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EFFECTS OF TRIPLE CONSTRAINTS ON THE MANAGEMENT OF PROJECTS IN NAIROBI: THE PROJECT MANAGERS' PERSPECTIVE

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ABSTRACT

Projects are generally undertaken because they are part of plans to meet business goals and charter organizations to new levels of performance. They are however constrained by competing demands and competing priorities within the project environment. The performance of the project, and the project manager, is measured by the degree to which they overcome these constraints to meet project objectives. The project management triple constraints of scope, time and cost are regarded by project managers' as key the successful management of projects. Despite the much acquired knowledge in project management, history shows a pattern of project underperformance with projects not effectively meeting one or more of these expectations. The study sought to determine the effects of the triple constraints on the management of projects in Nairobi from the perspective of the project manager. The study adopted purposive sampling targeting 30 (30% of population) project managers registered by The Kenya Association of Project Managers and Project Management Institute, Kenya Chapter. The study found no statistically significant effect of the triple constraint elements on the management of projects in Nairobi. The study recommends that project managers should identify other external factors and/or intra-management of the triple constraints including trade-offs that could be influencing the management of projects in Nairobi.

Key Words: *Triple Constraints, Management Of Projects, Project Manager, Cost, Scope, Time*

Background of the Study

This chapter covers the background information on the management of projects going through the global perspective and the Kenyan perspective. It also looks at the triple constraints and introduces the target group of the study. The study sought to determine the effects of the triple constraints on the management of projects in Nairobi from the perspective of the project manager.

Over the past several decades, more and more work has been accomplished through the use of projects and project management. The use of projects has been growing at an accelerated rate (Mantel, Meredith, Shafer, & Sutton, 2008). Projects are the engines that drive innovations from idea to commercialization. They are also the drivers that make organizations better, stronger and more efficient (Shenhar & Dvir, 2007). Because all organizations-commercial companies, government agencies, educational institutions and charitable funds- have projects, managers at all levels can play a critical role in turning project management into an organizational competitive asset (Shenhar & Dvir, 2007).

Generally, projects are undertaken because they are part of the plans to take organisations to new levels of performance and to meet business needs (Wayngaag, Pretorius, & Pretorius, 2011). They are formed in order to fix the responsibility and authority for the achievement of an organizational goal on an individual or small group when the job does not clearly fall within the definition of routine work (Mantel, Meredith, Shafer, & Sutton, 2008). They are temporary endeavours undertaken to create a unique product service or a result (PMI, 2013). Management of projects thus arose on the need to successfully execute projects.

Project management approach is relatively modern and is characterized by methods of restructuring management and adapting special management techniques, with the purpose of obtaining better control and use of existing resources (Kerzner , 2009). Project management is planning, organizing, coordinating, leading and controlling resources to accomplish the project objective. The successful accomplishment of the project objective could be constrained by many factors, including scope, quality, schedule, budget, resources, risks, customer satisfaction, and stakeholder support (Gido & Clements, 2015).

Global Perspetive on the Management by Projects

Management by projects has spread in recent years from its traditional dominance of the fields of construction and engineering into sectors as diverse as education, IT, media, health care, and surgery (Hodgson, 2002). As the data proves, most projects fail to meet their goals. They do not meet time and budget goals, do not meet their business objectives, or both (Shenhar & Dvir, 2007). In the study by Cooke-Davies (2002) of 136 European projects executed between 1994 and 2000 by a total of 23 organizations found that there is a strong correlation between schedule delay and cost escalation. From the US to the Europe, projects continually finish late, are overbudget or both. From India, Malaysia, Ethiopia, Nigeria, Ghana, Uganda- the story is the same for construction projects.

Management of Projects in Kenya

In Kenya, the focus has been mainly on construction projects undertaken by the government and parastatals. Time and cost performance of projects in Kenya are unacceptable with over 70% of initiated projects likely to escalate in time with a magnitude of over 50%. 50% of the projects likely to escalate in cost with a magnitude of over 20% (Mbatha, 1986; Talukhaba, 1988; Mbeche & Mwandali, 1996). Recently, Thika dam (Olima & K'akumu, 1999). Thika Road (KARA, 2012), and Langata Road projects have finished late and overbudget, just to mention a few. These reports contradict the inverse proptionality between time and cost as envisioned by the ‘iron triangle’ and the direct proportinality between scope and time and cost.

Project Management Triple Constraints

The triple constraint is a triangle of time, cost and scope that bounds the universe within which every project must be achieved (Dobson, 2004). Project managers must focus on three dimensions of success- completing all project deliverables on time, within budget and to the level of quality that is acceptable to sponsors and stakeholders (Greer, 2008). Although variations and different dimensions exist, these constraints are listed as project scope, time and cost. Performance is sometimes referred to as 'scope' or 'quality' and 'cost' and 'resources' are often listed separately (Dobson, 2004). This particular research took the view of Dobson (2004) of the triple constraint of project scope, cost and time since, as Wayngaad, Pretorius, & Pretorius (2012) evaluated, there is a general agreement that they comprise the key variables of the triple constraint. The triple constraint is also referred to as the iron triangle (Atkinson, 1999).

The triangle reflects the fact that the three constraints are inter-related and involve trade offs. Project quality take root in all three variables of the triple constraint and is affected by balancing the three factors (Wayngaad, Pretorius, & Pretorius, 2012). From the literature review, Wayngaad et al (2012), identified the inherent trade-off dynamics of the triple constraint as being described by the following three key relationships;

$S \propto TC$ (1)

$T \propto \frac{S}{C}$ (2)

$C \propto \frac{S}{T}$ (3)

Where S, T and C refer to scope, time and cost respectively. Equation (1) postulates that the scope is directly proportional to the time and cost and thus increasing or decreasing the scope will lead to an increase or decrease in the time and cost respectively. Equation (2) postulates that the time is directly propotional to the scope and inversely propotional to the cost and thus, an increase in time can lead to an expansion of scope and decrease in costs, and vice versa. Equation (3) postulates that the cost is directly propotional to the scope and inversely propotional to the time and hence increasing the cost of the project leads to an expansion/ increase in scope and a decrease in time and vice versa.

From the novice to the most experienced and senior project manager, triple constraint issues are at the core of the most crucial decisions about a project. Failure to understand them, interprete them, and exploit them correctly and effectively is enough to doom your project even if all else is done to a high standard of excellence (Dobson, 2004). Further, Dobson tells us that the great secret of the triple constraint is that they are not equally constraining. They exist in a hierachy of "driver", "middle" and "weak" constraint. The driver being the constraint we have to meet or else the project fails. The weak constraint, at the other extreme, has the greatest flexibility and furnishes the opportunity that can be used creatively to ensure that the driver constraint does not fail.

The Project Manager

A project manager can be defined as the person responsible for accomplishing the project objectives within the project constraints (Chiu, 2010). The emphasis and project goals may differ from project to project, but the total responsibility for overall project success rests on the shoulders of the project manager, the one who is running the project day-to-day (Shenhar & Dvir, 2007). As such, the research aimed to seek views from project managers. Project managers are professionals involved in the management of projects and have formed associations based on their profession.

Professional associations encourage professionals in a similar field to pursue a new balance of global and local best practices, relationship building, and sharing resources. They also set and assess professional exams (PMI, 2015; KAPM, 2015). Professional associations advocate for needs of both consumers and providers of project management services and liase with legislative and

regulatory bodies (McQide, Millonzi, & Farrell, 2007). In Kenya, there are two project management associations; The Kenya Association of Project Managers (KAPM) and the Project Management Institute, Kenya Chapter (PMI-K). The Kenya Association of Project Managers (KAPM) had 180 registered members (KAPM, 2015) while Project Management Institute, Kenya Chapter (PMI-K)had 108 registered members with around 35 members having the professional certification of Project Management Professional at the start of the study (PMI, 2015; KAPM, 2015). As such, there were 288 persons registered by the Kenyan project management associations. This constituted the target population for the study.

Statement of the Problem

Despite the much acquired knowledge in project management, history shows a pattern of project underperformance (Thompson, 2012). Delay and cost overruns are an inherent part of most projects (Ambituuni, 2011). They are the rule rather than the exception in construction, defence, power generation, aerospace, product development, software and other areas (Sterman, 1992). In a 2008 IBM survey on change management projects, only 40% of projects met schedule, budget and quality goals (IBM, 2008). One in six of the 1,471 IT projects studied had an average cost overrun of 200% and a schedule overrun of 70% (Flyvbjerg & Budzier, 2011). The Standish Group in 2012 found that 43% of projects were challenged (late, over budget and/or with less than the required features); and 18% failed (cancelled prior to completion or delivered and never used) (TSG, 2013). In a study of 5400 large IT projects, on average run 45% over budget and 7% over time, while delivering 56% less value than predicted (Bloch, Blumberg, & Laartz, 2012). In their survey of projects in 34 industries across 38 countries, Price Waterhouse Coopers (PwC) (2012), found that 86% of projects failed to deliver against their budget, schedule, scope, quality and benefits baseline.

In Kenya, Gwaya, Wanyona, and Masu (2014) suggested the need for Kenya to adopt a different approach in the application of project management, in its construction industries. This is due to research indicating ridiculous cost and time overruns in projects undertaken in Kenya, (Mbatha, 1986; Talukhaba, 1988; Mbeche & Mwandali, 1996; Olima & K'akumu, 1999; KARA, 2012). Need therefore arose to determine the effects of the triple constraints on the management of projects in Nairobi, Kenya and fill the existing knowledge gap.

General Objective

The study sought to determine the effects of the triple constraints on the management of projects in Nairobi from the perspective of the project manager.

Specific Objectives

The specific objectives of this study were as follows;

- To determine the effect of project scope constraint on the management of projects in Nairobi from the perspective of the project manager.
- To establish how project time constraint influences the management of projects in Nairobi from the perspective of the project manager.
- To find out the effect of project cost constraint on the management of projects in Nairobi from the perspective of the project manager.

LITERATURE REVIEW

This chapter reviews relevant literature to the triple constraint and the management of projects.

Theoretical Review

A theoretical review is an examination of the corpus of theory that has accumulated in regard to an issue, concept, theory or phenomena. It helps to establish what theories exist, the relationship between them, to what degree the existing theories have been investigated, and to develop

new hypothesis to be tested (Fink, 2014; Hart, 1998). This study was based on the theory of constraints, theory of the temporary organisation, the competency theory and the triple constraints theory.

Theory of Constraints

Theory of Constraints is a form of systems thinking that suggests that any complex system at any point in time often has only one aspect or constraint that limits its ability to achieve more of its goal. There is need to exploit the constraint and adjust scheduling and resource usage. The theory was put forth by Goldratt (1990) in his book 'The Goal'.

It is an approach that is used to develop specific management techniques. It lies on the presumption that every system was created for a purpose- the systems goal. This implies that, before we can .deal with the improvement of any section of a system, we must first define the system's global goal; and the measurements that will enable us to judge the impact of any subsystem and any local decision, on this global goal (Goldratt, 1990). He further says that once these are defined, we can describe the next steps in two different ways. One in which we are using the terminology of the system that we are trying to improve. The other using the terminology of the improvement process itself. They key to sort out the important few from the trivial many lies in the recognition of the important role of the system's constraints. A system's constraint is anything that limits a system from achieving higher performance versus its goal. The theory emphasizes on three things, finding 'what to change', deciding 'to what to change to', and finally 'how to cause the change'.

This theory has found application in two areas within project management; scheduling of a single project to reduce project duration and simplify control, and allocating resources that are shared by concurrent projects (Steyn, 2002). This is because; Positive cash flow can be obtained faster as a result of extended duration, contingency cost of delays could be very high, and extended project duration not only leads to escalation of overhead costs, but also lead to scope changes because stakeholder needs change over time (Steyn, 2002).

Theory of the Temporary Organization

This theory was put forth by Lundin and Soderholm (1995). They argue that efforts to renew businesses and to change existing operations in business firms are often organized as projects. Sometimes special task forces, program committees or action groups are formed, organized or appointed to handle a felt need for action, by addressing particular problems in order to "make things happen". These are all variations on the temporary organization theme. They take their perspectives from 'inside the temporary organization'. As opposed to theories of the firm, decision making is not viewed as a predominant factor in "explaining" the nature of the temporary organization. Rather, it is developed around the notion that action has a leading role.

The theory is developed around two sets of concepts; basic concepts and sequencing concepts. The basic concepts are time, task, team and transition. Time is envisioned as a linear section of a continuous time flow that is cut out and thus made predictable and plannable. The presence of a task is the main reason for creating a temporary organization and thus the goal. Team focuses on interpersonal relations and how they interrelate with the surrounding environment through processes of legitimization. Transition on the other hand is the main aim of the temporary organization; something has to be achieved in terms of transition before success can be proclaimed.

On the other hand, Dietrich, Lehtonen, and Lehtonen (2007) acknowledge the importance of contextual factors on the success and functioning of the temporary organization. Thus, they propose a model based on the system of context, goal, actor and action. Context is inherent in all temporary organizations and affects all of the other three perspectives and defines the application area. The

goal system consists of and contains the formal and informal goals of the temporary organisation, their relationships and interdependencies. The actor system comprises of all the relevant actors related to the temporary organisation – project managers, program managers, owners, steering groups, teams, team members, stakeholders etc. The action system consists of all the actions attributable and related to the temporary organisation.

This research took the view that context affects perspectives of the triple constraints in a temporary organization as affected by the actors in that organization in their actions to achieve the goal.

Competency Theory

The work of McClelland & McBer in the 1980's established the competence theory. The authors defined competency as the underlying characteristic of an individual that is causally related to criterion-referenced effective and/or superior performance in a job or situation (Githenya & Ngugi, 2014). A competence articulates the expected outcome or performance standard that is achieved as a result of applying a combination of knowledge, personal attitude, and skills and experience in a certain function (APM, 2008). A competent project manager implements proper project management techniques, avoids misuse of management techniques, ensures commitment to the project, spends time to define the project, correctly plans activities in the project, ensures correct and adequate information flows, changes activities to accommodate frequent changes, accommodates employees' personal goals with performance and rewards and makes a fresh start when mistakes in implementation are identified (Natchayangkun, 2014). While experience is considered the best teacher Carbone and Gholston (2004) as cited in (McHenry, 2008), argue that organizations must recognize the need to improve on-the-job project management training with more formal education and training.

In contrast, Sandberg (2000) found that human competence is not primarily a specific set of attributes. Instead, workers' knowledge, skills, and other attributes used in accomplishing work are preceded by and based upon their conceptions of work. The basic meaning structure of workers' conceptions of their work constitutes human competence. It is the workers' ways of conceiving work that make up, form, and organize their knowledge and skills into distinctive competence in performing their work.

Theory of Triple Constraints

The triple constraints derive from the very definition of a project; a temporary group activity designed to produce a unique product, service or result (PMI, 2015). It is a unique, transient endeavour, undertaken to achieve planned objectives, which could be defined in terms of outputs, outcomes or benefits. A project is usually deemed to be a success if it achieves the objectives according to their acceptance criteria, within an agreed timescale and budget (APM, 2015). As defined by PRINCE2®, it is a temporary organization that is created for the purpose of delivering one or more business products according to an agreed Business Case (OGW, 2005).

These definitions also imply another important characteristic; they take place inside organizations and in every organisation, there is a finite amount of resources with which to accomplish infinite tasks. This results in scarcity and gives us the triple constraints; a deadline, a budget, and a minimum acceptable level of performance (Dobson, 2004). This constitutes the triple constraint.

The theory of the triple constraint states that: the triple constraint is a triangle of time, cost and performance that bounds the universe within which every project must be accomplished (Dobson, 2004). The key attributes (relevant to this study), as stipulated by Wayngaad, Pretorius, and Pretorius, (2012), are; 1) The triple constraint constitutes a balance of the three interdependent project elements of scope, time and cost as a

function of the project higher purpose; 2) The cause and effect of new or changing triple constraint requirements are constantly negotiated during all phases of a project. 3) The three key triple constraint relationships signify that at least one of the triple constraint variables must be constrained (otherwise there is no baseline for planning), and at least one of the variables must have capacity for exploitation (otherwise quality may be affected).

Conceptual Framework

A conceptual framework is the way ideas are organised to achieve a research projects purpose (Shields & Rangarajan, 2013) and that conceptual frameworks are explicitly focused on the close-to-the-data theory needed to direct data collection in empirical research. Several types of conceptual frameworks have been identified (Shields & Tajalli, 2006, Shields, 1998, Shields & Rangarajan, 2013) depending on the research purpose. According to Mugenda and Mugenda (2003), it is a diagrammatial representation that shows the relationship between the the dependent and independent variables.

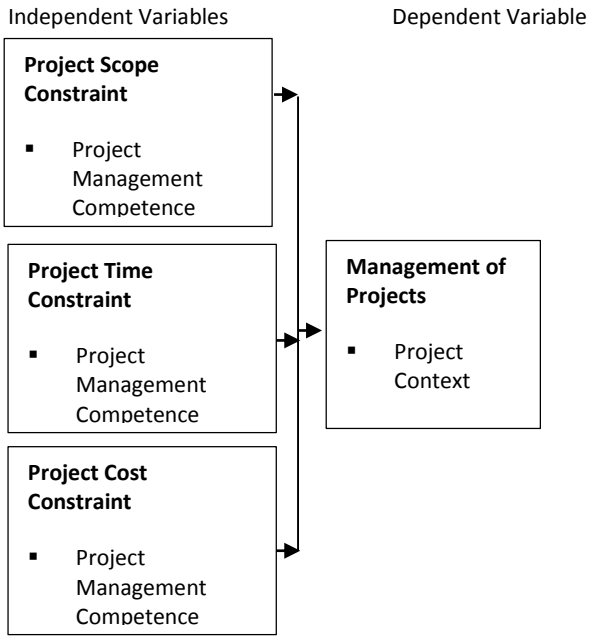

Figure 1: Conceptual Framework

Project Scope Constraint

Project scope is the overall definition of what the project is supposed to accomplish, and a specific description of what the end result should be or accomplish. A major component of scope is the quality of the final product. The amount of time put into individual tasks determines the overall quality of the project. Some tasks may require a given amount of time to complete adequately, but given more time could be completed exceptionally. Over the course of a large project, quality can have a significant impact on time and cost (or vice versa). Scope management is the skill project managers use to define the work that needs to be done on any given project (PMI, 2013; Catanio, Armstrong, & Tucker, 2013; Dobson, 2004; Dobson & Feickert, 2007; Wayngaad, Pretorius, & Pretorius, 2012).

Project Time Constraint

The time required to produce a deliverable is estimated using several techniques. One method is to identify tasks needed to produce the deliverables documented in a work breakdown structure. The work effort for each task is estimated and those estimates are rolled up into the final deliverable estimate, the project time. Tasks are prioritized, dependencies between tasks are identified, and this information is documented in a project schedule. The dependencies between the tasks can affect the length of the overall project (dependency constrained), as can the availability of resources (resource constrained). The Schedule/Time is the only non-recoverable commodity. Restricting the schedule affects either the cost or scope. In order to complete the project sooner the project manager adds extra resources. The more resources working on a task equates to a higher cost for task completion (PMI, 2013; Catanio, Armstrong, & Tucker, 2013; Dobson, 2004; Dobson & Feickert, 2007; Wayngaad, Pretorius, & Pretorius, 2012).

Project Cost Constraint

Nearly all projects have a finite budget. The approximation of project cost depends on several variables including: resources, work packages such

as labour rates and mitigating or controlling influencing factors that create cost variances. Reducing the project cost will most likely affect the project negatively as it could mean a reduction in scope. Cost is closely associated with resources. The more resources assigned to a project to shorten the schedule or meet increased scope, the more the cost will increase (PMI, 2013; Catanio, Armstrong, & Tucker, 2013; Dobson, 2004; Dobson & Feickert, 2007; Wayngaad, Pretorius, & Pretorius, 2012).

Empirical Review

The Project Management Institute (PMI) and numerous other text books on the subject define project management as the application of a body of knowledge and techniques to manage the trade-off or 'triple constraints' between the time, cost, and quality specification (Davies, 2014). To successfully complete a project, the deliverables must match the requirements. To produce this outcome, the project manager is constantly dealing with decisions designed to keep the triple constraint; within schedule and budget, while meeting the requirements (Richardson, 2015). The reason for a constraint and the way in which a constraint is expressed don't have to be related. Budgets can put pressure on deadlines; deadlines can alter performance (Dobson & Feickert, 2007).

Through their survey of 1386 projects, Serrador and Turner (2015) found that project efficiency is 60% correlated with project success and fell to 51% if efficiency was defined as time and budget only. Thus, project efficiency is an important contributor to project success. Project constraints introduce limitations and influence management of the project (Wayngaag, Pretorius, & Pretorius, 2011).

To be able to adequately address the triple constraints, we must first identify and document the constraints faced by our system. Once the constraints are documented, the first step is to intuitively identify and prioritize the constraints according to their impact on the goal (Goldratt, 1990). Studies conducted in this line include Flyvbjerg, Holm, and Buhl (2003) who assessed the commonality and size of cost overruns in transport infrastructure projects across twenty nations while Sovacool, Gilbert, and Nugent (2014) conducted an international comparative assessment of construction cost overruns for electricity infrastructure by identifying the frequencies of occurrence. Gideon and Bwisa (2013) found that politics in project management led to stalled projects in government institutions, while Ojwang' and Bwisa, (2014) found that political regimes and government were the joint highest influencers of CDF projects. Otieno and Bwisa (2013) identified enhanced project risk management as a major contributor to meeting the triple constraint in core software projects in the banking industry.

A basic principle of the theory of constraints is that the unpleasant problems in a field such as project management are usually a result of relatively few core problems (Newbold, 1998). Specific research undertaken to investigate what ails implementation of projects provide an insight into what has been the major causes of projects not meeting the triple constraint of time, cost and scope.

In 1991, Genuchten described reasons for delay in software development projects, while Mohamad (2010) identified the delay factors and effects on project completion of government construction industry in Kuantun. Similarly, (Haseeb, Lu, Bibi, Dylan, & Rabbani, 2011; Kikwasi, 2012; Ravisankar, AnandaKumar, & Krishnamoorthy, 2014; Mydin O. , Sani, Salim, & Alias, 2014) analysed the causes of delay in the construction industry in Pakistan, Tanzania, India, and Malaysia respectively. In Kenya, Sebure (2006) investigated factors causing delays in road construction projects and Mbaluku and Bwisa (2013) investigated delay factors in construction project implementation in the public sector. In 2012, Beischer and Lofstrom, investigated factors that cause time delays in hardware development projects.

Investigations have been conducted into causes of cost overruns mainly in infrastructure projects. Nega (2008) identified the causes and effects of cost overrun on public construction projects in Ethiopia while Nyambwari (2012) investigated on the causes of cost overrun on civil works projects in Mombasa County, Kenya. Similarly, Kaliba (2010) identified the significant causes of cost escalation, schedule overruns and quality shortfalls on construction projects in Zambia.

The major causes of time overruns include design error, poor site conditions, and delay in payment, financial incapability of clients, and financial incapability of contractors. The major causes of cost overruns include cost of materials, incorrect planning, and wrong method of estimation, contract management, and fluctuation of prices of materials. The most significant causes of poor scope delivery was identified as inadequate and inconsistent release of funds by the client, poor financial management by contractors, long lapse between feasibility study and implementation of projects, inadequate supervision and incompetence or lack of capacity by contractors. These causes are from the construction industry.

Project constraints vary from project to project or for projects from different industries. The different types of projects will be constrained differently by the different elements of the triple constraints depending on the environment in which they operate. Different studies have been conducted across industries, but none has assessed the triple constraint elements. Collins and Baccarini (2004), assessed success criteria across and within industry and found little differences between industries, Muller and Turner (2007) identified the importance of success criteria and reported project success based on project type and industry sector and found difference, while Cooke-Davies and Aryzymanow (2003) investigated into the nature and extent of variations between project management practices in six industries and found differences between companies and industries.

Until now practitioners have generally attained explicit project management competences through participation in vocational and tertiary education programs, as well as through experience-based professional accreditation in addition to practice experience (Sense & Kiridena, 2014). Gideon and Bwisa (2013) indicate that professionalism is key during project implementation while Project Management Information Software (PMIS) helps project managers perform their tasks in a much professional manner (Kahura & Bwisa, 2013) and hence project success.

Project management experience is gained through practice with older project managers having more experience through longer practice as compared to younger project managers. In their study, Skitmore and Seng Lei (2004) found that in terms of skills, older project managers, had a greater degree of project management skills than their younger counterparts. Muller and Turner (2007) found that different project managers attach different levels of importance to success criteria according to their traits with older project managers assigning higher importance to team building than their younger counterparts which indicated learning by experience. In their study Langer, Slaughter, and Mukhopadhyay (2008) found evidence that the project manager's task familiarity (gained with experience) improves cost performance, client satisfaction and manages client expectations better in IT outsourcing. In their analysis Catanio, Armstrong and Tucker (2013) found no significant difference between experienced project managers and inexperienced project managers in their ability to increase likelihood of successful projects in terms of meeting the triple constraint. There was no statistically significant relationship between project managers' years of experience and project success, although the effect was positive (Bond, 2015).

Professional certification is a designation earned by an individual identifying that they have demonstrated a standard level of skills, experience

and expertise within their field. They are earned from professional societies with a certifying body. The process of developing, administering and maintaining the certification is done to international standards (IIBA, 2015). According to International Project Management Association (IPMA) (2006), the certification programmes is an incentive for the managers of projects to expand and improve their knowledge and experience, continue their education and training, improve the quality of project management and achieve the project objectives more effectively. Certifications for project managers were identified as one strategy to improve project success rates since efficient and effective project management is critical for project success. This is because certifications are believed to improve the focus of project managers on project success factors to improve project performance leading to project success (Natchayangkun, 2014).

Of the 57 construction project managers interviewed in Australia, 36.84% believe it is of medium importance for a project manager to have a professional certification, while 29.82% believed it to be of high importance (Ma, Luong, & Zuo, 2014). In a 2006 survey, PWC found that "Higher-performing projects are significantly more likely to be staffed with certified project managers. In fact, 80% of projects classified as high-performing use a certified project manager". Certification makes a difference in high performing projects indicating that the best project managers are certificated, but poor certificated project managers perform as badly as poor non-certificated project managers (Muller & Turner , 2007). In comparing the difference between certified and uncertified project managers in their likelihood of project success in terms of meeting the triple constraint, Catanio, Armstrong and Tucker (2013) found no significant difference between the two.

RESEARCH METHODOLOGY

This chapter describes the methodology that was used in undertaking the study.

Research Design

The study adopted an exploratory approach using a descriptive survey design. Descriptive research focuses on *what* questions (Vaus, 2001).

Population of the Study

All items under consideration in any field of inquiry constitute a 'universe' or 'population' (Kothari, 2004). All project managers in Kenya constituted the population of this study. From data accessed at the start of the study from the Kenya Association of Project Managers and Project Management Institute, Kenya Chapter, there were 180 members registered by the KAPM and 108 members by the PMI, Kenya Chapter. This makes a total of 288 professional project managers. Thus the study targeted 288 project managers in Nairobi County.

Sample and Sampling Technique

The study adopted purposive sampling which is a non-probabilistic technique where the participants were self-selected. This is because; project managers registered under the associations would provided unique and rich information of value to the study (Suen, Huang, & Lee, 2014).

Data Collection Instrument

Data collection instrument refers to the device used to collect data, such as a paper or computer assisted interviewing system (UCB, 2010). The primary data was collected from project managers registered under KAPM and PMI, Kenya Chapter using a self-report/ administered structured questionnaire from self-selected samples. The questionnaire used was an amended version of Catanio, Armstrong, and Tucker, 2013).

Data Collection Procedure

Study participants completed an online survey using Survey Monkey®. The survey web link and a letter of introduction from university were sent to the presidents of the KAPM and PMI, Kenya chapter who then forward the web link to its members. The survey was structured with branching capabilities and thus allowed data to be collected from two different groups, certified

project managers and uncertified project managers. Both groups answered the first five questions on experience, industry sector, specific interest group, the importance of project management certification and whether they hold a professional project management certification.

Pilot Test

A pilot study is a small-scale research project that collects data from respondents similar to those to be used in the full study. A pilot study was conducted on 3 project managers to test reliability and validity of the questionnaire. This constituted 1% of the sample, a rule of the thumb according to (Cooper & Schindler, 2011; Creswell, 2003).

Data Analysis and Presentation

Data was analysed and presented using percentages and frequency tables. Quantitative data collected was exported to the software programme SPSS and Microsoft excel to generate quantitative results. Correlation and regression test were used to determine the relationship between the dependent and independent variables. Inferential statistics were used to answer the research questions.

RESEARCH FINDINGS AND DISCUSSION

This chapter presents analysis and findings of survey data gathered to determine the effects of the triple constraints on the management of projects Nairobi, taking the perspectives of the project managers'. The survey results were organised by study variable and corresponding objective. The data was gathered exclusively from the questionnaire as the research instruments. The questionnaire was designed in line with the objectives of the study.

Response Rate

29 respondents completed the survey. 3 surveys were discarded due to the participants not working in the capacity of project manager. This constitutes a response rate of 86.67%.

Gender Distribution

Of the 26 valid responses, twenty were male and six were female making 76.9% and 23.1% respectively.

Certification

73% of the respondents were certified while 27% were not certified.

Industry Sector

66% of the survey respondents practice in the private sector, 19% practice in not-for-profit organizations, and 15% practice in the public sector.

Study Variables

To facilitate analysis of the effects of triple constraints on the management of projects, a 7 point likert scale was used with the following correspondence; <5%= extremely weak effect, 5-10%= quite weak effect, 11-30%= slight weak effect, 31-50%= neither strong nor weak effect, 51-70%= slightly strong effect, 71-90%= quite strong effect, >90%= extremely strong effect.

Project Scope and the management of projects

The first objective was to determine the effect of project scope on the management of projects in Nairobi from the perspectives of the project manager. To this end, the respondents were asked to indicate the percentage of projects that exceeded the original project scope.

From the findings, 42% of the respondents had their project exceeding the original project scope by 5-10%, 15% exceeded by <5% and 31-50%, 12% exceeded by 11-30% , 8% by 71-90% while 4% exceeded by 51-70% and >90 per cent. This indicated quite weak effect of project scope on the management of projects in Nairobi.

There was no statistically significant effect on the ability to manage project scope constraint between certificated and non-certificated project managers ($t(24) = 1.30$, $p = .206$ at $\alpha = 0.05$). From the results ($F(4, 21) = 0.675$, $p = .617$), there was no evidence that experience indicated a statistically

significant effect on the ability to manage the project scope constraint. Thus, project management competence has no statistically significant effect on the management of project scope and consequently no effect on the management of projects.

Project Time and the Management of Projects

The second objective was to establish how project time influences the management of projects in Nairobi. From the perspectives of the project manager. To this end, the respondents were asked to indicate the percentage of projects that exceeded the original project time.

From the findings, 31% of the respondents had their project exceeding the original project time by 5-10%, 19% exceeded by 11-30%, 15% exceeded by <5% and 31-50%, 12% exceeded by 71-90% , while 4% exceeded by 51-70% and >90 per cent. This indicated quite weak influence of project time on the management of projects.

There was no statistically significant influence on the ability to manage project time constraint between certificated and non-certificated project managers ($t(24) = 1.08$, $p = .293$ at $\alpha = 0.05$). From the results ($F(4, 21) = 1.049$, $p = .406$), there was no evidence that experience indicated a statistically significant influence on the ability to manage the project time constraint. Thus, project management competence had no statistically significant influence on the management of project time and consequently no influence on the management of projects.

Project Cost and the Management of Projects

The third objective was to find out the effect of project cost on the management of projects in Nairobi from the perspectives of the project manager. To this end, the respondents were asked to indicate the percentage of projects that exceeded the original project cost.

From the findings, 35% of the respondents had their project exceeding the original project cost by 5-10%, 19% exceeded by 11-30% and 31-50%, 15% exceeded by <5%, 12% exceeded by 71-90% , while 0% exceeded by 51-70% and >90 per cent. This indicated quite weak effect of project cost on the management of projects in Nairobi.

There was no statistically significant effect on the ability to manage project cost constraint between certificated and non-certificated project managers ($t(24) = -0.636$, $p = .531$ at $\alpha = 0.05$). From the results ($F(4, 21) = 3.3638$, $p = .021$), there was no evidence that experience indicated a statistically significant effect on the ability to manage the project cost constraint. Thus, project management competence had no statistically significant effect on the management of project cost and consequently no effect on the management of projects.

Correlation Analysis

The study used Pearson product moment correlation analysis to establish whether there is an association between the independent variable and the dependent variable.

Table 1: Correlation between the Dependent and Independent Variables

Correlation Between Dependent and Independent Variables

		Management_of_Projects	Project_Scope	Project_Time	Project_Cost
Management_of_Projects	Pearson Correlation	1	-.157	-.314	-.350
	Sig. (2-tailed)		.445	.119	.080
	N	26	26	26	26
Project_Scope	Pearson Correlation	-.157	1	.494*	.315
	Sig. (2-tailed)	.445		.010	.117
	N	26	26	26	26
Project_Time	Pearson Correlation	-.314	.494*	1	.728**
	Sig. (2-tailed)	.119	.010		.000
	N	26	26	26	26
Project_Cost	Pearson Correlation	-.350	.315	.728**	1
	Sig. (2-tailed)	.080	.117	.000	
	N	26	26	26	26

*. Correlation is significant at the 0.05 level (2-tailed).

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

From the findings, there was no statistically significant relationship between the dependent and dependent variables s shown by the correlation coefficients and p-values of; r(26)= -.157, p= .445 for project scope and the management of projects, r(26)= -.314, p= .119 for project time and management of projects and r(26)= -.350, p= .80 for project cost and management of projects.

Regression Analysis

A multivariate analysis was used to determine the relationship between the dependent and independent variables. The multivariate regression model was;

$Y= ß_0 + ß_1X_1 + ß_2X_2 + ß_3X_3 + ε$

Where;

Y= Management of Projects in Nairobi;

$ß_0$= Constant term;

$ß_1$, $ß_2$, and $ß_3$= Beta coefficients;

X_1= Project Scope Constraint;

X_2= Project Time Constraint;

X_3= Project Cost Constraint;

ε= error term.

Table 2: Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.361[a]	.130	.011	.59528

a. Predictors: (Constant), Project_Cost, Project_Scope, Project_Time

The model shows that the triple constraint element studied explain only 13% of the management of projects in Nairobi as shown by the R^2. This shows that other factors not studied in this research explain 87% of the dependent variable (management of projects) and thus further research should be conducted to investigate these other factors.

Table 3: Analysis of Variance

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.166	3	.389	1.097	.371[b]
	Residual	7.796	22	.354		
	Total	8.962	25			

a. Dependent Variable: Management_of_Projects

b. Predictors: (Constant), Project_Cost, Project_Scope, Project_Time

The analysis of variance was used to determine whether the model is a good fit for the data. From the findings the three triple constraints do not significantly predict the management of projects, *F* (3, 22) = 1,097, p= .371. Hence, the model is not fit in predicting the influence of the independent

variables on the dependent variables since $F_{calculated}$= 1.097 is less than $F_{critical}$= 3.049 at α= 0.05.

Table 4: Regression Coefficients

Regression Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	2.480	.294		8.447	.000	1.871	3.089
	Project_Scope	-.006	.083	-.017	-.076	.940	-.178	.165
	Project_Time	-.040	.110	-.116	-.365	.719	-.268	.188
	Project_Cost	-.103	.116	-.260	-.894	.381	-.343	.136

a. Dependent Variable: Management_of_Projects

Based on this table, the equation for the regression line is;

$Y= 2.480- 0.006X_1- 0.040X_2- 0.103X_3+ \varepsilon$

According to the intercept ($ß_0$), when three independent variables are held constant, the value of management of projects will be 2.480. Since there is no significance on the influence of project scope constraint (p= -.940), project time constraint (p= -.7190), and project cost constraint (p= -.381) on the management of projects, further research should be conducted on the triple constraints and the management of projects for statistical inference.

SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS

The chapter provides the summary of the findings and it also gives the conclusions and recommendations of the study based on the objectives of the study. The objective of this study was to determine the effects of the triple constraints on the management of projects in Nairobi from the perspective of the project manager.

Summary of the Findings

Project Scope Constraint

The study found out no significant effect of the project scope constraint on the management of projects in Nairobi (p= .940). The findings concur with Catanio, Armstrong, and Tucker, (2013) who found that professional project management certification and/or experience of the project manager is not sufficient to guarantee successful management of the project scope constraint.

Project Time Constraint

The study found out no significant influence of the project time constraint on the management of projects in Nairobi (p= -.719). Again, the findings concur with Catanio, Armstrong, and Tucker, (2013) who found that professional project management certification and/or experience of the project manager is not sufficient to guarantee successful management of the project time constraint.

Project Cost Constraint

The study found out no significant effect of the project cost constraint on the management of projects in Nairobi (p= .381). Again, the findings

concur with Catanio, Armstrong, and Tucker, (2013) who found that professional project management certification and/or experience of the project manager is not sufficient to guarantee successful management of the project cost constraint.

Conclusion of the Study

The study concludes that the triple constraints had no statistically significant effect on the management of projects in Nairobi when measured in terms of project context. The relatively small sample size and the wide range of responses may have contributed to the results. These results indicate that the triple constraint elements are too small a component to have a significant effect on the ability of the project manager to manage projects in various contexts.

Recommendations of the Study

The study identified no statistically significant effects of the triple constraints on the management of projects. Thus, other external factors and/or intra-management of the triple constraints including trade-offs could be influencing the management of projects. Project managers in Nairobi should consider identifying these 'other' factors when managing projects.

Recommendations for Further Research

A further study into a bigger sample of this study is proposed. Also, the study identified a positive correlation between project time and project scope ($r(26) = 0.49$, $p = .010$) and project time and project scope ($r(26) = 0.73$, $p < .001$) and thus, a study on the effects of project scope and cost constraints on the project time constraint should be carried out to prove/disprove this relationship.

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