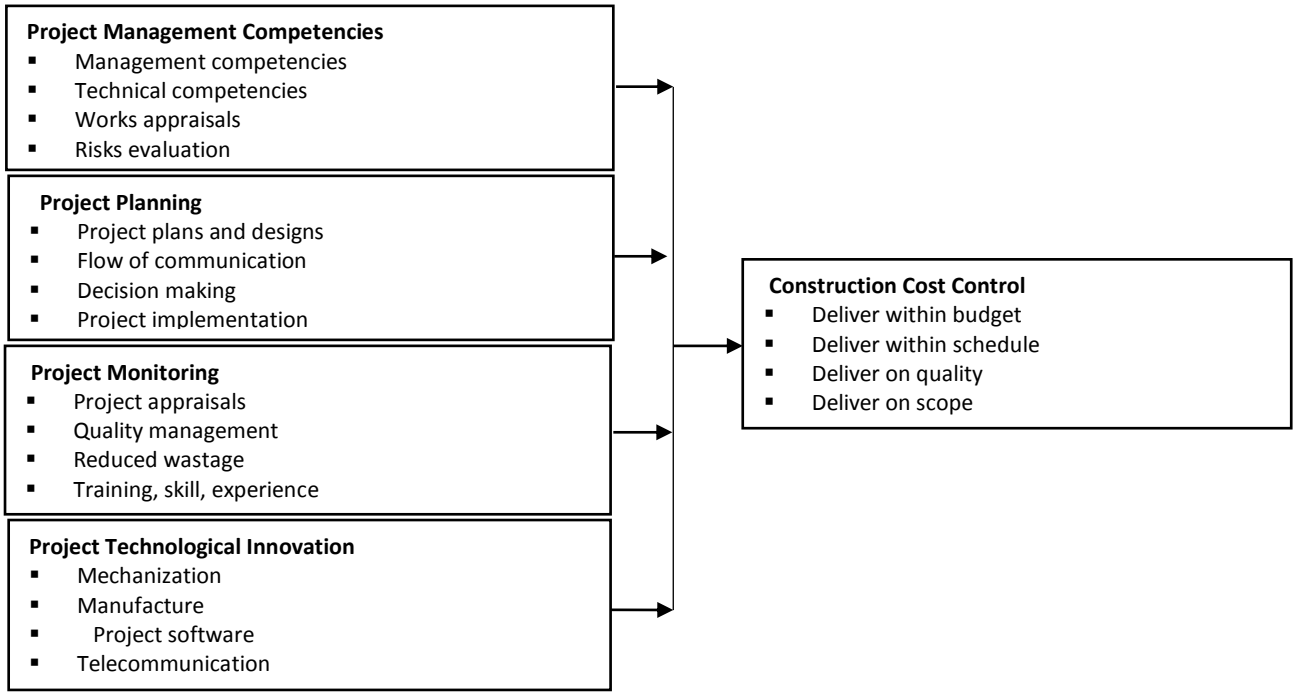

Fig 1: Conceptual Framework

Source: Author (2019)

The Strategic Journal of Business & Change Management. ISSN 2312-9492 (Online) 2414-8970 (Print). www.strategicjournals.com

Review of Literature

Project Management Competencies

Competence is the consistency of an individual to perform work properly (Wuim-Pam, 2014). A competency is a group of defined conducts that provide a regulated guide enabling the identification, evaluation and development of the behaviours in individual employees (Chan & Mohan, 2016). Job competencies are different from job tasks. Competencies include all the related knowledge, skills, abilities, and attributes that form a person's job. This set of context-specific qualities is correlated with superior job performance and can be used as a standard against which to measure job performance as well as to develop, recruit, and hire employees (Davies, 2018). Endowed with the requisite set of defined competencies such a manager in a site, where the rubber meets the road, would adeptly affect controls on construction costs.

Project Planning

The preparation stage is the most important and challenging phase in a project (Method 123, 2014). If a construction project is well planned, right from the beginning, it helps preempt many problems and confusion later, at implementation level. Preparation processes establish the scope or boundaries of the project by defining an expectation baseline on construction costs, among others. Changes, if any, proposed in future are evaluated against this baseline as a control measure on construction costs (Smith & Cronje, 2015). What must be balanced here and throughout the project are schedule, cost, quality, and scope. Changes to, say, scope of the project will almost certainly affect at least one of these, requiring changes in the rest to achieve balance again (Billows, 2015). The activities undertaken at this stage include: Conducting resource planning and making them available; defining the activities needed to perform the project using work breakdown structure to help organize the scope of the project accurately; studying and defining activities needed to perform the project; understanding the project details, e.g. project schedules, project plans and costs of various activities (Cooperative Governance and Traditional Affairs SA, 2013). Hence, project managers should be able to create a comprehensive diagram of the project plan that acts like a guide of the whole project, which tells the managers, through all phases, whether they are on the right track, also indicating changes that took place along the way (Najmi, 2016). This creates a vivid picture, relative to the baseline, of what to anticipate and as such avert any cost overruns thereby keeping the overall construction cost under control.

Project Monitoring

Project Monitoring is the continuous review of all aspects of a construction project with the aim of providing reliable information on whether to rectify, rework, proceed or not, with the endeavour (Njama, 2015). It is a segment that cuts across the board in a project life cycle. At no instance can a construction project manager, or any of the stakeholders afford to shy away from it. It plays an oversite role in ensuring that the team delivers through consistent, deliberate and elaborate efforts. This involves, among others, checking the estimates and the projections of the cost of the resources required and the expected flow of benefits along with possible finances and beneficiaries (World Bank, 2012). The appraisal of the construction project may be undertaken internally or externally by experts, donors or consultants and the report may be used to solicit funds (Hamilton, 2015). With such efforts where all activities are kept under scrutiny, the project journey with regard to construction cost control is synchronized, keeping it both in the right truck and on the right track.

Project Technological Innovation

The construction industry, like any other, is taking advantage of technological innovations and advancements. The essential thing is to find the developments that boost proficiency, are cost-effective and assist in improving safety (Constructible Trimble, 2017). Technologies have aided in significantly reducing the time and labour

required for large scale projects. If collaboration and productivity are an issue, there are new tools created to make communication and project management more efficient and less costly. New advances in technology, particularly on the digital side of the spectrum, can do a lot to enhance revenue and cut construction costs (Project Management Institute, 2013). Innovative techniques and processes for project management; mechanization, manufacture, new software solutions, mobile phones, the internet of things (IoT) and alternative materials are all making a push into mainstream construction. These breakthroughs aren't just science fiction anymore; but treasured technologies moving construction into the 21st century (Flynn, 2018). Some advances that already exist on jobsites today, and have an impact on construction cost control, are explored below.

Construction Cost Control

Construction cost control means far more than the control of expenditure on a construction project (Otim, Nakacwa and Kyakula, 2018). Control of revenue, ensuring that all possible and justifiable management on amount of money received and spent is in accordance with budgets and timing of each transaction is appropriate (The Global Fund, 2017). The main purpose in cost controlling for a construction project should be active controlling of final costs for owners and not just to record and register payments (Korke & Jarad, 2016). Harun (2018) observed that cost control is a process where construction cost of a project is managed with the best methods and in a systematic order that the contractor won't suffer any loss when actualising the project and the cost of such a construction project won't be overstated by the developer. According to Liu (2018), this process should continue throughout the construction period to ensure the cost of building is within the approved limits. Thus, control during design stage and when project is on course (UK Essays, 2018). Mostly, the limit on construction expenditure is influenced by the requirements that the building will demand. Ojedokun, Odewumi and Babalola (2012) pointed out that cost control of a project involves measuring and collecting cost records of a project and the work in progress. It also involves the comparison of actual progress with the planning. Hence the main objective of controlling costs in construction projects is to achieve maximum profit within the predetermined budget, time frame, satisfactory quality and scope of the project (Reh, 2018). Project management practices should therefore have a clear manifestation and manipulation to influence this principle objective. They connect all the dots in matters pertaining to construction cost control

METHODOLOGY

This study adopted descriptive research design. The population of the study was 1,873 contractors, registered by the National Construction Authority, in Mombasa County, as at 20.07.18. The NCA had categorized contractors from NCA1 through to NCA8. Therefore, the study targeted 1,873 contractors. The respondents were the general foremen, employed and deployed in construction sites, unto whom the entire mandate of project execution, encompassing construction cost control, bore on their shoulders, as delegated by their bosses, the contractors. Stratified random sampling method was used to select relevant respondents from across the board in the various categories of NCA contractors in Mombasa County. The primary research data was collected using a semi-structured questionnaire. Secondary data was obtained from literature sources through review of published literature such as journals, articles, published theses and text books. Both descriptive and inferential statistics was used to analyze the data. The descriptive statistical tools helped in describing the data and determining the respondents degree of agreement with the various statements under each factor. Data analysis was done with the help of SPSS version 23.0. The multiple linear equation that was used to estimate the coefficients was as follows:

$\mathbf{Y}_t = \beta_0 + \beta_1\mathbf{X}_{1t} + \beta_2\mathbf{X}_{2t} + \beta_3\mathbf{X}_{3t} + \beta_4\mathbf{X}_{4t}$ Where:

Y_t = Construction cost control, a dependent variable

The Strategic Journal of Business & Change Management. ISSN 2312-9492 (Online) 2414-8970 (Print). www.strategicjournals.com

β_0 = y-intercept of regression line, a constant term

β_1, β_2, β_3, β_4 = Partial regression coefficients of the independent variables, constants

X_{1t} = Project management competencies, an independent variable

X_{2t} = Project planning, an independent variable

X_{3t} = Project monitoring, an independent variable

X_{4t} = Project technological innovation, an independent variable

FINDINGS

Project Management Competencies

The first objective of the study was to examine the influence of project management competencies on construction cost control of projects in Mombasa County. Respondents were asked to state their individual opinions on four specific statements regarding the extent to which project management competencies influence construction cost control of projects in Mombasa County.

Based on the results findings, the statement that project managers with good management skills were able to deliver projects within the specified time had a (mean = 4.64, SD = .597). The statement on whether the managers with technical skills were able to deliver projects within the specified standards and quality had a (mean = 4.35, SD = .785). This was in support of Oguulana & Bach (2017) who observed that good management skills enable project managers deliver projects within a specified time schedule. Respondents were further asked on whether project managers need to appraise works to keep within budget and time; to which they strongly agreed with a (mean = 4.51, SD = .600). With a (mean = 4.44, SD = .635), respondents were also in agreement with the statement that project managers need to identify, evaluate and mitigate risks associated with project implementation.

The table showed that the responses had an overall mean score of 4.9 which was greater than 3.0. This implied that project management competencies had a great influence on construction cost control of projects in Mombasa County. Table 1 presented the project management competencies results findings.

Table 1: **Project Management Competencies**

Project Management Competencies	N	Mean	Std. Deviation
Project managers with good management Skills deliver projects within the specified time	130	4.64	.597
Project managers with technical skills deliver projects within the specified standards and quality	130	4.35	.785
Project managers need to appraise works to keep within budget and time	130	4.51	.600
Project managers need to identify, evaluate and mitigate risks associated with project implementation	130	4.44	.635
Project Management Competencies	**130**	**4.49**	**.654**

Project Planning

The second objective of the study was to examine the influence of project planning on construction cost control of projects in Mombasa County. Respondents were asked to state their individual opinions on four specific statements regarding the extent to which project planning influences construction cost control of projects in Mombasa County.

The statement that with proper construction plans and designs costs can be reduced in a project had a (mean = 4.88, SD = .321). On whether effective communication, during planning, among the project stakeholders reduces challenges and thus reduces costs had a (mean = 4.18, SD = .505). Respondents strongly agreed with a (mean = 4.55, SD = .558) that decisions made on time, during planning, reduce unnecessary costs. Finally, on whether properly planned construction projects can easily be

The Strategic Journal of Business & Change Management. **ISSN** 2312-9492 (Online) 2414-8970 (Print). www.strategicjournals.com

implemented thereby reducing costs and giving clients value for money had a (mean = 4.73, SD = .445).

The table showed that the responses had an overall mean score of 4.56 which was greater than 3.0. This implied that project planning has a great influence on construction cost control of projects in Mombasa County. Table 2 presented the project planning results findings.

Table 2 : Project Planning

Project Planning	N	Mean	Std. Deviation
With proper construction plans and designs costs can be reduced in a project	130	4.88	.321
Effective communication during planning, among the project stakeholders, reduces challenges and thus reduces costs	130	4.18	.505
Decisions made on time, during planning, reduce unnecessary costs	130	4.55	.558
Properly planned construction projects can easily be implemented thereby reducing costs and giving clients value for money	130	4.73	.445
Project Planning	**130**	**4.56**	**.457**

Project Monitoring

The third objective of the study was to assess the influence of project monitoring on construction cost control of projects in Mombasa County. The respondents were requested to state their individual opinions on four specific statements regarding the extent to which project monitoring influences construction cost control of projects in Mombasa County.

Based on the results, respondents strongly agreed with a (mean = 4.08, SD = .726) that sufficient project appraisal of a construction project reduces costs. On whether quality management ensures a construction project is on course and within the stipulated plans and designs had a (mean = 4.38, SD = .709). The statement that monitoring reduces wastage of materials and time, saving construction costs had a (mean = 4.55, SD = .623). Finally, on whether training, skill and experience proficiently deliver projects had a (mean = 4.72, SD = .453). The table showed that the responses had an overall mean score of 4.43 which was greater than 3.0. This implied that project monitoring has a great influence on construction cost control of projects in Mombasa County. Table 3 presents the project monitoring results findings.

Table 3 : Project Monitoring

Project Monitoring	N	Mean	Std. Deviation
Sufficient project appraisal of a construction project reduces costs	130	4.08	.726
Quality management ensures a construction project is on course and within the stipulated plans and designs	130	4.38	.709
Monitoring reduces wastage of materials and time, saving construction costs	130	4.55	.623
Training, skill and experience proficiently deliver projects thus controlling costs	130	4.72	.453
Project Monitoring	**130**	**4.43**	**0.628**

Project Technological Innovation

The fourth objective of the study was to evaluate the influence of project technological innovation on construction cost control of projects in Mombasa County. The respondents were requested to state their individual opinions on four specific statements regarding the extent to which project technological innovation influences construction cost control of projects in Mombasa County.

Based on the results findings, the statement that the use of mechanization creates and improves efficiency in construction projects and hence reduces costs had a (mean = 4.63, SD = .572). On whether use of smart equipment and modules in

The Strategic Journal of Business & Change Management. ISSN 2312-9492 (Online) 2414-8970 (Print). www.strategicjournals.com

the execution stage revolutionizes construction and saves on costs recorded a (mean = 4.12, SD = .693). The statement that project software simplifies complexities and enhances efficiency in project design and management saving time and resources recorded a (mean = 4.42, SD = .540). Finally, it was strongly agreed with a (mean = 4.82, SD = .389) by respondents that telecommunication expedites communication and coordination of a project thus saves on costs and time.

The table 4 showed that the responses had an overall mean score of 4.50 which was greater than 3.0. Thus implied that project monitoring had a great influence on construction cost control of projects in Mombasa County. Table 4 presented the project technological innovation results findings.

Table 4 : **Project Technological Innovation**

Project Technological Innovation	**N**	**Mean**	**Std. Deviation**
Use of mechanization creates and improves efficiency in construction projects and thus reduces costs	130	4.63	.572
Use of smart equipment and modules in the execution stage revolutionizes construction and saves on costs	130	4.12	.693
Project software simplifies complexities and enhances efficiency in project design and management saving time and resources	130	4.42	.540
Telecommunication expedites communication and coordination of a project thus saves on costs and time	130	4.82	.389
Project Technological Innovation	**130**	**4.50**	**.616**

Construction Cost Control

The main objective of the study was to examine the influence of project management practices on construction cost control of projects in Mombasa County. The respondents were requested to state their individual opinions on four specific statements regarding the extent to which project management practices influence construction cost control of projects in Mombasa County.

Examining the findings on construction cost control as tabulated below, revealed that construction projects were delivered within the prescribed budgets. This was demonstrated by a mean score of (mean = 4.05, SD = .227). In line with this, respondents also strongly agreed with a (mean = 4.95, SD = .227) that construction projects were delivered on time, in accordance with the contract schedule. It was further strongly agreed with a (mean = 4.49, SD = .502) that construction projects are delivered in compliance with the specifications and standards on quality anticipated. Construction projects were delivered on the scope as desired had a (mean = 4.64, SD = .513) concurring with Siguroarson (2012) that successful construction projects are delivered on the desired scope.

The responses had an overall mean score of 4.53 which was greater than 3.0. Thus, implied that project management practices have a great influence on construction cost control of projects in Mombasa County. Table 5 presented the construction cost control results findings.

Table 5 : **Construction Cost Control**

Construction Cost Control	**N**	**Mean**	**Std. Deviation**
Construction projects are delivered within the prescribed budgets	130	4.05	.227
Construction projects are delivered on time, in accordance with contract schedule	130	4.95	.227
Construction projects are delivered in compliance with the specifications and standards on quality	130	4.49	.502
Construction projects are delivered on the scope	130	4.64	.513
Construction Cost Control	**130**	**4.53**	**.367**

Correlation Analysis

Table 6 : Pearson Correlations

	Control	Competencies	Planning	Monitoring	Innovation
Control	1				
Sig. (2-tailed)					
Competencies	.518**	1			
Sig. (2-tailed)	.019				
Planning	.557**	.291**	1		
Sig. (2-tailed)	.047	.000			
Monitoring	.540**	.035**	.299**	1	
Sig. (2-tailed)	.000	.019	.048		
Innovation	.317**	.449**	.401**	.398**	1
Sig. (2-tailed)	.000	.002	.000	.013	

** Correlation is significant at the 0.01 level (2-tailed)

Regression analysis

Table 7 : Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.949a	.901	.897	.356

a. Predictors: (Constant), Project management competencies, project planning, project monitoring, project technological innovation.

Table 8 : ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	142.979	4	35.745	283.690	.000[b]
	Residual	15.798125	125	0.126		
	Total	**158.777**	**129**			

a. Dependent variable: Construction cost control

b. Predictors: (Constant), Project management competencies, project planning, project monitoring, project technological innovation.

Multiple Regression Analysis

The established model (regression equation) for the study is:

$\mathbf{Y}= 10.475+ 0.222\mathbf{X}_1 + 0.325\mathbf{X}_2 + 0.252\mathbf{X}_3 + 0.234\mathbf{X}_4$

Where: Y = Construction cost control

X_1 = Project management competencies

X_2 = Project planning

X_3 = Project monitoring

X_4 = Project technological innovation

Table 9 : Multiple regression (coefficients)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(**C**onstant)	10.475	.617		16.968	.000
	PM Competencies	.222	.048	.496	4.623	.038
	Project Planning	.325	.089	.079	3.652	.024
	Project Monitoring	.252	.073	.513	3.446	.009
	PT Innovation	.234	.073	.026	3.205	.027

a. Dependent variable: Construction cost control

Hypotheses Testing

Hypothesis one

H_{01} = Project management competencies have no significant influence on construction cost control of projects in Mombasa County.

In relation to the variable, project management competencies, the results above supported by regression analysis t-value of 4.623 was greater than the critical value 2.0, and p-value of 0.00 at 95% level of significance was less than 0.05. After testing the hypothesis, calculated t-value for project management competencies, which was greater than the critical t_{36} (0.05) = 2.0, the study rejected the null hypothesis that project management competencies have no significant influence on construction cost control of projects in Mombasa County. Therefore, the study accepted the alternative hypothesis; project management competencies have a significant effect on construction cost control of projects in Mombasa County.

Hypothesis Two

H_{02} = Project planning has no significant influence on construction cost control of projects in Mombasa County.

In relation to the variable, project planning, the results in table above supported by regression analysis t-value of 3.652 was greater than the critical value 2.0, and p-value of 0.00 at 95% level of significance is less than 0.05. After testing the hypothesis, calculated t-value for project planning, which is greater than the critical t_{36} (0.05) = 2.0, the study rejected the null hypothesis that project planning has no significant influence on construction cost control of projects in Mombasa County. Therefore, the study accepted the alternative hypothesis; project planning has a significant influence on construction cost control of projects in Mombasa County.

Hypothesis Three

H_{03} = Project monitoring has no significant influence on construction cost control of projects in Mombasa County.

In relation to the variable, project monitoring, the results above supported by regression analysis t-value of 3.446 is greater than the critical value 2.0, and p-value of 0.00 at 95% level of significance is less than 0.05. After testing the hypothesis, calculated t-value for project monitoring, which is greater than the critical t_{36} (0.05) = 2.0, the study rejected the null hypothesis that project monitoring has no significant influence on construction cost control of projects in Mombasa County. Therefore, the study accepted the alternative hypothesis; project monitoring has a significant influence on construction cost control of projects in Mombasa County. This confirms Block (2013) argument that project monitoring is one of the pillars of construction cost control in project management and helps to steer the organization achieve its goals. In line with this, Harold (2013) concluded that project monitoring helps project contractors and managers effectively appraise infrastructure projects so as to improve their performance. This concurs with Lawrence (2014) finding, who noted that; a timely, regular and reliable monitoring system on infrastructure projects is key in determining success of the project.

Hypothesis Four

H_{04} = Project technological innovation has no significant influence on construction cost control of projects in Mombasa County.

In relation to the variable, project technological innovation, the results in table above supported by regression analysis t-value of 3.205 was greater than the critical value 2.0, and p-value of 0.00 at 95% level of significance is less than 0.05. After testing the hypothesis, calculated t-value for project technological innovations, which is greater than the critical t_{36} (0.05) = 2.0, the study rejected the null hypothesis that project technological innovation has no significant influence on construction cost control of projects in Mombasa County. Therefore, the study accepted the alternative hypothesis;

The Strategic Journal of Business & Change Management. ISSN 2312-9492 (Online) 2414-8970 (Print). www.strategicjournals.com

project technological innovation has a significant influence on construction cost control of projects in Mombasa County.

Hypotheses Testing Results

The first null hypothesis, H_{01}, stated that project management competencies have no significant influence on construction cost control of projects in Mombasa County. The results indicated that (β_{01} = 0.496; t = 4.623; p < 0.005), hence the H_{01} was rejected leading to the conclusion that project management competencies had a statistically significant influence on construction cost control of projects in Mombasa county.

The second null hypothesis, H_{02}, stated that project planning has no significant influence on construction cost control of projects in Mombasa County. The results indicated that (β_{02} = 0.079; t = 3.652; p < 0.005), hence the H_{02} was rejected leading to the conclusion that project planning had a statistically significant influence on construction cost control of projects in Mombasa County.

The third null hypothesis, H_{03}, stated that project monitoring has no significant influence on construction cost control of projects in Mombasa County. The results indicated that (β_{03} = 0.513; t = 3.446; p < 0.005), hence the H_{03} was rejected leading to the conclusion that project monitoring had a statistically significant influence on construction cost control of projects in Mombasa County.

The fourth null hypothesis, $H_{04,}$ stated that a project technological innovation has no significant influence on construction cost control of projects in Mombasa County. The results indicated that (β_{04} = 0.026; t = 3.805; p < 0.005), hence the H_{04} was rejected leading to the conclusion that project technological innovation had a statistically significant influence on construction cost control of projects in Mombasa County. Table 10 presented the hypotheses testing results findings.

Table 10 : **Hypotheses Testing Results**

Hypothesis Statement	β	t	p-value	Decision
H_{01}: Project management competencies have no significant influence on construction cost control of projects in Mombasa county.	0.496	4.623	0.038	Reject the H_{01}
H_{02}: Project planning has no significant influence on construction cost control of projects in Mombasa county.	0.079	3.652	0.024	Reject the H_{02}
H_{03}: Project monitoring has no significant influence on construction cost control of projects in Mombasa county.	0.513	3.446	0.009	Reject the H_{03}
H_{04}: Project technological innovation has no significant influence on construction cost control of projects in Mombasa county.	0.026	3.805	0.027	Reject the H_{04}

CONCLUSIONS

The study concluded that management competencies and technical knowhow adeptly influence construction cost control of projects in Mombasa County. In concurrence, Oguulana and Bach (2017) observe that project managers with good management and technical skills are able to deliver projects within a specified time schedule. Further, acquaintance with works appraisals and risk evaluation augments construction cost control hence the performance of projects in Mombasa County. The study results in general concluded that there was a statistically significant influence of project management competencies on construction cost control of projects in Mombasa County.

The study concluded that project plans and designs enhance construction cost control of projects in Mombasa County. In addition, the flow of communication and involvement of all stakeholders in decision making contributes to project success. This concurs with Phua's (2013) observation that

The Strategic Journal of Business & Change Management. **ISSN** 2312-9492 (Online) 2414-8970 (Print). www.strategicjournals.com

good communication with project team members contributes to better project cost performance. Preparation of a work schedule and method statement during project implementation has a remarkable impact on construction cost control of projects in Mombasa County. The study results in general concluded that there was a statistically significant influence of project planning on construction cost control of projects in Mombasa County.

The study concluded that project appraisals stimulate construction cost control of projects in Mombasa County. Monitoring in order to reduce wastage of materials and time was one of the biggest contributors to success of project implementation. This concurs with Loudon (2012) who ascertains that project monitoring inspires cost reduction. Further, the study concluded that proper monitoring instils quality management and inculcates the relevant training, skills and experience which positively impact on construction cost control of projects in Mombasa County. The study results in general concluded that there was a statistically significant influence of project monitoring on construction cost control of projects in Mombasa County.

The study concluded that project mechanization enhances construction cost control of projects in Mombasa County. The reduction of costs is witnessed through mechanization and use of smart equipment to improve efficiency.
While project manufacture inventions like off-site module production has a high return on investment, project software has tremendously changed construction for the better. Telecommunication and internet are the novelties that have also claimed tribute in construction transformation. The study results in general concluded that there was a statistically significant influence of project technological innovation on construction cost control of projects in Mombasa County.

RECOMMENDATIONS

Based on the results analyses and subsequent findings of the study, it was established that project management practices positively influence construction cost control of projects in Mombasa County. It is therefore convenient for construction firms in the county to adopt the recommendations envisaged.

Construction companies in Mombasa County should hire staff at the management cadre endowed with project management competencies in management and technical knowhow; and, conversant with works appraisals and risk evaluation so as to smoothly control construction costs of projects. Construction firms in Mombasa County should embrace project planning to provide the requisite plans and designs with stakeholder involvement and effective communication in decision making to facilitate implementation, thereby prudently controlling construction costs of projects.

Construction companies in Mombasa County should foster project monitoring encompassing appraisals while mitigating wastage of time and materials. Proper monitoring instils quality management and inculcates the relevant training, skills and experience which positively impact on construction cost control of projects in Mombasa County. Construction firms in Mombasa County should be technology compliant by assimilating project technological innovation courtesy of project software and telecommunication; and, making use of mechanization and manufacture inventions so as to pragmatically invest in construction cost control of projects in Mombasa County.

Areas for further Study

This study focused on influence of project management practices on construction cost control of projects in Mombasa County. From the analyses, the study variables explained only 90.1%. Since only 90.1% was explained by the independent variables in this study; it is prudent that other studies be carried out on project initiation, project implementation, project exit and project evaluation

to determine their influence on construction cost control of projects in Mombasa County. These management components were not covered in this study. Additional studies to focus on other aspects of policy framework like ethical practices and how they influence construction cost control in Mombasa County are as well vital. Finally, the study can be replicated in other counties to find out the influence of project management practices on construction cost control of projects, and do correlation studies on its effect of adoption.

REFERENCES

Acharya, N. K., Lee, Y. D., & Im, H. M. (2016). Conflict Factors In Construction Project: Korean Perspective Engineering. *Construction and Architectural Management*, *13* (6), 543 - 566.

Ahmed, Z. (2017). The Impact of Material Management on Construction Project Delivery in Maldives. *Universiti Tunku Abdul Rahman*, *34*.

Alaghbari, T. (2014). *Organizational behaviour (6th ed.).* London: Prentice Hall.

Al-Momani, H. (2016). Examining Service Quality within Construction Processes. *Technovation*, *20*, 643 - 651.

Andi, Y., & Minato, T. (2016). Representing Casual Mechanism of Defective Designs: A System Approach Considering Human Errors. *Journal of Construction Management*, *21*, 297 - 305.

Barke, R. (2015). *Project management planning and control technique (5th ed.)* Hong Kong: Burke Publishing.

Bickel, R. (2017). *Multilevel Analysis for Applied Research: It's Just Regression.* New York: Guild Ford Press.

Blismas, N. G., Sher, W. D., Thorpe, A., & Baldwin, A. N. (2016). Factors Affecting Project Delivery Within Construction Clients Multi-Projects Environments. *Engineering , Construction and Architectural Management*, *11* (2), 113 - 125.

Brown, A., & Adams, J. (2016). Measuring the Effect of Project Management on Construction Outputs: A New Approach. *International Journal of Project Management*, *18*, 327 - 335.

Bryman, A., & Bell, E. (2015). *Business research methods.* London: Oxford University Press.

Butler, T. (2014). *Elements of administration for building students (3rd ed.).* London : Oxford University Press.

Chan, A. P., Scott, D., & Chan, A. L. (2016). Factors Affecting the Success of A Construction Project. *Journal of Construction Engineering & Management*, *130* (1), 153 - 155.

Chan, W., & Mohan, M. (2016). Compressing Construction Durations: Lessons Learned from Hong Kong Building Projects. *International Journal of Project Management*, *20*, 23 - 35.

Clough, R. H., Sears, G. A., & Sears, S. K. (2015). *Construction project management.* London: John Wiley & Sons Limited.

Conti, G. (2015). Training, Productivity and Wages in Italy. *Journal of Labour Economics*, *12* (4), 557 - 576.

Cooper, R., & Schinder, S. (2013). *Business research methods.* New York: McGrawHill.

Desster, G. (2015). *Management principles of tomorrow's leaders.* New Jersey: Pearson.

Dokata, R. A. (2017). Factors Influencing Building Construction Projects Costs Management in Commercial Real Estate in Nairobi County, Kenya. *Unpublished MA Project Planning, University of Nairobi*, Retrieved from https://www.uonbi.ac.ke.

Dubois, D., & Rothwell, W. (2016). *Competency ToolKit.* London: Sage Publishers.

Faridi, A. S., & El-Sayegh, S. M. (2014). Significant Factors Causing Delay in the Construction Industry. *Journal of Construction Management and Economics*, *24*, 1167 - 1176.

Flyvbierg, B., Holm, M. S., & Buhl, S. (2015). Underestimating Costs in Public Works Projects. Error or Lie. *The American Planning Association*, *68* (3), 279 - 295.

Gersup, M. (2016). Design Errors, Construction Mistakes and Building Failure. *International Conference, Program of Project Management Engineering System.* Rome, Italy: John Wiley & Sons Limited.

Gidado, K. I. (2016). Project Complexity: The Focal Point of Construction Production Planning. *Construction Management Economics*, *14*, 213 - 225.

Golder, M., & Golder, S. N. (2016). *Simple Regression.* Pennsylvania: Pennsylvania State University, USA.

Griethuijsen, R. A. L. F., Eijck, M. W., Haste, H., Brok, P. J., Skinner, N. C., Mansour, N., et al. (2014). Global patterns in students' views of science and interest in science. *Research in Science Education, 45* (4), 581–603. doi:10.1007/s11165-014-9438-6.

Gujarati, D. N. (2016). *Basic Econometrics.* New York: McGraw-Hill.

Gwaya, A. O. (2015). Development of a Project Management Evaluation Model for the Construction Industry in Kenya. *Unpublished Doctoral Thesis, Jomo Kenyatta University of Agriculture and Technology*, Retrieved from https://www.jkuat.ac.ke.

Gyula, S. (2017). *Construction: Craft to Industry.* London : Spon Press.

Hastie, R., Tibshirani, R., & Friedman, J. (2018). *The Elelments of Statistical Learning:Data Mining, Inference and Prediction.* Stanford: Springer.

Idoko, L. A. (2017). Developing Local Capacity for Project Management-Key to Social and Business Transformation in Developing Countries. *PMI Global Congress*, 56.

Iyer, C., & Jha, K. (2016). *Critical Factors Affecting Schedule Performance In China, Building & Environment.* New York: Harvard Business School Press.

Jackson, K. (2016). Fundamentals of Project Performance. *Journal of Project Management, 56* (3), 41 - 54.

Jacobides, J. (2017). *Mastering Project Management: Applying Advanced Concepts to Systems Thinking, Control and Evaluation, Resource Allocation.* London: McGraw Hill Publishers.

Karim, M., & Marosszeky, M. (2016). *Process Monitoring For Process Re-Engineering Using Key Performance Indicators.* New Jersey: John Wiley & Sons Limited.

Kibuchi, N., & Muchungu, P. (2015). The Contribution of Human factors in the Performance of Construction Projects in Kenya. *Unpublished MA Project Planning, University of Nairobi*, Retrieved from https://www.uonbi.ac.ke.

Kothari, , C. K., & Garg, G. (2018). *Research methodology: Methods and techniques (3rd ed).* New Delhi, India: New Age International Publishers.

Luthaus, F. (2014). *Organizational Behaviour.* Singapor: McGraw Hill.

Mbatha, C. M. (2014). The Management of Building Projects, Analysis of Building Procurement Systems Features and Conception of An Appropriate Project Management Systems for Kenya. *Journal of Construction Economics*, *56* (2), 90.

Mbeche, I. M., & Mwandali, D. N. (2015). Management by Projects. *Paper Presented at the Regional Conference on Construction Project Management* . Machakos: ACTS.

Momon, A. H., Rahma, I. A., & Azis, A. A. (2016). Preliminary Study on causative Factors Leading to Construction Cost Overrun. *International Journal of Sustainable Construction*, *2* (1).

Najmi, H. (2016). Project Management for Construction Projects. *Unpublished PhD Thesis Najah National University*, *89* (8), 90 -100.

Nicholas, J. A. (2017). *The Effect of Management Commitment to service quality on frontline employees effective and performance outcomes:an empirical investigation of the New Zealand Public Health Care Sector.* Wellington: John Wiley & Sons Limited.

Nkwachukwu, E., Ibeawachi, E., & Okoli, M. N. (2016). Project Management Factors Indexes: A Constraint to Project Implementation Success in the Construction Sector of a Developing Economy. *European Journal of Scientific Research*, *43* (3), 392 - 405.

Nyangilo, A. O. (2016). An Assessment of the Organization Structure and Leadership Effects on Construction Projects Performance in Kenya: A Case of Public Building Projects within Nairobi. *Unpublished MA Projects Planning, University of Nairobi*, Retrieved from https://www.uonbi.ac.ke.

Ofori, G. (2016). Construction in Developing Countries: A Research Agenda. *Journal of Construction in Developing Countries*, *12* (9), 8 -11.

Oguulana, F., & Bach, Z. (2017). Competency in Project Management. *Journal of Strategic Management and Projects Development*, *78* (7), 109 - 113.

Pearman, R. (2016). Contractors Look Abroad for High Rise Expertise. *Contract Journal*, *435* (6597). Pearson Education Ltd Essex.

Phua, T. T. (2013). Determining the Relationship Between Fee Structure and Project Performance between Firms: An Empirical Study Based on Institutional and Task Environment Perspectives. *Construction Management and Economics*, *23*, 45 - 56.

Pinto, J. K., & Covin, J. (2016). Critical Factors in Project Implementation, A Comparison of Construction and R & D Projects. *Technovation*, *67* (9), 123 - 133.

Scott, D., Wurth, D., Dong, C. Y., & Tran, T. T. (2017). Moments of the Generalized Hyperbolic Distribution. *Computational Statistics*, *26*, 459 - 476.

Smith, P. J., & Cronje, G. J. (2015). *Management Principles: A Contemporary Edition for Africa (3rd ed.).* Cape Town: University of Cape Town.

Tabachnick, B. & Fidell, L. (2012) *Using multivariate Analysis.* Boston, Pearson

Education Inc.

Talukhaba, A. A. (2016). An Investigation into Factors Causing Construction Project Delays in Kenya: A Case Study of Highrise Building Projects in Nairobi. *Unpublished MA Project, Faculty of Architecture, Design and Development*, Retrieved from https://www.uonbi.ac.ke.

Thomsett, R. (2016). Project Pathological Causes, Patterns and Symbols of Project Failures. *Journal of Project Management International*, *12* (7), 23 - 45.

Vandevoorde, S., & Vanhoucke, M. (2016). A Comparison of Different Project Duration Forecasting Methods Using earned Value Metrics. *International Journal of Project Management*, *24* (4), 289 - 302.

Walker, D. H., & Shen, Y. J. (2015). Project Understanding, Planning, Flexibility of Management Action and Construction Time Performance: Two Australian Case Studies. *Construction Management and Economics*, *20* (3), 31 - 44.

Wambui, D. N., Ombui, K., & Kagiri, A. (2015). Factors Affecting Completion of Road Construction Projects in Nairobi City County:A Case Study of Kenya Urban Roads