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Project Success Evaluation Criteria of Construction Project Stakeholders in Kenya

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Abstract:
The formal practice in the Kenyan construction industry has been to evaluate project success based purely on the Time, Quality and Cost (TQC) criterion leading to incomplete and misleading assessments. The study discovered other evaluation criteria that are inherent in the Kenyan construction industry that included the organizational benefits, user benefits, project team members' benefits, the Iron-Diamond, and the social benefits success criteria. A questionnaire consisting of both structured and open-ended questions was sent to 380 randomly selected project stakeholders who comprised of 57 consultants, 26 project sponsors, 252 contractors, and 45 project managers. In the case of consultants and project managers, the sample frames were obtained from their respective professional bodies; and in the case of project sponsors and contactors from the National Construction Authority (NCA). Out of the 380 questionnaires that were sent, 239 questionnaires were returned (42 consultants, 157 contractors, 34 project managers and 6 project sponsors) representing a response rate of 62.9 %. The study employed a mixed method research of the convergent parallel design and a research philosophy that combined two perspectives: ontological realism and epistemological post-positivism.

Keywords: *Project success, critical success factors, success criteria, construction projects, evaluation*

1. Introduction

From the early 1960s to the turn of the century the Time, Quality, and Cost (TQC) criterion, usually referred to as the 'Iron-Triangle' after Atkinson (1999), was the criterion used for measuring project success. These factors correspond to a project completing on schedule, according to specifications, and within budget respectively. Towards the beginning of the new millennium however, this concept of project success started to get refutation as being too narrow and only focused on project control (Cooke-Davies, 2002; Munns & Bjeirmi, 1996; Shenhar, Levy, & Dvir, 1997; Ngacho & Das, 2013). Despite this realization of the shallowness of the TQC as a criteria for measuring project success, the concept of project success has remained loosely defined by researchers and project stakeholders (Pinto & Slevin, 1988; Belassi & Tukel, 1996; Cooke-Davies, 2002; Chan, Scot & Chan, 2004; Fortune & White, 2006; Alias, Zawawi, Yusof, & Abra, 2014). Some of the stakeholders continued viewing project success to mean efficient project delivery by the project manager and the project team members, measured using the TQC criterion, while others viewed project success in broader terms of meeting the stated project objectives as well as meeting customer satisfaction. The former refers to project management success while the latter refers more closely to project success as used in this study.

Several authors including Shenhar, et al. (1997); Cooke-Davies (2002); Westerveld (2003); Chan, et al. (2004); Fortune & White (2006); Ngacho & Das (2013); Frefer, Mahmoud, Haleema, & Almamlook (2018) have made a clear distinction between project success and project management success. They agree that project management success refers to the efficiency of producing the project deliverables right from the start of the project all the way up to project hand over to the client. The TQC criteria are the appropriate criteria for measuring project management success. On the other hand, project success has a broader meaning because it goes further and includes the short term and long-term project outcomes. Munns & Bjeirmi (1996) identified the different individuals involved on the project and those involved on project management, together with their objectives, expectations and influences and demonstrated how a better appreciation of the distinction between the two could bring a higher possibility of project success. Nowadays, there is agreement that project success and project management success mean different things. Project management success is concerned with how efficiently the management of the project inputs to produce the expected outputs is, while project success is more long term and deals with the question of how effective and useful the project outcomes are to the users, owners, stakeholders, and to the public. Extant literature has many examples of projects that failed on the measures of efficiency but people still consider them successful. On the other hand, literature also has many examples of projects that were delivered on time, cost, and quality but in the end failed to deliver on the project's objectives and hence were classified as failed projects. Realization of organizational benefits, project team members' benefits, user benefits, the TQC, and social benefits are appropriate criteria for measuring project success.

The formal practice in the Kenyan construction industry has been to evaluate project success based only on the TQC criterion (Mohammed, 2017; Karwitha, 2017; Oyaya, 2017; Omondi, 2017; Somba, 2015; Mulu, 2016; Muchelule, 2018; Ogero, 2014) leading to incomplete and misleading assessments. For example, the oil pipeline from Mombasa to Nairobi that was commissioned in 1978 was initially opposed as a waste of time and money. The argument at the time of construction was that the pipeline money should instead fund the supply of water to Ukambani to fight hunger. As years progressed, the benefits of the oil pipeline became quite evident; the oil pipeline initially 450km long now stands at slightly below 1,230km long. In recent times, similar arguments have been made against the standard gauge railway project. Therefore, there is need for a paradigm shift from the way project success is currently evaluated in Kenya to a multidimensional approach that embraces other success criteria in order to provide better projects that satisfy the stakeholders and enhance the knowledge quotient of the construction projects' stakeholders.

2. Literature Review

2.1. Theoretical Framework

The TQC criteria of measuring project success have continued to receive a lot of criticism for its many shortcomings. The critics argue that the TQC is only concerned with project management actions that take place from ideation to project hand-over but does not put into account the reasons for the project existence (Pinto & Slevin, 1988; Belassi & Tukel, 1996; Cooke-Davies, 2002; Westerveld, 2003; Fortune & White, 2006; Wateridge, 1998; Baccarini, 1999; Hyvari, 2006; Koutsikouri et al. 2006; Muller and Judgev, 2012; Williams, 2015). A project can be completed late and still be considered successful. A much-quoted example is the dome of cologne in Germany that started in 1248 as a gothic cathedral but remained unfinished for 632 years, only coming through to completion in 1880. Its height was 157 meters; it remained the tallest building in the world for a long time. Germans considered it as a success story, and today it is part of the UNESCO world cultural heritage (Gemunden, 2015). In this case, the users of the project, the Germans, consider this project as a success but the project sponsors and the project managers may have considered this project a failure due the inordinately long time it took to complete.

Shenhar, et al. (1997) developed a four-factor framework for measuring project success across the entire time horizon of the project life cycle through project operation up to the future. They named the four factors project efficiency, impact on the customer, business success, and preparing for the future respectively. After a ten years period, Shenhar and Dvir (2007) proposed five slightly different dimensions of success: project efficiency, impact on the customer, impact on the team, business and direct success, and preparation for the future. Atkinson (1999) divided project success into two stages of delivery stage and post-delivery stage. The delivery stage corresponded with the TQC while the post-delivery stage consisted of getting the system right through benefits to many stakeholders involved in the project such as users, customers, project staff members, project manager, top management, and the client; and the benefits realization such as impact on the customer and business success.

Ngacho & Das (2013) evaluated CDF construction projects in Western Kenya based on six success criteria measures of time, cost, quality, safety, site disputes and environmental impact. The time, cost, quality and safety measures form what this study calls the Iron Diamond success criterion. There appears to be a mix-up on the 'site disputes' variable which is just one measure of the human related factors that influence project success and not a success criterion variable. A closer look at the questionnaire items used for the exploratory part of their study shows that there was a clear distinction between CSFs, which they referred to as success variables, and the success criteria that they called performance variables. However, there was mix-up of the CSFs and success criteria variables in their confirmatory study questionnaire. For instance, harmonious relationship on site, formulation of a clear plan, delays in procurement of funds, effects of weather and climatic conditions are CSFs that they should have classified under what they referred to as project success variables but they were instead classified under time performance factors. In addition, they did not consider the influence of organizational benefits, user benefits, and project team benefits on project success. Therefore, they not only used insufficient success criteria factors for evaluating project success losing statistical power and increasing the chance of making type 1 error but also their confirmatory questionnaire items could have been invalid for that study. Therefore, different project stakeholder have different criteria that they use to assess success of construction projects. Without an agreed criteria with which project success is judged and evaluated, it remains a challenge to reach consensus on the real CSF's for project success (Pinto & Slevin, 1988; Belassi & Tukel, 1996; Cooke-Davies, 2002; Fortune & White, 2006; Muller & Judgev, 2012; Alias et al. 2014).

There is not much information available in literature pertaining to the influence of success criteria and the CSF's on project success of construction projects in Kenya. Furthermore, much of the available literature does not discuss the pertinent issues of project management efficiency and effectiveness measures that influence the success of construction projects. Rather the economics that drive construction projects in Kenya are more often discussed. For example, one of the areas of research study that have received attention is procurement methods (Kithinji, 1988; Mbatha, 1993; Mbaya, 1984). Another area that has been studied is project performance where cost overruns, time overruns and labour output have been discussed (Gichuge, 2000; Talukhaba, 1998; Wachira, 1996). Construction business performance focusing on indigenous contractors, marketing and labour practices have been studied (Bakuli, 1986; Gitagi, 1992; Magare 1987; Mitullah & Wachira 2003).

Some studies on the Kenyan construction industry were found that discuss other causes of project success and failure. These include Munano (2012) that discussed the processes undertaken during the preconstruction planning phase within the public sector buildings in Kenya. The study found out that inadequate personnel, bureaucracy in decision-making, and inadequate and late release of project funds are the main causes of project delays. Daib (2014) discussed the challenges that influence the completion rate of construction projects in the devolved units in Kenya with reference to the modernization of a sewerage system in Wajir County. The study reported that problems related to poor planning of the project, inadequate project funding, poor feasibility study, and unqualified and inexperienced personnel had a negative impact on completion rates of construction projects in Kenya. The study concluded that corruption in public offices and lack of professionalism were to blame for the poor performance of government projects in Kenya. Mbaabu (2012) carried out a study on factors that influence implementation of road projects in Kenya. The conclusion drawn from this study was that proper planning, good site management, adequate contractor experience, and adequate clients finance and payment for completed works, are the main factors that influence the successful implementation of road projects in Kenya. Other factors included favorable external conditions, identification of sub-contractors, proper adequate materials, labour supply, proper maintenance of both plants and equipment, and proper communication channels between parties of the project. Mugo (2014) found that government projects experience time and cost over-runs due to inadequate or poor instructions, delays and unrealistic project acquisition, delayed or disrupted communication or late approvals.

Hassan (2017) discussed three success criteria for project success namely client attributes, the Iron Triangle which he called project attributes, and the stakeholders attributes. The stakeholders' attributes included the user benefits and the organization benefits as used by the researcher in this study. Mokua (2014) carried out a study to evaluate the success indicators of the building construction projects in Kenya on four dimensions of factors related to the contractor, factors related to the end user, factors related to the public, and factors related to project sponsor or client on their influence on project success. The study recommended the development of a framework and a modelling system for success of construction projects in Kenya. In the same vein, Macharia (2013); Hassan (2017); and Macharia (2017) have recognized the important role that other success criteria play in project success. They have identified the TQC, organization benefits and user benefits as being critical in assessing success of construction projects in Kenya. However, none of the studies demonstrated empirically how they came to identify the TQC, user benefits, organizational benefits, and social benefits as criteria for measuring and assessing the success of construction projects in Kenya. Ngacho & Das (2013) developed a multidimensional performance evaluation framework for Constituency Development Fund (CDF) construction projects in Western Kenya. They found six success criteria namely time, cost, quality, safety, site disputes, and environmental impact as important in influencing project success. They evaluated project success based on the six criteria and found six CSFs namely project-related, client-related, consultant-related, contractor-related, supply chain-related and external environment-related factors to influence project success in that order of importance.

2.2. Conceptual Framework

It was theorized that the project life cycle of construction projects in Kenya consists of four independent phases. These are Conceptualization, Planning, Execution, and Termination phases similar to those identified in Pinto & Slevin (1987).

Success Criteria (Dimensions)	Attribute Enablers (Manifest Variables)
Iron Diamond	Project delivered on schedule (Time)
(TQCS)	Project delivered to specifications (Quality)
	Project delivered within budget (Cost) Projects delivered safely (Safety)
Project Team's Benefits	Projects without legal claims Aesthetically pleasing construction
	Profits goals of consultants and contractors met
Organizational Benefits	Flexible project with room for expansion Good Return on Investment (ROI)
	Projects with minimum maintenance costs
	Marketable products
User Benefits	Projects in which users are satisfied
	Projects functioning as intended Low cost of maintenance
Social Benefits	Projects with minimum negative impact on the environment Socially acceptable projects

Table 1: Success Criteria and Their Attribute Enablers

The success criteria used to judge the success of construction projects were hypothesized to be grouped into five independent dimensions; the Iron Diamond; Project Team's Benefits; Organizational Benefits; User benefits; and Social Benefits. These factors are operational zed by their respective attribute enablers or manifest variables shown in **Error! Reference source not found.**. The success criteria variable measures were obtained by taking the arithmetic mean of their respective attribute enablers. In addition, the project success variable measure was obtained by taking the arithmetic mean of Iron Diamond, project team's benefits, organizational benefits, user benefits, and social benefits measures. Four construction projects stakeholder groups considered important in this study are the project sponsors, the consultants, the contractors, and the project managers

Table shows the CSFs grouped into the five categories. These are the Human related factors, Project related factors, Project procedures, Project management actions, and External environment as categorized in Chan et al. (2004). Figure 1 shows the conceptual model in which the five CSFs, operational zed by their attribute enablers, are the independent variables while the success criteria as operational zed by their attribute enablers are the dependent variables. It is conceptualized that the project phase at which the construction project is currently at acts as a moderator on the influence of the CSFs on project success. This model was applied separately for each of the four phases of the project life cycle.

Category/Group (Latent CSFs)	Cluster	Critical Success Factors (Manifest CSFs)
Human Related Factors	Client /Sponsor Related	Ability to brief Ability to contribute to construction Ability to contribute to design Ability to define roles Ability to make decisions Emphasis on cost of construction Emphasis on quality of construction Emphasis on speed of construction Experience Nature (Private/Public/PPP)
	Project Manager Related	Ability to adapt to the changes Business skills Commitment to the project Communication skills Coordination skills Experience Involvement in the project Leadership skills Motivational skills Organizational skills Technical skills Working relationships with project team
	Top Management	Top management support
Project Related Factors	Project	Nature of the project e.g. scope Project complexity Size of the project e.g. monetary value involved Type of the project e.g. road, building etc.
Project Procedures	Procedures	Adherence to the procurement plan Adherence to the laid down tendering procedure Approval processes
Project Management Actions	Project Management	Communication systems Control mechanisms Feedback Mechanisms Implementation of a quality assurance program Implementation of a safety program Organizational structure Planning effort
External Environment	External Influences	Economic environment Environmental conservation Political environment Social environment Technological advancement Legal environment (laws and regulations)

Table 2: Critical Success Factors

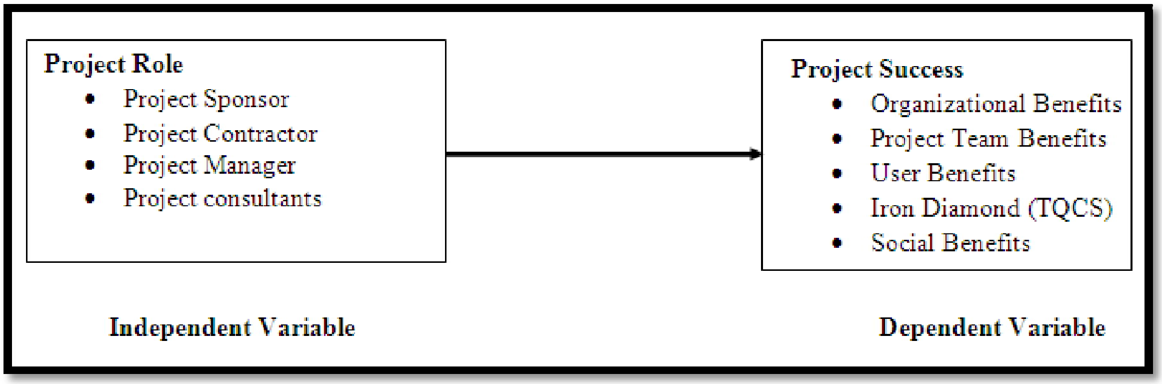

Figure 1: Conceptual Model

3. Research Methodology

3.1. Research Philosophy

The researcher adopted a philosophical position that combined two perspectives; ontological realism that holds the belief that there is a real world that exists independently of our own perceptions and theories, and the epistemological post-positivism that holds the belief that our understanding of this world is based on both objective and subjective perceptions of reality. The belief that project success, CSFs, and success criteria exist in the real world independent of our own perceptions is an objective proposition. However, these concepts are not fully quantifiable and are influenced by subjective judgement. Furthermore, since opinions and perceptions of the respondents are subjective in nature, our results cannot be purely objective.

3.2. Research Design

This study sought to find out whether there were any significant differences in the criteria used by the project stakeholders (project sponsors, contractors, consultants, and project managers) in evaluating project success. Project success is an abstract concept. Therefore, the researcher drew from Chan & Chan (2004) who suggested that project success could be evaluated through performance measures developed through literature review where success criteria can be identified.

A mixed method research of the convergent parallel design was adopted for this study. It used descriptive, deductive and inductive approaches and employed the survey strategy for data collection since it allowed a large amount of data to be collected in a cost-effective way. The purpose of using the mixed method research was to initiate fresh ideas, insights, and perspectives from the respondents and to look for any divergence and dissonance in their responses. The researcher collected quantitative and qualitative data simultaneously, analyzed them separately, and interfaced them only at the point of comparisons. The purpose of this research design was to make comparisons of the project success criteria obtained from both methods of data analysis. However, the research philosophy adopted required that quantitative data be given a higher priority over the qualitative data. Due to the constraints of both time and financial resources, a cross sectional research type for data collection was adopted. The research was conducted using two main methods of data analysis. These were the Factor Analysis, which employed the Principal Component Analysis and Varimax rotation that reduced the 22 manifest variables to five latent variables, and the Standard Multiple Linear Regression for prioritizing the CSFs at each phase of the Kenyan construction projects.

3.3. Target Population

The target population consisted of four major stakeholder groups directly involved in the construction projects in Kenya. These are the consultants (architects, mechanical engineers, electrical engineers, quantity surveyors, and civil engineers), project sponsors (owners, clients, and developers), contractors (civil, mechanical, and electrical) and project managers working in the Kenyan construction industry.

3.4. Sample and Sampling Techniques

The sampling frames were obtained from several sources. The first and the second sampling units consisted of all Architects and all Quantity Surveyors registered with the Board of Registration of Architects and Quantity Surveyors (BORAQS). The actual lists of registered members; both Architects and Quantity Surveyors, were downloaded from the BORAQs website on 10th may 2016 located at https://boraqs.or.ke/members/. The third, fourth and fifth sampling units consisted of all Mechanical Engineers, Civil Engineers, and Electrical Engineers registered with The Institution of Engineers of Kenya (IEK) respectively. These lists were downloaded on 10 May 2016 from the IEK website located at http://www.iekenya.org/. These five sampling units together formed the consultants group. The sixth and seventh sampling units are the project Sponsors and the Contractors registered with the NCA respectively. The list was provided by the NCA.

The sampling units comprised of the project sponsors, contractors, project managers, architects, quantity surveyors, mechanical engineers, electrical engineers, and civil engineers. Together, more than 26,000 individuals were targeted. Table shows the actual number of individuals in the various accessible populations.

Sampling Unit	Population	Percentage
Project Sponsors	1072	6.8
Contractors	10456	66.4
Architects	806	5.1
Quantity Surveyors	450	2.9
Civil Engineers	736	4.7
Mechanical Engineers	183	1.2
Electrical Engineers	186	1.2
Project Managers	1864	11.8

Table 3: Sampling Frame

The issue of the number of cases to use for factor analysis has not yet achieved consensus. Although the size of the sample is important in factor analysis, varied opinions and several rules has been cited in literature. Some of the notable rules of thumb include the Tabachnick's rule which states that at least 300 cases are required. Hair, Anderson, Tatham and Black (1995) recommend that at least 100 cases are required for factor analysis to proceed. The work of Comrey and Lee (1973) in which they rated 100 cases as poor, 200 cases as fair, 300 cases as good, 500 cases as very good, and 1000 cases as excellent for factor analysis has been cited in Williams, Brown and Onsman (2012). A good estimate of the sample size was calculated from the following formula:

$$n = \frac{q}{1+(q-1)/N}$$ -- Equation 0.1

Where n is the desired sample size
N is the size of the target population

$$q = \frac{\left(Z^2 P(1-P)\right)}{d^2}$$ -- Equation 0.2

Z is the standard normal deviation at the required confidence level.
p is the proportion in the target population estimated to have the characteristics being measured.
d is the desired level of statistical significance.

Since the size of the target population is known to be finite, although the actual size is unknown, a good estimate of the sample size was found by putting N =15,753 for the size of the accessible population, Z=1.96 for 95% level of confidence, p = 0.5 for 50% response distribution, and d= 0.05 for 5 % margin of error. This calculation gave n = 376. Using the Erap Sample Size calculator, a desktop sample size calculator validated against the available online sample size calculators, gave a sample size of 376 the same sample size as the one calculated above. A sample size of 380 respondents was therefore used for this study as it also falls within the required sample sizes suggested by various researchers as suitable for factor analysis. Table shows the populations and the sample sizes of the consultant's role category and Table shows a summary of the required sample sizes from each sampling unit.

Consultants	Population	Size	Percentage
Architects	806	19	34.1
Quantity Surveyors	450	11	19.0
Civil Engineers	736	18	31.2
Mechanical Engineers	183	4	7.8
Electrical Engineers	186	5	7.9
Total	2361	57	100

Table 4: Sample Size for the Consultants Group

Sampling Unit	Population	Size	Percentage
Project Sponsors	1072	26	6.9
Contractors	10,456	252	66.3
Architects	806	19	5.0
Quantity Surveyors	450	11	2.9
Civil Engineers	736	18	4.7
Mechanical Engineers	183	4	1.1
Electrical Engineers	186	5	1.3
Project Managers	1864	45	11.8
Total	15,753	380	100

Table 5: Required Sample Sizes for Each Population

A total of 380 cases were sampled in the study. In order to obtain accurate results, a simple stratified sampling procedure sampled 19 architects, 11 Quantity Surveyors, 18 Civil Engineers, 4 Mechanical Engineers, and 5 Electrical Engineers making a total of 57 consultants as shown in Table . Simple random sampling procedures sampled 252 Contractors, 45 Project Managers and 26 Project sponsors to take part in the study. The sample sizes for each sampling unit are as shown in Table . The sample size satisfies most of the rules of thumbs in literature for carrying out a factor analysis. The four strata that were sampled are the project sponsors (clients or developers), consultants, the contractors and the project managers. The researcher used simple random sampling procedure to get a representative sample from each sampling unit.

3.5. Data Collection Methods and Instruments

This study used a questionnaire as an instrument for data collection. This data collection tool was preferred over other tools due to its suitability when collecting data from respondents who are spread across a wide geographical area (Mugenda & Mugenda, 2003). The survey questionnaire enabled the researcher to collect reliable and valid data from a high proportion of the samples within a reasonable time period at minimal cost. A seven-page questionnaire was constructed. It consisted of the cover page and two sections, 1 and 2. The cover page contained a statement of the purpose of the project. It also gave an assurance that the researcher was committed to ensuring that the participants' rights to anonymity and confidentiality were observed. It declaration that the researcher was not going to diverge or disclose the contents of the information received from the respondents without their written permission.

Section 1 of the questionnaire contained 7 items that asked the respondents to select the demographic details that best described their individual characteristics from the given options. These details included their role in the construction industry; years they had worked in construction industry; gender; age in years; highest level of education attained; largest project that they have been involved in (in millions of Kenya shillings); and the sector in the construction industry that they have had most experience. Section 2 of the questionnaire contained items 8, 9, 10, 11, 12, 13, and 14. Item 8 contained a list of 22 factors obtained through literature review that are used as criteria for measuring and evaluating project success. The respondents were asked to rate on a 5-point Likert scale (Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree) the level to which, in their own experiences, the stated factors led to the success of projects. The respondents were also requested to add other items they considered important that had not been included in the questionnaire items and rate them as well. Item 9 contained a list of 43 construction projects' CSFs obtained from Chan & Chan (2004). The respondents were asked to rate them on a Likert scale of 1-5 on their degree of influence to the success of construction projects in Kenya at each of the four phases of the project life cycle. The respondents were also requested to add other items they considered important that had not been included in the questionnaire items and rate them as well. Items 10, 11, 12, 13, and 14 were open ended questions intended to complement the quantitative data obtained from item 9 questions by giving the respondents an opportunity to express themselves within the same study. Several authors have observed that the perennial paradigm wars of dichotomizing and polarizing research into quantitative and qualitative research is overdone and misleading. They observe that it has become common practice for researchers to use both approaches within the same research (Burns & Burns, 2008; Kothari, 2004). Item 10 asked the respondents to think of a construction project in Kenya in which they were involved in and that had been completed within the last three years. They were then asked to indicate two major problems encountered and their respective suggested remedy at each of the four phases of the project life cycle. They were also asked to state two major reasons they thought the project was a success and two major reasons they thought the project was a failure. They were also asked to suggest two ways in which the project would have been made more successful. Item 11asked the respondents to state two major reasons why, in their own knowledge and understanding of the Kenyan construction sector, some high rise multi-storey residential buildings were collapsing. They were also asked to give two solutions to that problem. Item 12 asked the respondents to select from a list of design software programs that they were using in their projects. They were also asked to include any other software they were using that was not included in the list. Item 13 asked the respondents to give a reason why they were using the software, if any, in item 12. Finally, item 14 asked the respondents to state whether they had used COBie. All the 14 items were also entered into a Google form survey questionnaire domiciled in the researcher's Google Drive online storage facility for online transmission to the respondents' email addresses.

A total of 328 email addresses of some 328 respondents were obtained and the online google form survey questionnaires sent to them. Before sending the online questionnaire, we made telephone calls to some 209 respondents, who answered our telephone calls, and explained to them that an online survey questions was about to be sent to their email addresses and requested them to respond positively. After one month, we had received some 36 responses representing 11.0% response rate. We then obtained the postal addresses of the remaining 344 respondents and questionnaires sent to them through their respective post office box addresses. The researcher included a stamped self-addressed envelope for that purpose. The respondents were requested to send the filled questionnaires back to of the researcher within three weeks. After one month, we had received seven responses through this method representing a 2.0% response rate. The physical addresses of some 278 of the remaining 337 respondents were obtained and questionnaires physical delivered to their respective offices and field sites where a majority of the contractors were based. The data collection technique used was the drop and pick method. After seven months, some 196 responses had been received using the drop and pick method representing a 70.5 % response rate. In total 239 responses were received representing a 62.9% response rate. The entire duration of effective data collection took about nine months.

3.6. Pilot Testing

Before sending the data collection instruments to the respondents, a pilot study was undertaken to test their validity and reliability. In particular, the researcher was interested in finding out how easy or how difficult it would be for the respondents to fill-in an online Google form questionnaire sent through email. The researcher was also interested in finding out if there were any items that were not clear from the respondents' viewpoint in order to make the necessary changes before distributing the final questionnaires to the 380 respondents. The 10% general rule of determining the sample size of the pilot study was applied. A total of 40 respondents were selected to take part in the pilot study using a purposive random sampling method. There were 27 contractors, 5 project managers, 2 architects, 2 civil engineers, 1 project sponsor, 1 electrical engineer, 1 mechanical engineer, and 1 quantity surveyor included in the study. Three other persons competent in the field of project management were also selected to take part in the pilot study. The questionnaires were physically delivered to their respective offices and requested to give their independent feedback as to how relevant the contents of the research instrument were to the study. They were also requested to make suggestions on how the questionnaire could be improved. This acted as a test for the validity of the instrument before distributing the questionnaire.

3.7. Data Processing and Analysis

3.7.1. Data Coding

The returned questionnaires were checked for any additional items which would have been added by the respondents. None of the respondents had included any extra items to the questionnaire. Coding for questionnaire items 1 – 9 was done in the IBM SPSS Statistics Version 23 (SPSS). First, the variables were defined by giving each of them a short name and a label. For instance, item 1 variable was named 'q01' and labelled 'Role in the construction industry'. Values were created by allocating numbers to levels for each of the variables that had discrete levels. For instance, Item 1 variables, "Project Sponsor", "Consultant", "Contractor", and "Project Manager" were allocated numbers 1, 2, 3, and 4 respectively. Question 2 items "Male" and "Female" were allocated numbers 1 and 2 respectively. Similarly, each of items 3, 4, and 5 had four levels and the variables were allocated numbers 1, 2, 3, and 4 respectively. Items 6 and 7 data were entered as is. The levels "SD", "D" "N", "A", and "SA" in item 8 were allocated numbers 1, 2, 3, 4, and 5 respectively. The levels "Very Low", "Low" "Average", "High", and "Very High" in item 9 were allocated numbers 1, 2, 3, 4, and 5 respectively while all missing values were allocated number 99 with the exception of the 'age of the respondent' variable whose missing value was allocated the number 999. Each returned questionnaire was represented as a single case for SPSS analysis.

Coding of the open-ended questionnaire items 10 – 14 was done using MS Excel. An MS Excel workbook was created and 12 worksheets were inserted in the workbook. Some of the worksheets created were q10.b.P1, q10.b.P2, q10.b.P3, q10.b.P4 containing the responses made on the questionnaire item on the major problems encountered during the conceptualization, planning, execution, and termination phases of the project life cycle respectively. Each returned questionnaire was represented on a single row of the worksheet. The responses were typed into the worksheets in the correct row that represented the respective questionnaire. Each of the two problems were initially written on two different columns along the same row. Only 110 out of the 239 returned questionnaires contained responses to the open-ended questions.

All the responses, in each of the four worksheets, together with their corresponding suggested remedies were examined carefully, keenly looking into their similarities and dissimilarities, and broken down into nine problem categories. These categories were labelled and coded as funds (f), risk (r), technical skills (t), project management (p), external environmental issues (e), sustainability (s), legal (l), scope creep (sc), and client briefs (cb). Each of the responses was then coded by writing the corresponding codes in the worksheet cell to the immediate right of the respective response. Frequencies of occurrence of each code were then determined and reported.

Three worksheets representing questionnaire items 10c, 10d, and 10e were inserted into the workbook and named q10.c, q10.d, q10.e respectively. The reported reasons as to why the projects were successful were typed into worksheet q10. c. Again each questionnaire was represented by a single worksheet row. After careful examination of all the reasons for success, six categories of the Iron Triangle, Safety, Organization benefits, User benefits, Project team benefits, and Social benefits were identified. These categories were coded as t, s, o, u, p, and sb respectively. Each code was written in the worksheet cell to the immediate right of the response it represented. Frequencies of occurrence of each codes was determined and reported. Similar analysis were done to q10.d, q10.e, q11a, and q11b representing reasons for project failure, ways to make the project more successful, reasons for collapse of several high rise residential buildings, and solutions to collapse of high rise residential buildings respectively.

3.7.2. Data Screening

After the SPSS data set was created, graphical displays of histograms, stem-and-leaf plots, and the Q-Q normality plots for each questionnaire item using the explore procedure of the SPSS were generated. Measures of central tendency (mean) and measures of spread, i.e. the standard deviations, skewness, and kurtosis for each questionnaire item were calculated. The aim at this stage of data analysis was to describe the general distributional properties of the data, screen the data for input errors by identifying any unusual observations (outliers and extreme values) or any unusual patterns of observations that may cause problems for later data analyses. No unusual data were found and so the next stage of data analysis was performed.

3.7.3 Exploratory Factor Analysis

The Exploratory Factor Analysis (EFA) is concerned with whether the correlations between a set of manifest variables X_1, X_2, X_3, X_4, ..., X_p could be explained by a smaller number of latent variables F_1, F_2, F_3, ..., F_q where $q < p$. It is desired that m is far much less than n so that a much less number of variables can be used to represent the original model. The model linking the manifest and latent variables is the multiple regression model with the manifest variables regressed on the latent variables. Table 6 shows the correlation matrix between the manifest variables (the X's) and the latent variables (the F's which are extracted) in which the number of the F's is hopefully much less than the number of the X's. The α's are the correlations or the factor loadings between the X's and the F's.

	F1	F2	F3	F4	...	Fq
X1	α_{11}	α_{12}	α_{13}	α_{14}	$\alpha_{1...}$	α_{1q}
X2	α_{21}	α_{22}	α_{23}	α_{24}	$\alpha_{2...}$	α_{2q}
X3	α_{31}	α_{32}	α_{33}	α_{34}	$\alpha_{3...}$	α_{3q}
X4	α_{41}	α_{42}	α_{43}	α_{44}	$\alpha_{4...}$	α_{4q}
...	$\alpha_{..1}$	$\alpha_{...2}$	$\alpha_{...3}$	$\alpha_{...4}$	$\alpha_{....}$	$\alpha_{...q}$
Xp	A_{p1}	A_{p2}	A_{p3}	A_{p4}	$A_{p...}$	A_{pq}

Table 6: Factor Loading Matrix

In mathematical notation, it becomes:

$X_i = \alpha_{i1}F_1 + \alpha_{i2}F_2 + \alpha_{i3}F_3 + \alpha_{i4}F_4 + ... + \alpha_{iq}F_q + U_i$ ------------ Equation 0.3

Where i =1, 2, 3 ... p and U's are the residues.

The assumptions made when applying the model are that the error terms (residues) are uncorrelated with each other and with the latent variables. Since the latent variables cannot be observed, the factor loadings cannot be estimated using the procedure of estimating the multiple regression coefficients. However, several approaches for estimating the factor loadings exist. The principal component analysis being the most popular among these approaches was therefore used with subsequent varimax rotation.

A Principal Component Analysis (PCA) with subsequent rotation (Varimax) was conducted on the 22 items of the Success Criteria Factors i.e. Question 8 of the questionnaire. Kaiser rule was used and five component factors were extracted. These factors were labelled as the Iron Diamond (Iron Triangle and safety), Organizational Benefits, Project Team Benefits, User Benefits, and the Social Benefits success criteria factors. A new variable c.MF1 was created and labelled 'Organizational benefits'. It computed the mean of all the six manifest variables combined on which this factor had loaded these are the variables Flexible projects with room for expansion , Projects with minimum maintenance cost, Projects that produce marketable products, Projects with satisfied clients , Projects without defects , Projects with satisfied users, Projects without legal claims.

A new variable c.MF2 was created and labeled 'Project team benefits'. It calculated the mean of all the six manifest variables combined on which this factor had loaded. These are projects without legal claims, aesthetically pleasing construction projects, projects completed without accidents, projects which derive professional satisfaction, projects in which profit goals of consultants/contractors are met, and projects with minimum construction problems. Another new variable c.MF3 was created and labeled 'user benefits'. It calculated the mean of all the four manifest variables combined on which this factor had loaded. These are the projects in which users are satisfied, projects functioning as intended, projects with a good return on investment, and projects with low maintenance costs. A new variable c.MF4 was created and labelled 'Iron triangle + safety (project management)' that had loaded on projects delivered to specifications, projects delivered on schedule, projects delivered safely, and projects delivered within budget. Finally, a new variable c.MF5 was created and labelled 'mean for social benefits'. It calculated the mean of all the two manifest variables on which this factor had loaded. These are the projects with minimum negative impact on the environment, and socially acceptable projects. A one-way ANOVA was conducted for each of the five variables in order to determine whether there were any significant differences in the mean scores of the four stakeholders' role categories in each case.

3.7.4. Multiple Linear Regression

The purpose of the multiple linear regression was to assess the strength of the relationship between each of the set of 'p' explanatory variables (x_1, x_2, x_3, x_4, ..., x_p) and a single response variable (y). Summated scales were used for both the response and the explanatory variables in order to mitigate against measurement errors. The explanatory variables were the five categories of the CSFs namely human related factors, project related factors, project procedures, project management actions, and external environment. The response variable was project success operationalized by the five sets of success criteria namely the organizational benefits, project team benefits, user benefits, Iron Diamond (TQCS), and social benefits. **Error! Reference source not found.** and Table shows the attribute enablers for success criteria variables and the CSFs respectively. When multiple linear regression was applied to the set of data, the resulting outputs were the regression coefficients: one for each explanatory variable. These coefficients gave the estimated change in the response variable associated with a unit change of the corresponding explanatory variable provided the other explanatory variables remained unchanged (Landau & Everitt, 2004). The n coefficients are written as $\beta_{11}, \beta_{12}, \beta_{13}, \beta_{14}, \ldots, \beta_{1p}$ while the corresponding residues are $\varepsilon_1, \varepsilon_2, \varepsilon_3, \varepsilon_4, \ldots, \varepsilon_p$ respectively. In mathematical notation, the multiple linear regression model for a response variable y with m observable values and 'n' explanatory variables is given by:

$y_i = \beta_{i0} + \beta_{i1} x_{i1} + \beta_{i2} x_{i2} + \beta_{13} x_{i3} + \beta_{i4} x_{i4}, + \ldots + \beta_{ip} x_{ip} + \varepsilon_i$ --------Equation 0.4

Where i = 1, 2, 3 ... q

A new variable labelled 'Project Success' was created in SPSS to represent the mean of the Iron Diamond (Iron Triangle and Safety), Organizational Benefits, Project Team Benefits, User Benefits, and the Social Benefits success criteria factors . Three new CSFs variables were also created in SPSS for each phase of the project life cycle. Phase 1, Phase 2, Phase 3, and Phase 4 were represented by the prefix P1, P2, P3, and P4, respectively. For instant, the conceptualization phase which is phase 1 had the following new factors. P1ClientRelated, representing the client related factors during the conceptualization phase, was created by computing the mean of all client related factors appearing in Table. P1PMRelated, representing project manager related factors during conceptualization phase, was created by computing all project manager related factors. Similarly, P1TopManagement variable representing top management support during the conceptualization phase was also created. Another Five variables were created in SPSS to represent the CSFs groupings. The P1HRFactors variable was created by computing the mean of the P1ClientRelated, P1PMRelated, and P1TopManagement variables. P1ProjectManActions was created by computing the mean all the Project Management related factors; P1ProjectProcedures was created by computing the mean all the Project Procedures related factors; P1ProjectRFactors was created by computing the mean all the Project related factors; and the P1ExternalEnvironment was created by computing the mean of all External Environment related factors. Corresponding variables were created for each of the other three remaining phases. A standard multiple regression analysis was performed between Project Success as the dependent variable and the scores of the P1HRFactors, P1ProjectManActions, P1ProjectProcedures, P1ProjectRFactors and P1ExternalEnvironment as the independent variables. Similar standard multiple regression analysis was performed for each of the other three phases of the project life cycle.

A stepwise multiple regression with forward entry was performed as an exploratory procedure of identifying the relative strength of influence the CSFs had on project success in preparation for a more rigorous regression analysis. A hierarchical multiple regression was then performed to determine the CSFs which are statistically significant in predicting project success.

4. Research Findings and Discussion

4.1. Response Rate

Data collection exercise started in the month of March 2017 and continued up to December 2017. A total of three hundred and eighty questionnaires were distributed to the respondents out of which two hundred and thirty-nine responses were received representing an overall response rate of 62.9%. The number of questionnaires distributed and those returned by the respondents categorized according to their project roles as consultants, contractors, project managers, and project sponsors are shown in Table .

Respondents	Frame Size	Sampled	%	Received	%	Response Rate %
Consultants						
Architects	806	19	5.00	12	5.02	63.16
QS	450	11	2.89	8	3.35	72.73
Civil	736	18	4.74	15	6.28	83.33
Mechanical	183	4	1.05	4	1.67	100.00
Electrical	186	5	1.32	3	1.26	60.00
All Consultants	2361	57	15.00	42	17.57	73.68
Contractors	10456	252	66.32	157	65.69	62.30
Proj Managers	1864	45	11.84	34	14.23	75.56
Proj Sponsors	1072	26	6.84	6	2.51	23.08
Total	1573	380	100	239	100.00	62.08

Table 7: Response Rates Obtained from Each Project Role Category

This compares favorably with response rates reported from similar studies. For instance, Dosumu & Onukwube (2013) received a response rate of 28.7 %. Ibrahim (2014) received an overall response rate of 59% while Owoko (2012) reported 67.5%. Daib (2014) obtained 86.2%; Munano (2012) obtained an overall response rate of 84.85% while Salleh (2009) reported 61%, 44%, and 30% response rates for contractors, architects, and engineers respectively. Mokua (2014) obtained an overall response rate of 32.2%, while Yong & Mustaffa (2012) got a 31.1% response rate. Therefore, the response rate of 62.9% was found adequate for this research and data analysis was carried out.

4.2. Demographics

4.2.1. Respondents' Age in Years

Table shows the mean, standard deviation, skewness and kurtosis of the respondents' age in years. The average age of the respondents was about 40 years with a standard deviation of 7.7 years.

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Age of the respondent in years	238	39.54	7.697	.599	.158	.078	.314
Valid N (list wise)	238						

Table 8: Mean, SD, SKEWNESS and Kurtosis for the Respondents' Age

4.2.2. Respondents' Number of Years Worked in the Construction Industry

As Table shows, the average number of years that the respondents have worked in the construction industry is slightly more than 12 years with a standard deviation of slightly more than 6 years. The number of years worked can be taken as a surrogate for the experience of the respondents and hence the capability of the respondents to give accurate and informed survey responses. No respondent had worked for more than 35 years in the Kenyan construction industry

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Number of years worked in the	239	12.19	6.252	.934	.157	.837	.314
Valid N (list wise)	239						

Table 9: Number of Years Worked in the Kenyan Construction Industry

4.2.3. Respondents' Level of Education

Table shows the frequencies and the respective percentages of the level of education of the respondents. The majority of the respondents had a bachelor degree representing 51.9% of the respondents. Those with a diploma level of education followed at 29.3% with only 18.8% of the respondents having a post graduate level of education.

Level of Education	Frequency	Percentage	Cummulative Percentage
Diploma	70	29.3	29.3
Bachelor	124	51.9	81.2
Post Graduate	45	18.8	100
Total	239	100	

Table 10: Respondents' Level of Education

Figure 2 shows the number of respondents who reported to have attained the indicated education levels i.e. diploma, bachelor, and post graduate qualifications. It shows that a large portion of the respondents had either a diploma or a bachelor qualification or both accounting for 81.2% of all the respondents. None of the respondents reported that they had only a craft level of education.

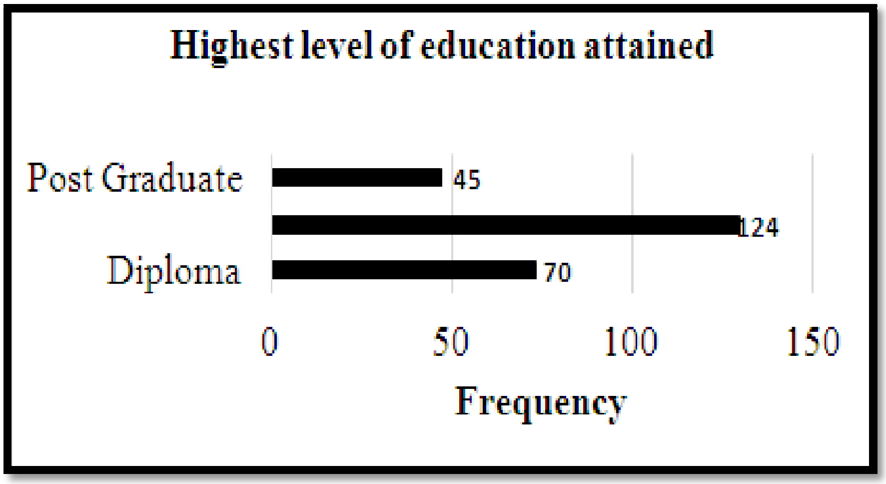

Figure 2: Highest Level of Education Attainted by the Respondents

4.2.4. Respondents' Gender

The construction industry in Kenya is dominated by males who constituted 86.6% of all the respondents as compared to only 13.4% who were females. Figure 3 shows a pie chart of the percentages of the respondents by gender (Male, Female) in the Kenyan construction industry.

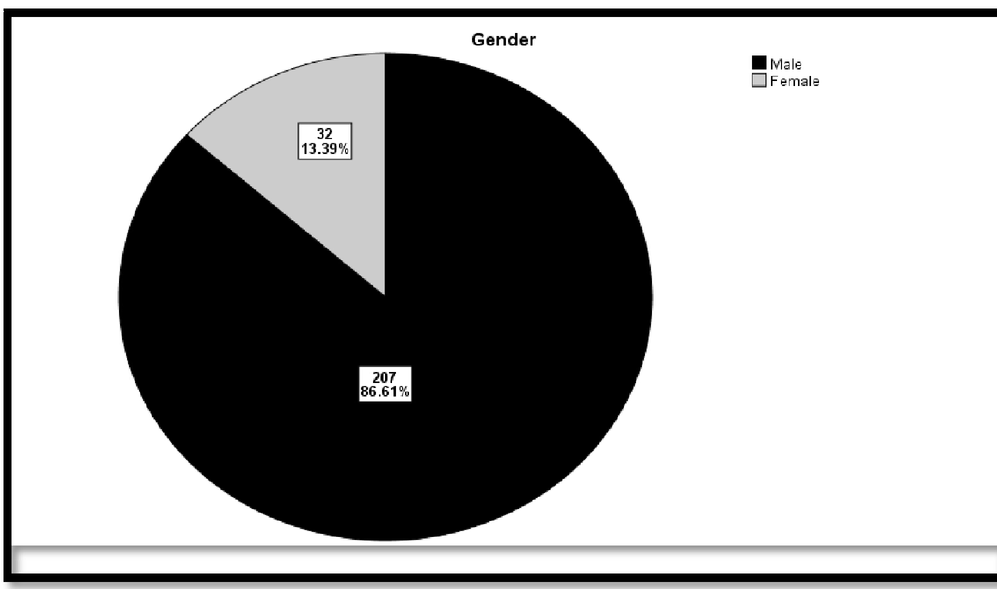

Figure 3: Percentages of the Respondents by Gender

4.2.5. Respondents' Largest Project Involved in Within Construction Projects in Kenya

The size of the largest project that a majority of the respondents, representing 64%, had been involved in was in the range of KES 50 million to KES 1 billion as shown in Table 11. This was followed by projects within the range of 1,001 million KES and 10 billion KES with 19.2% of the respondents. Projects below 50 million KES had 14.2% of the respondents while 2.5% of the respondents had been involved in projects worth more than 10 billion KES. Project size can be used as a proxy for project complexity.

Project Size in Millions of KES	Frequency	Percentage	Cummulative Percentage
Less than 50	34	14.2	14.2
50-1,000	153	64	78.2
1,001-10,000	46	19.2	97.5
More than 10,000	6	2.5	100
Total	239	100	

Table 11: Largest Project the Respondents Had Been Involved in (KES Millions)

4.2.6. Respondents' Role in the Construction Projects in Kenya

Four roles in the construction industry were examined. These were the project sponsor (developer, client, or owner), the project manager, the consultant, and the contractor. The contractors were the majority of all those who responded to the survey representing 65.7% of all the respondents. They were followed by the consultants with 17.6%, then the project managers with 14.2% while the project sponsors come in last with a paltry 2.5 % as shown in Table .

Role in Consruction Projects	Frequency	Percent	Cummulative Percent
Project sponsor	6	2.5	2.5
Consultant	42	17.6	20.1
Contractor	157	65.7	85.8
Project manager	34	14.2	100
Total	239	100.0	

Table 12: Role of the Respondents in Construction Industry

4.2.7. Sector in Which the Respondents Are Mostly Involved in within Kenyan Construction

Table shows the results obtained for the sector within the Kenyan construction industry that the respondents are mostly involved in. A large proportion, representing 70.7%, of the respondents are mostly involved in the building construction sector. This was followed by the roads sector with 18.8% of the respondents. The water sector came in third with only 8.4% of the respondents reporting that they are mostly involved in the water sector. All the other sectors in the Kenyan construction industry together, e.g. energy, were represented by only 2.1% of the respondents cumulatively.

Sector Mostly Involved in	Frequency	Percentage	Cummulative Percentage
Water	20	8.4	8.4
Buildings	169	70.7	79.1
Roads	45	18.8	97.9
Other	5	2.1	100
Total	239	100	

Table 13: Sector in Which the Respondents Were Mostly Involved in

4.3. Validation of Data Collection Tool

4.3.1. Reliability

Reliability analysis were carried out using SPSS to detect if there were any random or systematic errors of measurement in the research instrument with a view to correcting them before distributing the instrument. The Cronbach's alpha was used as the test statistics. This test is useful in developing questionnaires as the alpha level (or reliability) indicates if the items are measuring the same construct. The generally agreed value of the lower limit for Cronbach's alpha is 0.70 while an alpha of 0.8 and above is regarded as highly acceptable for assuming homogeneity of items (Burns and Burns, 2008). The advantage of using SPSS for the inter-item reliability analysis is that SPSS uses the Spearman-Brown formula in its calculations to counter the negative effect of obtaining a reduced reliability measure on an assessment that is only one-half as long as the original after the split-half method is applied.

A reliability analysis to assess internal reliability of the questionnaire item 8 on success criteria factors was carried out in SPSS. The inter-item statistics for a 22-item scale completed by the 14 respondents showed that the questionnaire item was reliable with a Cronbach's alpha of 0.866. The corrected item-total correlations varied from 0.28 to 0.615. The Cronbach's alpha for individual items if item is deleted ranged from 0.816 to 0.889. Similar, reliability analysis on questionnaire item 9 were carried out for each of the four phases of the project life cycle. The inter-item statistics for a 43-item scale completed by the 14 respondents showed that the questionnaire item was reliable with a Cronbach's alpha value of 0.921 for the conceptualization, 0.901 for the planning, 0.937 for the execution and 0.942 for the termination phases. The corrected item-total correlations did not reveal any items to be deleted. It was therefore concluded that the questionnaire was reliable

4.3.2. Validity

In order to test for the validity of the data collection instruments, three persons competent in the field of project management were selected for this task. Three questionnaires were physically delivered to the offices of the three experts respectively. They were then asked to give their independent feedback as to how relevant the contents of the research instrument were to the study. They were also requested to make suggestions on how the questionnaire could be improved. The experts recommended that the size of the questionnaire be reduced without affecting its contents. This recommendation was incorporated in the final questionnaire that was used in the full study.

4.4. Measurement and Diagnostics of the Study Variables

4.4.1. Project Success

Project Success was the response (or the dependent) variable and was measured using an original set of some 22 manifest variables (success criteria factors) that were later reduced to five latent variables through factor analysis. Some 239 respondents drawn from among the project sponsors, consultants, project managers, and contractors completed the responses. The descriptive statistics of these responses are as shown in

Table .

Success Criteria	**SD %**	**D %**	**N %**	**A %**	**SA %**	**M**	**STD DEV**
Projects delivered on schedule are a success			1.7	66.5	31.8	4.30	.495
Projects delivered to specifications are a success			1.7	69.9	28.5	4.27	.480
Projects delivered safely are a success			1.7	70.7	27.6	4.26	.476
Projects delivered within budget are a success	.8		.4	70.7	28.0	4.25	.546
Aesthetically pleasing construction projects are a success	9.2	14.2	18.4	45.2	13.0	3.38	1.157
Projects with low maintenance costs are a success	2.5	.4	18.0	62.3	16.7	3.90	.764
Projects in which profit goals of consultants/contractors are met are a success	3.8	15.5	13.0	55.6	12.1	3.57	1.014
Projects with minimum negative impact on the environment are a success	1.7	7.5	20.5	47.7	22.6	3.82	.924
Projects in which users are satisfied with project are a success			9.2	63.2	27.6	4.18	.579
Socially acceptable projects are a success	3.3	9.6	16.7	45.2	25.1	3.79	1.032
Projects with minimum construction problems are a success	.8	10.5	16.7	62.3	9.6	3.69	.817
Projects which derive professional satisfaction are a success	4.2	11.3	16.3	49.8	18.4	3.67	1.035
Projects without legal claims are a success	8.4	15.1	18.0	42.7	15.9	3.43	1.171
Projects functioning as intended are a success			9.2	61.5	29.3	4.20	.588
Projects without defects are a success		11.3	9.2	57.7	21.8	3.90	.869
Projects completed without accidents are a success	5.4	18.8	14.6	50.2	10.9	3.42	1.081
Projects with a good Return On Investment are a success		1.7	9.6	68.6	20.1	4.07	.600
Projects with satisfied clients are a success		6.3	6.7	53.6	33.5	4.14	.797
Projects that produce marketable products are a success		7.1	6.3	67.8	18.8	3.98	.733
Projects with minimum maintenance cost are a success		5.9	4.2	69.0	20.9	4.05	.696
Flexible projects with room for expansion are a success	2.5	6.7	7.9	65.7	17.2	3.88	.857
Projects with satisfied users are a success		5.4	7.5	64.0	23.0	4.05	.723

Table 14: Percentages, Means, and Standard Deviations of Success Criteria Factors
N=239
SD: Strongly (1) D: Disagree (2) N: Neutral (3) A: Agree (4) SA: Strongly
(5) M: Mean STDDEV: Standard Disagree Agree Deviation

Figure 4 shows a bar chart of the means scores of the 22 manifest variables.

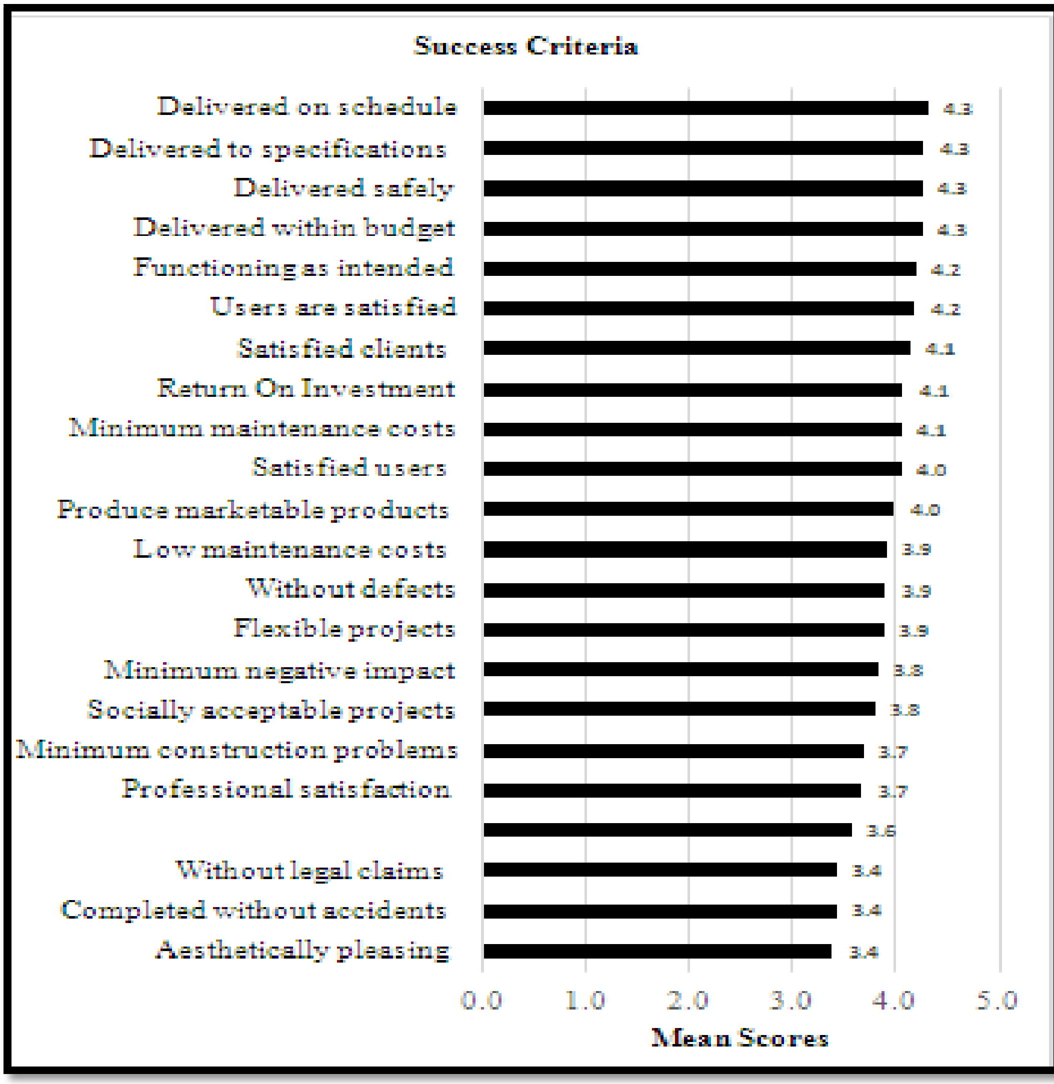

Figure 4: Mean Scores for the Success Criteria Manifest Variables

Internal reliability of the 22 items scale (success criteria factors i.e. items of question 8 of the questionnaire) was assessed using the Cronbach alpha technique. The scale produced an alpha of 0.874. Inspection of the item-total correlations table showed that all items were positively correlated. The Cronbach alpha if item is deleted varied little from 0.863 to 0.875. No item was deleted from the scale.

A Principal Component Analysis (PCA) with subsequent rotation (Varimax) was conducted. The SPSS output for the Pearson's r correlation coefficients had many correlations in excess of 0.3. The Keiser-Meyer–Olkin (KMO) measure of sampling adequacy was 0.825 which showed that the sample size was good enough for factor analysis. The Bartlett's test of sphericity was significant ($P < 0.001$) indicating that the manifest variables did have some correlations with each other. These two measures together supported the idea that the data was appropriate for carrying out factor analyses. Only two manifest variables had communalities below 0.5. These were, 'projects delivered within budget' with a communality of 0.411 and 'projects with low maintenance costs' which had a communality of 0.452. The communalities of all other manifest variables varied between 0.527 and 0.917. The goodness of fit test showed 62 (26 %) non-redundant residues whose absolute value was greater than 0.05. Kaiser's rule was applied and only those factors with latent roots greater than 1 were considered. This gave rise to five factors that were deemed important. The five factors combined explained 69.3 % of the total variation. Table shows the rotated component matrix for the success criteria factors.

Rotated Component Matrix[a]					
	Component				
	1	2	3	4	5
Flexible projects with room for expansion	.831				
Projects with minimum maintenance cost	.821				
Projects that produce marketable products	.817				
Projects with satisfied clients	.777				
Projects without defects	.674				
Projects with satisfied users	.537				
Projects without legal claims		.906			
Aesthetically pleasing construction projects		.835			
Projects completed without accidents		.834			
Projects which derive professional satisfaction		.770			
Profit goals of consultants/contractors are met		.690			
Projects with minimum construction problems		.639			
Projects in which users are satisfied with project			.832		
Projects functioning as intended			.775		
Projects with a good Return On Investment			.592		
Projects with low maintenance costs			.546		
Projects delivered to specifications				.869	
Projects delivered on schedule				.818	
Projects delivered safely				.797	
Projects delivered within budget				.597	
Projects with minimum negative impact on the environment					.890
Socially acceptable projects					.883

Table 15: Rotated Component Matrix: Factor Loadings
Extraction Method: Principal Component Analysis
Rotation Method: Varimax with Kaiser Normalization
A. Rotation Converged in 7 Iterations.

Table shows the factors that were extracted, their respective Eigenvalues, percentage of variance of the manifest variables that each factor explained and the cumulative total. Only the first five factors were considered and together they explained 69.3% of the variance

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared			Rotation Sums of Squared		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.404	29.108	29.108	6.404	29.108	29.108	3.974	18.062	18.062
2	3.468	15.762	44.870	3.468	15.762	44.870	3.920	17.816	35.878
3	2.719	12.359	57.229	2.719	12.359	57.229	2.780	12.639	48.517
4	1.399	6.357	63.586	1.399	6.357	63.586	2.608	11.854	60.371
5	1.256	5.709	69.296	1.256	5.709	69.296	1.963	8.925	69.296
6	0.872	3.964	73.260						
7	0.803	3.648	76.908						
8	0.741	3.369	80.277						
9	0.591	2.686	82.963						
10	0.478	2.172	85.135						
11	0.471	2.141	87.276						
12	0.430	1.954	89.229						
13	0.375	1.705	90.934						
14	0.361	1.643	92.577						
15	0.311	1.415	93.992						
16	0.291	1.322	95.314						
17	0.243	1.105	96.420						
18	0.226	1.029	97.448						
19	0.205	0.933	98.382						
20	0.177	0.807	99.188						
21	0.092	0.418	99.607						
22	0.087	0.393	100.000						

Table 16: Extracted Factors: Percentage of Variance Explained
Extraction Method: Principal Component Analysis

Following Varimax rotation, component factor 1 loaded on six items representing general factors related to organizational benefits as shown in Table . It had an Eigenvalue (latent root) of 6.404 and accounted for 18.1 % of the total variance of the initial 22 manifest variables as shown in

Table . This factor loaded heavily on 'flexible projects with room for expansion' with a factor loading of 0.831 followed by 'projects with minimum cost of maintenance' with a factor loading of 0.821 and 'projects that produce marketable products' with a factor loading of 0.817 respectively as shown in Table .

Table shows the five latent success criteria factors that were extracted by the PCA procedure together with their respective attribute enablers (manifest variables) and the manifest variables onto which the latent variable loaded with statistical significance (factor loading of 0.5 and above were considered significant). Five new variables were created. The 'organizational benefits' variable was computed in SPSS by taking the mean of 'flexible projects with room for expansion', 'projects with minimum maintenance costs', 'projects that produce marketable products', 'projects with satisfied clients', 'projects without defects', and 'projects with satisfied users' manifest variables. Similarly, the 'project team benefits', 'user benefits', 'Iron Diamond', and 'social benefits' variables were computed by taking the arithmetic mean of their respective attribute enablers shown in Table . Another new variable labelled 'project success' was created by computing the arithmetic mean of the 'organizational benefits', 'project team benefits', 'user benefits', 'Iron diamond', and the 'social benefits' variables.

Success Criteria	Manifest variables	% of Variance
Organizational benefits	• Flexible projects with room for expansion	18.06
	• Projects with minimum maintenance costs	
	• Projects that produce marketable products	
	• Projects with satisfied clients	
	• Projects without defects	
	• Projects with satisfied users	
Project team benefits	• Projects without legal claims	17.82
	• Aesthetically pleasing construction projects	
	• Projects completed without accidents	
	• Projects which derive professional satisfaction	
	• Profit goals of consultants/contractors are met	
	• Projects with minimum construction problems	
User benefts	• Projects in which users are satisfied with project	12.64
	• Projects functioning as intended	
	• Projects with a good Return On Investment	
	• Projects with low maintenance costs	
Iron Diamond	• Projects delivered to specifications	11.85
	• Projects delivered on schedule	
	• Projects delivered safely	
	• Projects delivered within budget	
Social benefits	• Projects with minimum negative impact on the environment	8.93
	• Socially acceptable projects	
Total		69.3

Table 17: Success Criteria for Kenyan Construction Projects
n = 239

Table shows the descriptive statistics for the success criteria factors and also for the overall project success.

Statistics						
	Organizational Benefits	Project Team Benefits	User Benefits	Iron Diamond	Social Benefits	Project Success
Mean	4.00	3.46	4.10	4.27	3.81	3.93
Std. Deviation	0.59	0.96	0.53	0.39	0.95	0.45
Skewness	-1.19	-0.87	-0.54	0.86	-0.77	-0.26
Std. Error of Skewness	0.16	0.16	0.16	0.16	0.16	0.16
Skew Ratio	-7.56	-5.50	-3.45	5.44	-4.87	-1.64
Kurtosis	2.46	0.30	1.06	-0.66	0.24	0.84
Std. Error of Kurtosis	0.31	0.31	0.31	0.31	0.31	0.31
Kurtosis Ratio	7.85	0.96	3.37	-2.12	0.77	2.68

Table 18: Descriptive Statistics for the Success Criteria Factors

The results show the 'Iron diamond' success criteria had the highest mean of 4.27 and a standard deviation of 0.39. It was followed by 'user benefits' (M = 4.10, STDDEV = 0.53), 'organizational benefits' (M = 4.00, STDDEV = 0.59), 'social benefits' (M = 3.81, STDDEV = 0.95) and 'project team benefits' (M = 3.46, STDDEV = 0.96). The skew ratio for all five success criteria factors were greater than 2.58 (1% level of significance for two-tail test) and were all negative implying that the success criteria factors had a negative skew distribution. The 'project success' variable is the overall success criteria for all five combined. It had a mean of 3.93 and a standard deviation of 0.45. Its skew ratio = -2.58 is at the margin of normality at the 0.01 level. The kurtosis ratio is 2.68 indicating that it is leptokurtic. Figure 5 shows the same information in a bar chart.

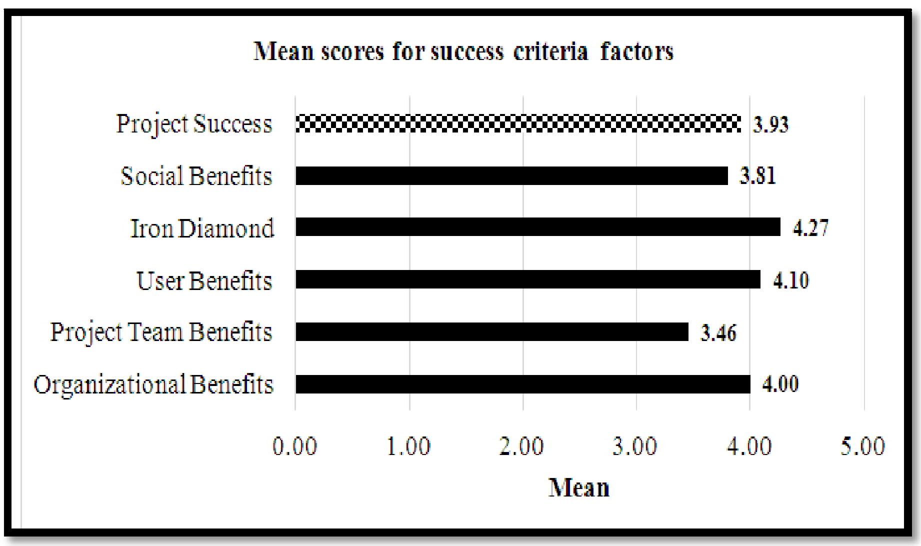

Figure 5: Bar Chart for the Mean Scores of the Success Criteria Factors

Table shows the mean scores and the standard deviations of the four groups of the project stakeholders' role categories on the project success variable. The project sponsor had the highest mean score of 4.144 and the lowest standard deviation of 0.303. The contractor role category had the second highest mean score of 3.930 and the highest standard deviation of 0.482. Therefore, the ratio of the highest standard deviation to the lowest standard deviation was 1.571.

Role Category	Mean	STDDEV
Project sponsor	4.144	0.303
Consultant	3.923	0.397
Contractor	3.930	0.482
Project manager	3.869	0.374

Table 19: Means and Standard Deviations of

Role Categories on Project Success

Figure 6 shows the frequency distribution of the project success variable. A normal curve is superimposed for comparison.

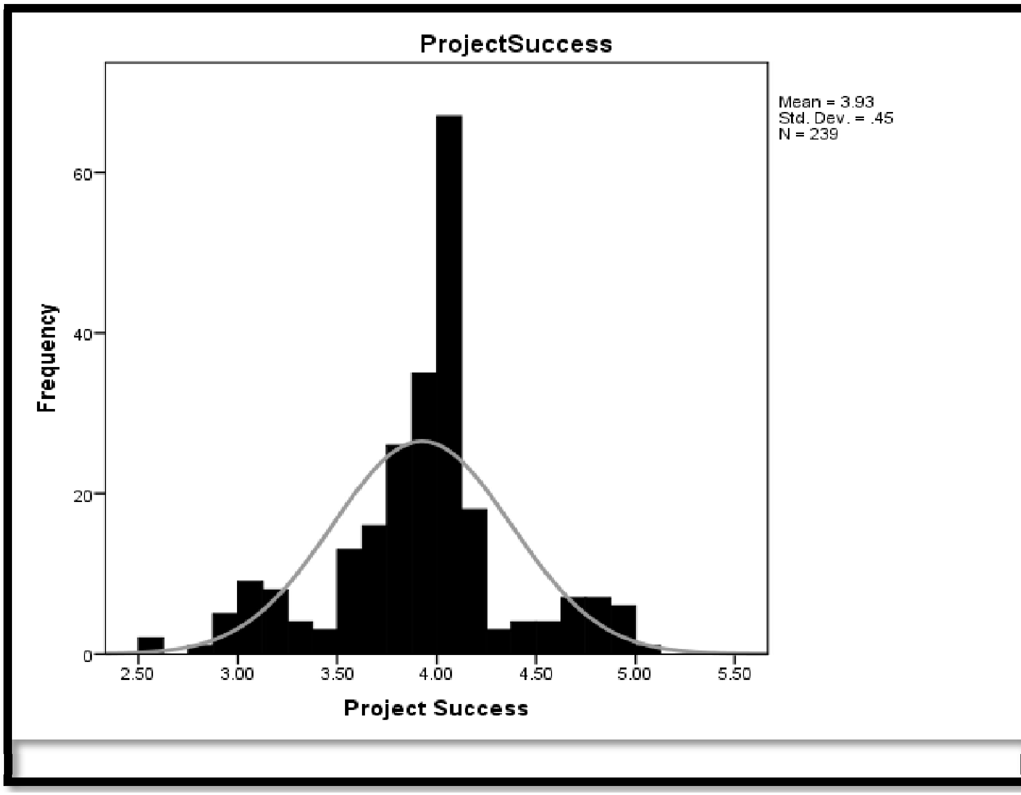

Figure 6: Histogram of Mean Scores of the Success Criteria Factors

<u>4.4.2. The Open-Ended Question Item 10c of the Questionnaire</u>

The open-ended questionnaire item 10c asked the respondents to state the reasons (if any) why a project they were involved in and which had been completed within the last three years was a success and the reasons (if any) why it was a failure. All the responses were examined carefully and hand coded in MS Excel into six success criteria categories of 'Iron Triangle', 'safety', 'organization benefits', 'user benefits', 'project team benefits', and 'social benefits'. The frequencies with which each of the six success criteria was reported by each role category group members as to why they thought the project was a success are summarized and reported in Table .

Success Criteria	Project Sponsor	Project Manager	Consultant	Contractor	Total	Percentage
Iron Triangle	4	23	35	49	111	62
Safety	0	0	4	0	4	2.3
Organization benefits	2	3	7	1	13	7.3
User benefits	1	3	8	19	31	17.5
Project team benefits	0	4	4	0	8	4.5
Social benefits	0	8	0	2	10	5.6
Total	7	41	58	71	177	100.0

Table 20: Frequency of Occurrence of Success Criteria Factors

The success criteria by which a majority of the respondents judged the success of a recently completed construction project was the Iron Triangle (TQC) criteria which was used by 62.7% of the respondents. This was followed, at a distance second, by user benefits success criteria which was used by 17.5% of the respondents. Organizational benefits, social benefits, and Project team benefits followed with 7.3%, 5.6%, and 4.5% of the respondents respectively. The Iron Triangle and Safety success criteria were combined into one criterion and labelled Iron Diamond in which 4 project sponsors, 23 project managers, 39 consultants, and 49 contractors used as a criterion for assessing success of construction projects in Kenya.

Table shows the number of respondents in a given role category who assessed the project that had been completed within the last three years and in which they were involved in as a failure when the project failed to deliver on the indicated success criteria

Success Criteria	Project Sponsor	Project Manager	Consultant	Contractor	Total	Percentage
Iron Triangle	0	12	22	39	73	75.3
Safety	0	0	0	0	0	0.0
Organization benefits	0	5	0	0	5	5.2
User benefits	0	4	0	0	4	4.1
Project team benefits	0	0	3	12	15	15.5
Social benefits	0	0	0	0	0	0.0
Total	0	21	15	51	97	100.0

Table 21: Frequency of Occurrence of Project Failure for Given Success Criteria

There was no project sponsor respondent who assessed the project that they had been involved in within the last three years as a failure. The reason for this response is not clear. It could have been that the project sponsors who took part in the survey could not identify a construction project in Kenya with which they were actively involved and which had been completed within the last three years. This could explain the non-response by the project sponsors on this question. It is also evident that failure on safety and on social benefits success criteria were not cited as reasons for project failure by any of the 239 respondents. However, a large majority of the respondents representing 75.3 % assessed a project as a failure if the project failed to deliver on the project efficiency metrics of the TQC.

4.4.3. Organizational Benefits Success Criterion

The null hypothesis for the organizational benefits success criterion was as shown.

- Ho: There is no significant difference in the mean scores of the project stakeholders' role categories on the 'organizational benefits' success criterion.

A one-way ANOVA was conducted in order to determine whether there were any significant differences in the mean scores of the four role categories i.e. project sponsors, consultants, project managers, and contractors. The results of the ANOVA test for the variable 'organizational benefits' are shown in Table 22, Table 23, and Table 24 which shows the descriptive statistics, The Levene test for homogeneity of variance and the ANOVA test respectively.

	N	Mean	Std. Deviation	Std. Error	95% Confidence		Minimum	Maximum
					Lower Bound	Upper Bound		
Project Sponsor	6	4.1667	.33333	.13608	3.8169	4.5165	4.00	4.83
Consultant	42	3.9762	.72841	.11240	3.7492	4.2032	2.33	5.00
Contractor	157	4.0138	.54628	.04360	3.9277	4.0999	2.00	5.00
Project Manager	34	3.9412	.86250	.14792	3.6402	4.2421	2.17	5.00
Total	239	4.0007	.62762	.04060	3.9207	4.0807	2.00	5.00

Table 22: Descriptive Statistics For The 'Organizational Benefits' Criterion

Levene Statistic	df1	df2	Sig.
6.813	**3**	**235**	**.000**

Table 23: Homogeneity of Variance Test for the 'Organizational Benefits' Criterion

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	.338	3	.113	.283	.837
Within Groups	93.412	235	.397		
Total	93.750	238			

Table 24: One-Way ANOVA for the 'Mean for Organizational Benefits' Criterion

The Levene test showed that a significant difference existed between the variances of the different role categories, *F (3,235) = 6.813, P < 0.001*. Hence, the homogeneity of variance assumption was rejected. The one-way ANOVA test suggested that there is no significant difference between the means of the role categories, *F (3,235) = 0.283, P = 0.837*. Since the sample sizes for the different role categories were unequal and the variances are not homogeneous, the more robust Welch and the Brown-Forsythe tests were carried out. The results are shown in Table 25 in which the Welch test revealed that the differences of the means were not significant, *F (3, 23.077) = 0.503, P = 0.681*. The Brown- Forsythe test also produced similar results, *F (3, 85.191) = 0.263, P = 0.852.*

Robust Tests of Equality of Means					
		Statistic[a]	df1	df2	Sig.
Organizational benefits	Welch	.507	3	23.077	.681
	Brown-Forsythe	.263	3	85.191	.852

Table 25: Welch and Brown-Forsythe Tests for Equality of Means for Organizational Benefits
Asymptotically F Distributed

The results of the two tests indicated that there was no significant difference in the means of the different role categories on the 'organizational benefits' success criteria and the null hypothesis was not rejected. Therefore, no significant difference was found between project sponsors, project managers, consultants and contractors ratings of the 'organizational benefits' success criterion in the evaluation of success of construction projects in Kenya.

4.4.4. Project Team Benefits Success Criterion

The null hypothesis for the project team benefits success criterion was as shown.

- Ho: There is no significant difference in the mean scores of the project stakeholders' role categories on the 'project team benefits' success criterion.

A one-way ANOVA was conducted in order to determine whether there were any significant differences in the mean scores of the four role categories. The results of the ANOVA test for the variable 'project team benefits' are shown in Table 26, Table 27, and Table 28 which shows the descriptive statistics, the Levene test for homogeneity of variance and the ANOVA test respectively.

	N	Mean	Std. Deviation	Std. Error	95% Confidence		Minimum	Maximum
					Lower Bound	Upper Bound		
Project Sponsor	6	3.9722	.26701	.10901	3.6920	4.2524	3.83	4.50
Consultant	42	3.1468	.80581	.12434	2.8957	3.3979	1.67	4.67
Contractor	157	3.7113	.83106	.06633	3.5802	3.8423	1.33	5.00
Project Manager	34	3.0735	.63324	.10860	2.8526	3.2945	2.00	3.83
Total	239	3.5279	.83901	.05427	3.4210	3.6348	1.33	5.00

Table 26: Descriptive Statistics for the 'Project Team Benefits' Criterion

Levene Statistic	df1	df2	Sig.
1.620	**3**	**285**	**.185**

Table 27: Homogeneity of Variance Test for the 'Project Team Benefits' Criterion

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	19.581	3	6.527	10.367	.000
Within Groups	147.955	235	.630		
Total					

Table 28: One Way ANOVA for the 'Project Team Benefits' Criterion

The Levene test showed that a non-significant difference existed between the variances of the different role categories (F (3,235) = 1.62, P = 0.185). Hence, the homogeneity of variance assumption was not rejected. The one-way ANOVA test suggested that there was at least one significant difference between the means of the role categories, *F (3,235) = 10.367, P < 0.001*. The results of the more robust Welch test (*F (3, 28.820) = 16.123, P < 0.001*) and the Brown-Forsythe test (*F (3,235) =*

16.515, P < 0.001) indicated the existence of significant differences in the means of the role categories. Therefore, the null hypothesis was rejected. A Post Hoc test was then carried out in order to determine the sources of variation of the means of the different role categories. Table 29 shows the results of the Scheffe post hoc test in which multiple pair-wise comparisons between the means of the role categories were made. Two significant differences were obtained between consultants and contractors (P = 0.001) and between contractors and project managers (P = 0.001). No significant difference was obtained between the means of consultants and project managers and between project sponsors and any of the other role categories. Therefore, it was concluded that contractors and project managers differed on the 'project team benefits' success criterion.

(I) Role in the construction industry			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Scheffe	Project sponsor	Consultant	.82540	.34630	.131	-.1497	1.8005
		Contractor	.26097	.33006	.891	-.6684	1.1904
		Project manager	.89869	.35135	.091	-.0907	1.8881
	Consultant	Project sponsor	-.82540	.34630	.131	-1.8005	.1497
		Contractor	-.56443*	.13784	.001	-.9526	-.1763
		Project manager	.07330	.18305	.984	-.4422	.5887
	Contractor	Project sponsor	-.26097	.33006	.891	-1.1904	.6684
		Consultant	.56443*	.13784	.001	.1763	.9526
		Project manager	.63772*	.15009	.001	.2151	1.0604
	Project manager	Project sponsor	-.89869	.35135	.091	-1.8881	.0907
		Consultant	-.07330	.18305	.984	-.5887	.4422
		Contractor	-.63772*	.15009	.001	-1.0604	-.2151

Table 29: Scheffe Post Hoc Test for the 'Project Team Benefits' Criterion
**. The Mean Difference Is Significant at the 0.05 Level*

A similar difference existed between the consultants and the contractors. However, no differences were found between contractors and project managers and between project managers and any of other three role categories. Table 30 gives a summary of these findings.

	Project Sponsors	Project Managers	Consultants
Project managers	NO		
Consultants	NO	NO	
Contractors	YES	YES	YES

Table 30: Significant Differences Found for 'Project Team Benefits' Factor

4.4.5. User Benefits Success Criterion

The null hypothesis for the user benefits success criterion was as shown.

- Ho: There is no significant difference in the mean scores of the project stakeholders' role categories on the 'user benefits' success criterion.

A one-way ANOVA was conducted in order to determine whether there were any significant differences in the mean scores of the four role categories. The results of the ANOVA test for the variable 'user benefits' are shown in Table 31, Table 32 and Table 33 which shows the descriptive statistics, the Levene test for homogeneity of variance and the ANOVA test respectively.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Project Sponsor	6	4.2917	.24580	.10035	4.0337	4.5496	4.00	4.75
Consultant	42	4.1071	.49121	.07580	3.9541	4.2602	3.00	4.75
Contractor	157	4.0812	.50257	.04011	4.0020	4.1604	2.50	5.00
Project Manager	34	4.0735	.48277	.08279	3.9051	4.2420	3.25	5.00
Total	239	4.0900	.49181	.03181	4.0273	4.1526	2.50	5.00

Table 31: Descriptive Statistics for the 'User Benefits' Criterion

Levene Statistic	df1	df2	Sig.
1.272	3	235	.285

Table 32: Homogeneity of Variance Test for The 'Project Team Benefits' Criterion

The Levene test for the homogeneity of variances showed that a non-significant difference existed between the variances of the different role categories, *F (3,235) = 1.272, P = 0.285.* Hence the homogeneity of variance assumption was not rejected.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.278	3	.093	.380	.768
Within Groups	57.288	235	.244		
Total	57.566	238			

Table 33: One Way ANOVA for the 'User Benefits' Criterion

The one-way ANOVA test did not show any significant differences in the mean scores of the four role categories on the user benefits criterion, *F (3,235) = 0.38, P = 0.768.* The results of the more robust Welch test (*F (3, 24.508) = 1.258, P = 0.313*) and the Brown-Forsythe test (*F (3,101.557) = 0.510, P = 0.6761*) implied that there was no significant differences in the means of the role categories on the 'user benefits' success criterion.

4.4.6. Iron Diamond Success Criterion

The null hypothesis for the Iron Diamond success criterion was as shown.

- Ho: There is no significant difference in the mean scores of the project stakeholders' role categories on the 'Iron Diamond' success criterion.

A one-way ANOVA was conducted in order to determine whether there were any significant differences in the mean scores of the four role categories. The results of the ANOVA test for the variable 'Iron Diamond' are shown in Table 34.

Table 35 and Table 36 which showed the descriptive statistics, the Levene test for homogeneity of variance and the ANOVA test respectively.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Project Sponsor	6	4.7083	.29226	.11932	4.4016	5.0150	4.25	5.00
Consultant	42	4.4881	.45850	.07075	4.3452	4.6310	4.00	5.00
Contractor	157	4.1672	.32323	.02580	4.1162	4.2182	3.50	5.00
Project Manager	34	4.3971	.40879	.07011	4.2544	4.5397	4.00	5.00
Total	239	4.2699	.39010	.02523	4.2202	4.3196	3.50	5.00

Table 34: Descriptive Statistics for the 'Iron Diamond' Criterion

Test of Homogeneity of Variances			
Iron Diamond			
Levene Statistic	df1	df2	Sig.
12.146	3	235	.000

Table 35: Homogeneity of Variance Test for the 'Iron Diamond' Criterion

Levene test for the homogeneity of variances showed that a significant difference existed between the variances of the different role categories (F (3,235) = 12.146, P < 0.001). Hence the homogeneity of variance assumption was rejected.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.359	3	1.786	13.602	.000
Within Groups	30.859	235	.131		
Total	36.218	238			

Table 36: One-Way ANOVA for the 'Iron Diamond' Criterion

The one-way ANOVA test showed that there existed significant differences in the means of role categories, $F(3,235) = 13.602, P < 0.001$. The results of the more robust Welch test ($F(3, 21.692) = 12.773, P < 0.001$) and the Brown-Forsythe test ($F(3, 69.041) = 12.298, P < 0.001$) confirmed the existence of significant differences in the means of the role categories.
A post hoc test was then carried out in order to determine the sources of variation of the means of the different role categories. Since equal variances could not be assumed and the sample sizes for various role categories were different, the Games-Howell test was considered the most appropriate for this analysis. Table 37 *shows* the test results.

(I) Role in the construction industry			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Games-Howell	Project sponsor	Consultant	.22024	.13871	.431	-.2128	.6533
		Contractor	.54114*	.12207	.021	.1056	.9767
		Project manager	.31127	.13839	.183	-.1219	.7444
	Consultant	Project sponsor	-.22024	.13871	.431	-.6533	.2128
		Contractor	.32090*	.07530	.000	.1211	.5207
		Project manager	.09104	.09960	.797	-.1708	.3529
	Contractor	Project sponsor	-.54114*	.12207	.021	-.9767	-.1056
		Consultant	-.32090*	.07530	.000	-.5207	-.1211
		Project manager	-.22986*	.07470	.018	-.4296	-.0301
	Project manager	Project sponsor	-.31127	.13839	.183	-.7444	.1219
		Consultant	-.09104	.09960	.797	-.3529	.1708
		Contractor	.22986*	.07470	.018	.0301	.4296

Table 37: Games-Howell Post Hoc Test for the 'Iron Diamond' Criterion
**. The Mean Difference Is Significant at the 0.05 Level*

Three significant differences of the means were obtained between project sponsors and contractors (P = 0.021), between contractors and project managers (P = 0.018) and between consultants and contractors (P < 0.001). No significant difference was obtained between the means of consultants and project managers, between project sponsors and project managers and between project sponsors and consultants. It was therefore concluded that contractors and project managers differed on success criteria that attributed project success to the project management factor. A similar difference existed between the consultants and contractors and between project sponsors and contractors. However, no differences were found between consultants and project managers, between project sponsors and project managers and between project sponsors and contractors. Table 38 summarizes these findings.

	Project Sponsors	Project Managers	Consultants
Project managers	NO		
Consultants	NO	NO	
Contractors	YES	YES	YES

Table 38: Significant Differences Found for 'Iron Diamond' Criteria

4.4.7. Social Benefits Success Criterion

The null hypothesis for the social benefits success criterion was as shown.

- Ho: There is no significant difference in the mean scores of the project stakeholders' role categories on the 'social benefits' success criterion.

A one-way ANOVA was conducted in order to determine whether there were any significant differences in the mean scores of the four role categories. The results of the ANOVA test for the variable 'social benefits' are shown in Table 39, Table 4.34, and Table 40 which shows the descriptive statistics, the Levene test for homogeneity of variance and the ANOVA test respectively.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Project sponsor	6	3.5000	.83666	.34157	2.6220	4.3780	3.00	5.00
Consultant	42	3.9286	1.14002	.17591	3.5733	4.2838	2.00	5.00
Contractor	157	3.7484	.95344	.07609	3.5981	3.8987	1.00	5.00
Project manager	34	3.9706	.68469	.11742	3.7317	4.2095	2.50	5.00
Total	239	3.8054	.95421	.06172	3.6838	3.9270	1.00	5.00

Table 39: Descriptive Statistics For The 'Social Benefits' Criterion

Levene Statistic	df1	df2	Sig.
5.466	3	235	.001

Table 40: Homogeneity of Variance Test for the 'Social Benefits' Criterion

Levene test for the homogeneity of variances showed that a significant difference existed between the variances of the different role categories, *F (3,235) = 0.285, P = 0.001*. The results of the more robust Welch test (*F (3, 22.19) = 1.191, P = 0.336*) and the Brown-Forsythe test (*F (3, 48.080) = 1.068, P = 0.362*) differed with the ANOVA results and because the Welch test is the most robust, the homogeneity of variance assumption was not rejected.

ANOVA					
Social Benefits					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.635	3	.878	.964	.410
Within Groups	214.068	235	.911		
Total	216.703	238			

Table 41: One Way ANOVA for the 'Social Benefits' Criterion

The results of the one way ANOVA test, shown in Table 41, did not show any significant differences in the means of role categories, *F (3,235) = 0.964, P = 0.410*. Therefore no significant differences were found between the four role categories on the 'Social benefits' factor.

5. Discussions and Recommendations

The official evaluation criteria used in the Kenyan construction projects is the TQC. The current findings show that there are other project success criteria that are at play in the minds of the Kenyan construction industry stakeholders. For instance, no significant difference was found among all the four project stakeholder groups on the organizational benefits success criterion, user benefits success criterion, and the social benefits success criterion. Therefore, there was agreement among the project stakeholders that these success criteria should be used for evaluating the success of construction projects in Kenya. Furthermore, no significant differences were found between the project sponsors and the project managers, between the project sponsors and the consultants and between the project managers and the consultants across all five project success criteria factors. Significant differences were only found between the contractors and each of the other three role categories for the Iron Diamond success criterion and between the contractors and the consultants and project managers on the project team benefits success criterion. The Iron Diamond success criterion represents the efficiency of delivering a construction project. On this success criterion, the contractors seem to disagree with the other three role categories. The contractors have the responsibility of delivering the physical product and this might explain why the other three role categories agree on project efficiency measures while the contractors disagree with them.

These results support the argument that there is need for a paradigm shift from the way project success is currently evaluated in the Kenyan construction industry. The TQC is not the only criterion and a shift to a multidimensional approach that embraces other success criteria that include both the hard and the soft factors in order to provide better projects that satisfy the stakeholders, deliver intended benefits, and enhance the knowledge quotient of the construction projects' stakeholders is implied.

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