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Influence of Human Related Factors on Success of Construction Projects in Kenya

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Abstract:
Human factors have long been considered essential ingredients for success of any business. These critical success factors (CSFs) are soft factors that are flexible, unpredictable, difficult to understand, not easily calculable and difficult to grasp. They are shaped by societies and cultures and therefore are context based. Few studies were found that discussed the effect of the human related factors on project success. Therefore, this study sought to find out the influence of human related factors on project success in the Kenyan construction industry. The findings were that the human related factors had marginal influence on project success and that they were dominated by the external environmental factors in influencing success of construction projects.

Keywords: *Project success, critical success factors, human related factors, construction projects*

1. Introduction

The term Critical Success Factors (CSFs) as an information system methodology was first used in Rockart (1982). It has now become a very popular area of study by researchers in the field of project management probably because of the lack of convergence of thought and agreement on how CSFs influence project success of different sizes, contexts, and locations (Atencio, 2013; Hyvari, 2006; Fortune & White, 2006; Kylindri, Henriksen & Stoyan 2012; Westerveld, 2003; Belassi & Tukel, 1996; Ngacho & Das, 2013). Several researchers have given a number of definitions of CSFs. This study adopted the definition by Boynton and Zmud (1984) which is indicated below.

> "Critical success factors are those few things that must go well to ensure success for a manager or an organization, and, therefore, they represent those managerial or enterprise areas, that must be given special and continual attention to bring about high performance. CSFs include issues vital to an organization's current operating activities and to its future success."

In an attempt to assist project managers to deliver successful projects, earlier work focused on generating lists of CSFs that the project manager would refer to in the normal course of project delivery. A plethora of these lists were in existent in the 1980's but rather than assist the project managers do their work more efficiently and successfully they ended up bringing more confusion to the profession (Belassi and Tukel, 1996; Hyvari, 2006). These lists of CSFs have received criticism that they apply to the specific projects and locations where the research were carried out and could not be generalized to other similar projects in other locations or under different contexts (Belassi & Tukel, 1996; Cooke-Davies, 2002; Westerveld, 2003; Fortune & White, 2006). Without a comprehensive list of CSF's, the project managers could not effectively assess and evaluate the success of projects.

Over the years, project management researchers have built a vast amount of literature on CSFs for project success and it continues to grow. For instance, a ten CSFs model that formed the basis of the project success diagnostic tools called the Project Implementation Profile (PIP) were added to the existing literature in Slevin & Pinto (1986). These CSFs are project mission; top management support; project schedule/plan; client consultation; personnel recruitment, selection, and training; technical tasks; client acceptance (of the final product); communication; and troubleshooting. Other CSF's that have been added to the literature include: user satisfaction, safety, technology, environmental concerns, aesthetics, project manager's characteristics, client characteristics, and project characteristics. Chan et al., (2004) proposed a list of 44 manifest CSFs and grouped them into five categories of latent CSFs namely human related factors, project related factors, project management actions, project procedures, and external environment related factors. It is clear from the reviewed literature that the search for CSF's for projects have been intensive over the years. However, without reaching any consensus the real CSF's for project success has continued to elude the project management community (Koutsikouri et al. 2006; Hyvari, 2006; Atencio, 2013; Alias et al. 2014).

2. Literature Review

2.1. Theoretical Framework

Since the 1960's, project management researchers have been busy trying to discover the factors that are critical to project success (Fortune and White, 2006; Gemunden, 2015; Williams, 2015; Serrador & Turner, 2015; Kerzner, 2017; Frefer, et al., 2018). Atencio (2013) has given a comprehensive account of the development and the usage of the critical success factors between 1960 and the 21st century.

Martin[16] (1976)	Locke[14] (1984)	Cleland and King[28] (1983)	Sayles and Chandler[26] (1971)	Baker, Murphy and Fisher[9] (1983)	Pinto and Slevin[7] (1989)	Morris and Hough[11] (1987)
Define goals	Make project commitments known	Project summary	Project manager's competence	Clear goals	Top management support	Project objectives
Select project organizational philosophy	Project authority from the top	Operational concept	Scheduling	Goal commitment of project team	Client consultation	Technical uncertainty innovation
General management support	Appoint competent project manager	Top management support	Control systems and responsibilities	On-site project manager	Personnel recruitment	Politics
Organize and delegate authority	Set up communications and procedures	Financial support	Monitoring and feedback	Adequate funding to completion	Technical tasks	Community involvement
Select project team	Set up control mechanisms (schedules, etc.)	Logistic requirements	Continuing involvement in the project	Adequate project team capability	Client acceptance	Schedule duration urgency
Allocate sufficient resources	Progress meetings	Facility support		Accurate initial cost estimates	Monitoring and feedback	Financial contract legal problems
Provide for control and information mechanisms		Market intelligence (who is the client)		Minimum start-up difficulties	Communication	Implement problems
Require planning and review		Project schedule		Planning and control techniques	Trouble-shooting	
		Executive development and training		Task (vs. social orientation)	Characteristics of the project team leader	
		Manpower and organization		Absence of bureaucracy	Power and politics	
		Acquisition			Environment events	
		Information and communication channels			Urgency	
		Project review				

Table 1: Seven Lists of Critical Success Factors
Source: Balessi and Tukel (1996)

The thinking within the project management community was that if they could identify, explain, and then package those factors that were critical to the success of projects as a prescription, then project managers would have a ready tool at their disposal with which to deliver successful projects. This led to the development of several lists of CSFs. Balessi and Tukel (1996) identified seven lists of CSFs as shown in Table 2.1. Bounds (1998), Clarke (1999), Morris (1988), Kendra and Taplin (2004) and Pinto and Slevin (1988) are some of the other authors who came up with different lists of critical success factors for project success.

Table 2.1, extracted from Belassi and Tukel (1996), shows seven lists of CSF's that were available in the project management literature in the late 1980's. The publication of these lists of CSFs gave rise to a vast amount of literature on CSFs. However, there was very little agreement on these lists of CSFs as factors that affected project success (Atencio, 2013; Fortune & White, 2006; Kylindri, et al. 2012; Westerveld, 2003; Belassi & Tukel, 1996). It was therefore difficult for project managers and other project stakeholders to select the most appropriate list of CSFs to use in their specific projects. The task of choosing from large lists of CSFs, that had not received consensus on their influence and ability to contribute towards project success, dissuaded the project managers from using them in their own projects. The project managers that decided to apply these lists of CSFs in their own projects faced a major challenge because many projects failed to deliver. The main reason advanced was that there existed a theoretical misconception about what CSFs were and how they were to be applied in actual projects. Cooke-Davies (2002) argued that a comprehensive answer to the question of which factors are critical to project success depended on answering three separate questions and not one. He discussed the three questions: "what factors lead to project management success?", "what factors lead to a successful project?" and "what factors lead to consistently successful projects?". He then identified 12 factors that he said were critical to the success of projects; 8 of which he attributed to project management success, one to successful projects, and three to consistently successful projects. We do not agree with Cooke-Davies on the third question, as we do not think that there are a set of factors that on their own would lead to consistently successful projects of different sizes, complexity and context. However, we concur with Cooke-Davies that there are those few factors that are critical to the success of projects. We consider the examples given by Cooke-Davies to be success criteria and not CSFs. We also posit that these CSFs influence project success differently at each phase of construction projects.

Several studies have discussed the problems that arise when CSFs are reduced to a list (Belassi & Tukel, 1996; Westerveld, 2003; Fortune & White, 2006). They hold the view that such lists contain factors that vary in their scope and purpose and can be either very general or very specific affecting only a particular project. Another common criticism of CSFs in the literature is that lists of CSFs are provided without attempting to interrelate the factors or determine their dependencies (e.g. Fortune & White, 2006) or to link the CSFs with success criteria (Westerveld, 2003). Larsen and Myers (1999), reported in Fortune and White (2006), argued that such lists ignored the potential of a factor to have varying levels of importance at different stages of project implementation. Another argument advocated against prescribing a list of CSFs is that such lists cannot be reliably applied in other non-similar projects, projects of a different size from the one in which the CSFs were determined, or in projects under different operating contexts (Belassi & Tukel, 1996; Cooke-Davies, 2002; Westerveld, 2003; Fortune & White, 2006). Therefore, the concept of project success is complex and assuming that projects can be delivered successfully by simply prescribing a list of CSFs is superficial and not helpful to the project managers. Without a comprehensive list of CSF's that the project managers and researchers can use for all types of projects it becomes difficult to assess and evaluate project success based on factors drawn from these disparate lists.

In order to address the limitations of the lists of CSF's, several attempts have been made to develop frameworks of CSF's for project success. Belassi & Tukel (1996); Westerveld (2003); and Fortune & White (2006) are of the view that to use CSFs systematically, a framework around the CSFs should be used in studying them. Key contributions in this area of inquiry include the seminal work by Pinto and Slevin (1986) where several tools and concepts that a project manager could use to deliver successful projects were developed. A framework that included ten empirically derived critical success factors, a diagnostic instrument, , called the Project Implementation Profile (PIP) for measuring the ten factors, a ten factors model for the project implementation process, and measures of the key elements of project strategy and tactics were developed. It aimed at establishing the effect of strategy and tactics on the project implementation success and the impact of the project life cycle on the relative importance of the CSF's. They not only used the criteria of Time, Cost, and Quality as the determinants of project success but also included client satisfaction as an essential criterion on which project success should be judged. The ten CSF's that they identified were the Project Mission; Top Management Support; Project Schedule/Plan; Client Consultation; Personnel Recruitment, Selection, and Training; Technical Tasks; Client Acceptance (of the final product); Communication; and Troubleshooting. Figure 2.1 shows the PIP model used in Pinto and Slevin (1987).

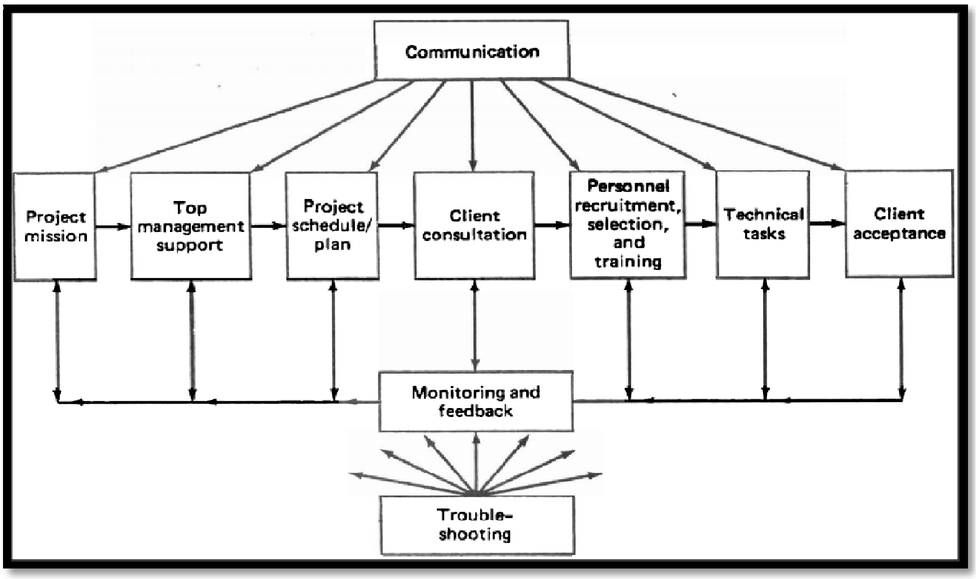

Figure 1: Ten Csfs of the Project Implementation Profile
Source: Pinto and Slevin (1987)

These ten factors are time dependent and can be conceived to occur in a sequenced and logical manner from left to right instead of randomly or concurrently (Pinto & Slevin, 1987). Subsequently, in addition to these ten CSF's which appear to be under the control of the project team, Pinto and Slevin (1988) included four additional factors in their study. These are the characteristics that are thought to be beyond the control of the project team but very important to project success. These additional factors are Characteristics of the project team leader; Power and politics; Environmental events; and Urgency.

In that study, Pinto and Slevin (1988) sent out 600 questionnaires by mail to 600 members of the Project Management Institute in which the project managers responded to 586 of the questionnaires. In total, 486 responses were useful representing a 71% response rate, which is very high in relation to similar studies that have reported 14% - 24% response rate (Pinto & Slevin, 1988). Three questions were randomly mailed to the respondents. One question asked the respondents to think of a successful project which they were currently involved in or recently completed. The second question asked the respondents to think of an unsuccessful project to which they had experience. The third question asked the respondents to think of a project and did not specify the type of project for them to consider. This project was to be their frame of reference as they answered the questionnaire items. The four phase of a project life cycle i.e. conceptualization, planning, execution, and termination were included in the questionnaire items. In the first analysis, each of the 14 factors was tested individually on its ability to predict project success through a regression analysis. They found out that all the 14 factors were significantly related to project success. Through a pair-wise regression analysis procedure, a second analysis involving all the 14 factors simultaneously was performed at each phase of the project life cycle. The aim was to test which factors were significant at each phase of the project life cycle. Their findings are represented in Figure 2.2, which is the Pinto and Slevin (1988) model. For instant, during the conceptual phase, the mission and client consultations were found to be the dominant CSF's related to project success with an adjusted r^2 value of 0.64 (Pinto & Slevin, 1988). This would imply that project mission definition is very critical and any project activities carried without a clear project mission definition has very high chances of failure. Project mission is closely followed by top management support, which is then followed by preparation of project schedules and plans. The rest of the factors follow in that order. However, they found out that communication, monitoring and feedback should occur at any stage of the project implementation process.

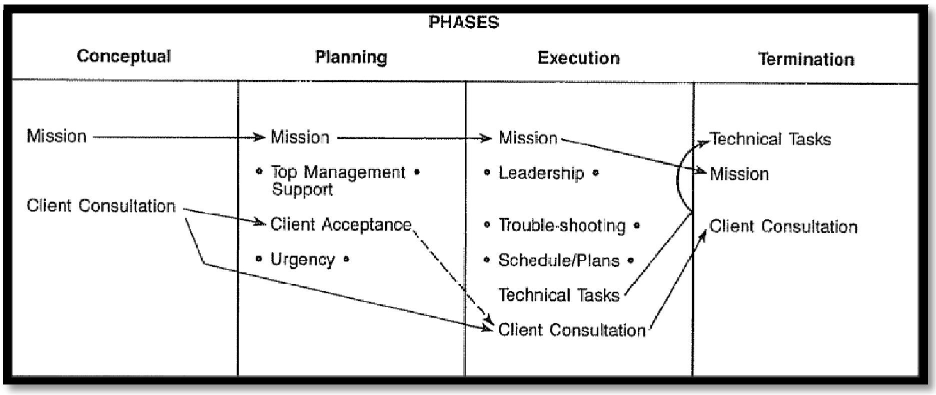

Figure 2: Critical Success Factors at Each Phase of Project Life Cycle
Source: Pinto and Slevin (1988)

Belassi and Tukel (1996) developed a framework that emphasized on grouping the CSF's into four categories. These were: Factors related to the project (size and value of project, uniqueness of project activities, interdependencies between activities, project life cycle, and urgency); Factors related to the project manager and the project team (ability to delegate authority, ability to tradeoff, ability to coordinate, perception of roles and responsibilities, competence, and commitment); Factors related the organization (top management support, project organizational structure, functional managers' support, and project champion); and Factors related to the external environment (political, economic, social, technological, nature, client, competitors, and sub-contractors). The framework took into account how these factors interacted among themselves and how they interacted with project manager's performance on the job, client consultation and acceptance, project preliminary estimates, and availability of resources in determining project success or failure. They prepared a questionnaire consisting of two sections and 10 questions. The first section contained questions about project organization and attributes and project managers asked to choose the best answer from this section. The second section asked project managers to choose the factors that they thought were most important to the success of their respective projects from choices given for each of the four factor groups. If a factor was not listed, they were asked to also include it in its corresponding factor group. Two hundred questionnaires were sent to project managers selected from the Project Management Institute directory. Fifty-seven responses were received representing a 28% response rate. Their findings were that the top management support and project related factors of coordination and competence were the most critical overall. Factors related to project team members were found to be critical in the construction and MIS industries while environmental factors such as technology, economy, and the client were found to be more critical in the construction industry (Belassi and Tukel, 1996). They also found out that a factor in one group can influence a factor in another group and that a combination of several factors from various groups can lead to project failure. For instance, top management support is an organizational factor that might be affected by the general state of the economy.

Westerveld (2003) developed the Project Excellence Model that linked the CSF's with the success criteria. The model was developed using studies on both CSF's and success criteria and borrowed from the European Foundation of Quality Management (EFQM) model. It consists of 12 areas in which six areas covered CSF's and the other six factors covered the project success criteria. The success criteria used in this model are appreciation by the following: client; project team; users; contracting partners; stakeholders; and the Iron Triangle. The CSFs considered were leadership and team; policy and strategy; stakeholder management; resources; contracting; and project management i.e. project control. They classified the Iron Triangle and the project management assets such as schedule, budget, organization, information, risk, and quality that usually influence project efficiency as the narrow view while the other factors that usually influence project effectiveness were classified as the broad view. The project excellence model was based on the assumption that in order to manage a project successfully the project organization has to focus on key result areas (project success criteria) and critical organizational areas (CSF's) Westerveld (2003). Further, in order to be successful the organizational areas must fit with the result areas and the external factors of the project both of which vary greatly with project type. Due to the variability of the project goals (result areas) and the external factors, five different project types were developed as templates to help project managers decide on the necessary project organization for their particular project. These project types are product oriented, tool oriented, system oriented, strategy oriented and total project management. According to Westerveld (2003), the five project types do not represent a "good" or "excellent" scale but the choice of the most adequate project type to use should be based on the desired project goals and the external factors affecting the project. Thence the model can be used for setting up, managing, assessing and evaluating a project.

Project organization for implementing a new ERP system for a mid-sized company was analyzed using the Project Excellence Model. It involved the corporation of the users, management, project personnel, project manager, and contracting partners. The findings were that the functioning of the project organization could be improved on the areas of policy and strategy and stakeholder management. Policy and strategy were found to be inflexible with respect to adapting the project goals. It was also found that a risk existed in that the opportunities the new system offered were not fully realized. Further, it was found out that the project goals did not sufficiently match the overall strategy of the company (Westerveld, 2003).

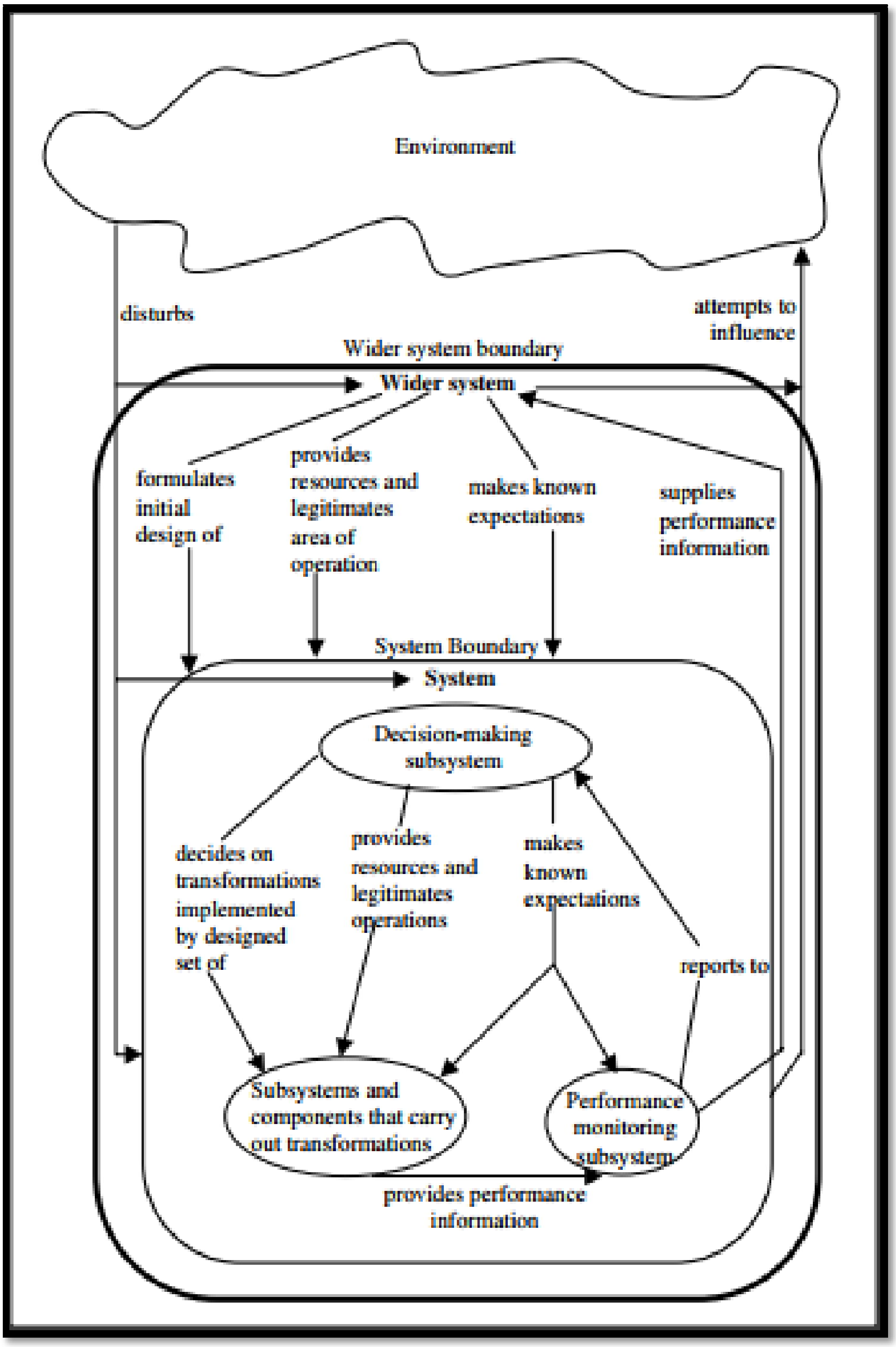

Figure 3: The Formal System Model
Source: Fortune and White (2006)

Figure 2.3 shows the Formal System Model (FMS) developed by Fortune & white (2006). The FMS comprises the decision-making, the performance monitoring, and the set of subsystems and components that carry out transformations by converting inputs into outputs are at the heart of the FMS. It is contained within a wider system that provides resources etc. It also interacts with its external environment.

FSM Components	Critical Success Factors
1. Goals and Objectives	Clear and realistic objectives
	Strong business case
2. Performance monitoring	Effective monitoring/control
	Planned close down
	Reviews
	Acceptance of possible failure
3. Decision maker(s)	Support from senior management
	Competent project manager
	Strong/detailed plan kept up to date
	Realistic schedule
	Good leadership
	Correct choice/past experience of project
	management methodology/tools
4. Transformations	Skilled/suitably qualified/sufficient staff/team
5. Communication	Good communication/feedback
6. Environment	Political stability
	Environmental influences
	Past experience (learning from)
	Organizational adaptation/culture/structure
7. Boundaries	Project size/level of complexity
	number of people involved/duration
8. Resources	Adequate budget
	Sufficient/well allocated resources
	Training provision
	Proven/familiar technology
	Good performance by suppliers/contractors/consultants
9. Continuity	Risks addressed/assessed/managed
	User/client involvement
	Different viewpoints (appreciating)
	Project sponsor/champion
	Effective change management

Table 2: CSFS Mapping Onto the Formal Systems Model Components
Source: Fortune and White (2006)

They grouped the CSFs into nine components namely Goals and objective; Performance monitoring; Decision maker(s); Transformations; Communication; Environment; Boundaries; Resources; and Continuity as shown in Table 2.2. They argued that by categorizing the CSFs into these nine components, removed the overlaps that existed between the various sets of CSFs that were available in literature. They also opined that the FSM had the advantage of being dynamic and was therefore able to consider the relationships between factors that other models could not do. In order to test the model, they compared two projects; one successful and one that was not successful. They gathered the data of the two projects using structured and semi-structured interviews when the two projects were on going before their levels of success could be determined. The two projects were similar in terms of size and scope. They found out that one of the two projects was largely successful along the whole range of measures used to measure project success. However, they did not indicate which project success measures were used in the study nor give a detailed account of the comparison of these two projects on these measures of project success.

In construction projects management, Chan et al. (2004) sorted the CSFs into five main categories that they termed: Human related factors; Project factors; Project procedures; Project management actions; and External environment. They arrived at these factors following a comprehensive literature review of CSFs in seven major international journals that had the highest scores in the quality rankings. These five factors and their corresponding attribute enablers are as shown in Figure 2.4. They conceptualized these factors as having dependencies and feedback forming a complex configuration of factors involved in complex causal interactions where variables in each group are interrelated with each other and intra-related with variables from other groups.

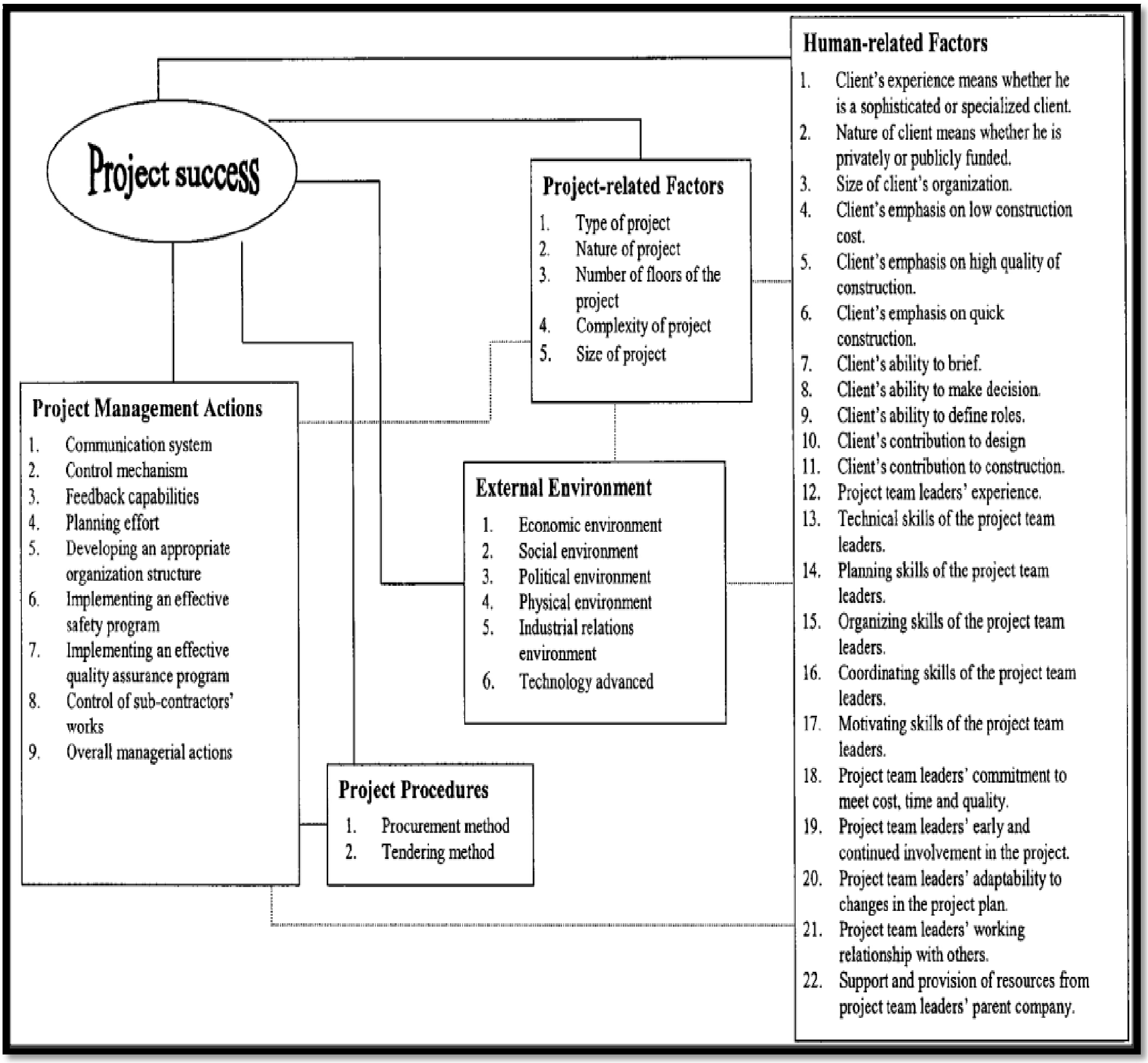

Figure 4: Factors Affecting Success of Construction Projects
Source: Chan Et Al. (2004)

They hypothesized project success as a function of human related factors, project related factors, project procedures, project management actions, and external environment. They also hypothesized that the project would be executed more successfully if the project complexity is low, is of a shorter duration, the overall managerial actions are effective, the project is funded by a private and experienced client, the client is competent on preparing project brief and making decision, the project team leaders are competent and experienced; and the project is executed in a stable environment with developed technology together with an appropriate organization structure. Though they did not proceed to test or validate their model, they recommended that further study to identify the Key Performance Indicators (KPIs), or success criteria, be carried out so that the causal relationships between CSFs and KPIs can be identified. The causal relationships, once identified, become a useful piece of information to implement a project successfully.

2.2. Human Related Factors

The human related factors, as discussed in Chan et al. (2004), relate to the project manager and the project team, client (management), consultants, contractors, sub-contractors, suppliers, and the manufacturers. It did not include other project stakeholders such as government agencies, the public, and the users of these projects. Although it is well known that all project stakeholders can influence project success in different ways, this study adapted the definition of human related factors as used in Chan et al. (2004) but omitted the influence of supplies and manufacturers on project success as they we viewed as being external to the project. In this study, the human related factors were divided into three clusters of project manager related, client related, and the top management support.

2.3. Project Related Factors

The type of project (i.e. road, building, energy, water etc.), the nature of the project (i.e. public, private, PPP), project size (i.e. monetary value involved), and complexity of the project are the attributes that were used to operationalize this CSF. It was hypothesized that the combined effect of these manifest variables had a significant influence on project success.

2.4. Project Procedures

Chan et al. (2004), classified project procedures into two groups of tendering and procurement processes. The researcher adopted these two attribute enablers and added the approval processes as an important attribute enabler as it was hypothesized that the speed of approval of the various project documents had an effect on project success. There are many steps involved when seeking approvals of construction projects in Kenya. The main steps occur in the following order: survey plans, architectural drawings, structural drawings, environment impact assessment, NCA registration, work-place registration, certificate of compliance of installed equipment, Kenya Bureau of Standards (KEBS) certification, and occupation health and safety certificate. Wamuyu (2017) found out that it took 430 days to complete the building approval process in Kenya against the cumulative 169 days estimated from the performance charters of all the approving authorities combined. This represents only 39.3% of the time recorded in the service delivery charters of the approving authorities. Therefore, over 60% of the targeted approval time is lost, negatively influencing project success.

2.5. Project Management Actions

These factors fall within the scope of influence of the project manager. Communication systems, control mechanisms, feedback mechanisms, implementation of a quality assurance program, implementation of a safety program, organizational structure, and amount of planning effort put into the planning process. These attribute enablers were used to operationalize the project management actions. It is hypothesized that the combined effect of the project management actions attribute enablers has a significant influence on project success.

<u>2.5.1. External Environment</u>

The attribute enablers used to measure this factor were the political, economic, social, technological, legal, and environmental factors. These factors are external to the project and are outside the control of the project manager and other project stakeholders. The combined effect of these factors was hypothesized to have a significant influence on project success. In particular, the supervision of construction work by the responsible authorities was found to have a negative effect on project success.

In summary, only one study, Pinto and Slevin (1988) see Figure 2.2, was found that discussed the influence of the CSFs on project success across the project life cycle. It reported mission and client consultations as the two most important CSFs during the project conceptualization phase. They also found out that mission, top management support, client acceptance, and urgency to be important CSFs in that order of influence during the planning phase. During the execution phase, they identified mission, leadership, trouble shooting, schedule/plans, technical tasks, and client consultation in that order. Finally, during the termination phase they found technical tasks, mission, client consultation in that order respectively. This study adapted the CSFs classification used in Chan et al. (2004) of human related factors, project related factors, project procedures, project management actions, and external environment as shown in Figure 2.4 and then classified the CSFs as shown in Table 4. It was conceptualized that these five factor categories had individual effects on project success when acting alone. In addition, all the CSFs when acting together had an effect on one another that contributed to further influence on project success.

<u>2.5.2. Project Success</u>

Extant literature in project management has made a clear distinction among project success, product success, and project management success. De Wit (1988) distinguishes between projects success and project management success by stating that project success is measured against the objectives of the project while project management success is measured against the traditional TQC measures.

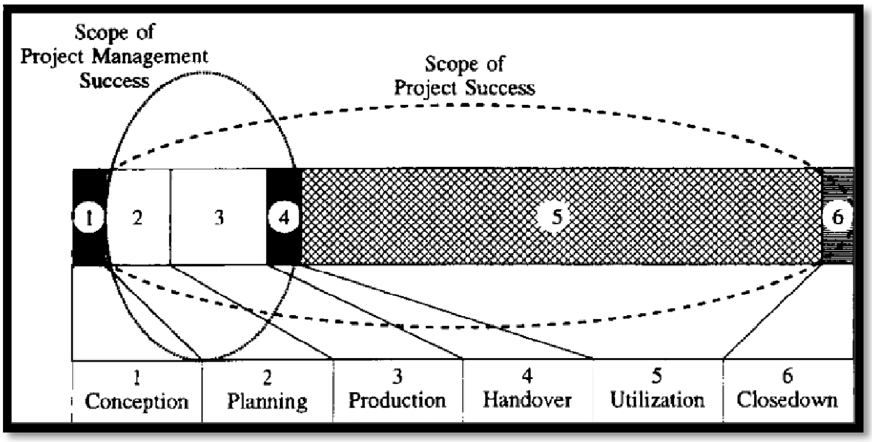

Figure 5: The Scope of Success within the Project Life Cycle
Source: Munns and Bjeirmi (1996)

Munns and Bjeirmi (1996) distinguish between project management success and project success by considering project management to be the short-term planning and control considerations i.e. of time, resources, processes etc. to deliver a project while project success is viewed as long term benefits that accrue when the project is in use as shown in Figure 2.5. They consider a project to be long term and is concerned with defining and selecting a task which is expected to be of overall benefit to the organization which may be financial, technical or marketing benefit. Several authors agree with these distinctions. For instance, Cooke-Davies (2002); Hyvari (2006); Koutsikouri et al. (2006); and Frefer, et al., (2018), hold the view that project success must involve the stakeholders' opinions on what they consider to be project success while project management success has done with the effectiveness and efficiency of the project manager and the project team and is measured using the traditional TQC criteria.

Shenhar et al. (1997) developed a model based on four dimensions as shown in Figure 2.6 that considered project success to extend over the time horizon from project inception into the future. The first dimension, project efficiency, can be assessed using the TQC criteria. The second dimension, impact on the customer, can be assessed when the customer is using the product and involves assessing how the product is meeting functional performance, technical specifications, and solving customers' problems etc. The third dimension is assessed in the long-term when the product has gained commercial recognition, market share and profits. The last dimension can be assessed after a very long time when other similar and competing products have entered the market.

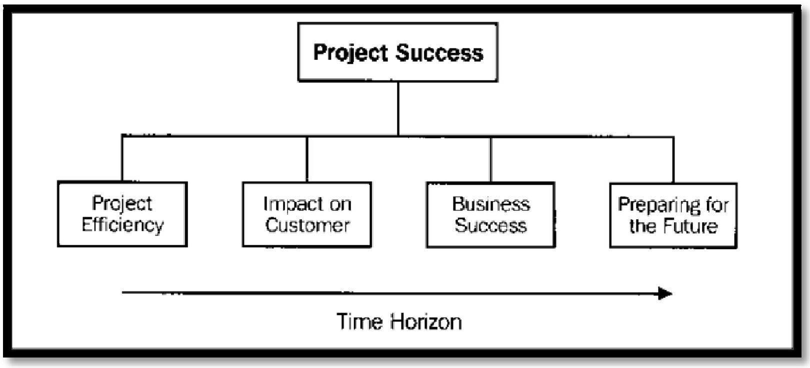

Figure 6: Four Dimensions of Project Success.
Source: Shenhar Et Al. (1997)

There is consensus in literature that the TQC criteria is not sufficient for measuring project success. Shenhar, Tishler, Dvir, Lipovetsky, and Lechler (2002) argue that simplistic measures have been used to equate project success with meeting the objectives of the TQC holding the common view that project success mean different things to different stakeholders and that comprehensive success criteria must reflect different views and interests of all the stakeholders. They go further to suggest that project success factors themselves are contingent upon the specific type of project.

Atkinson (1999) defined project success in three phases as shown in Figure 2.7. The first phase is the delivery stage and corresponds to the project management criteria of TQC with efficiency added as a CSF. The second and third phases are the post-delivery stage. The second phase is about the system being right while the third phase concerns the benefits; getting them right.

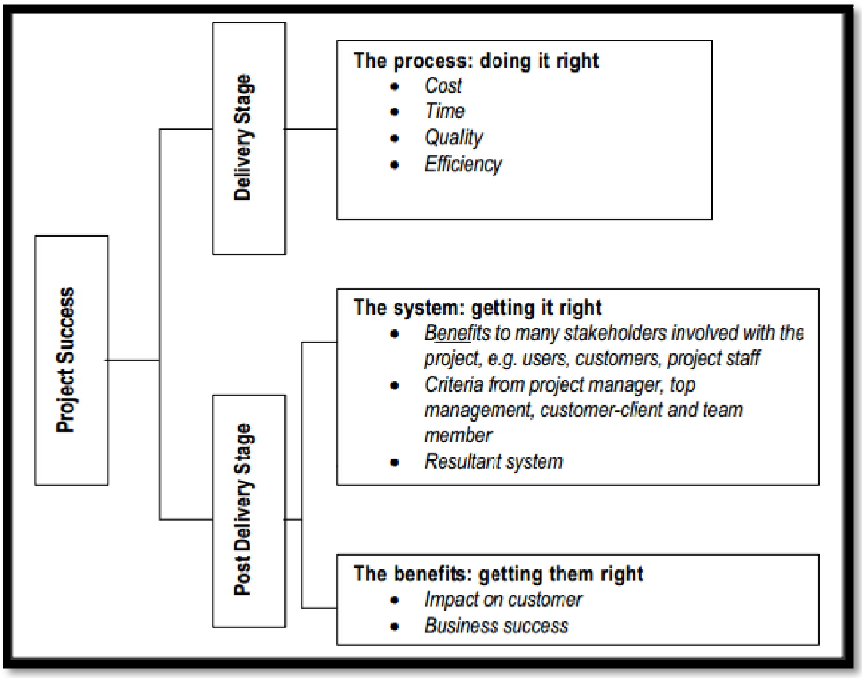

Figure 7: Atkinson's Model of Measuring Project Success
Source: Atkinson (1999)

Sutton (2005) has a different perspective on project success and holds that project success is not a dichotomous concept of success or failure but that different levels of success or failure do occur simultaneously. Sutton identified four different levels of success; project management success, repeatable project management success, project success, and corporate success in that order. This view, although probable, has not received many followers.

All Project stakeholders have one thing in common. They all want their projects to be successful. Nevertheless, how is project success to be measured when different project stakeholders perceive project success differently? Some project stakeholders view project success from the lens of project efficiency (or performance) in terms of the TQC criteria (e.g. Mohammed, 2017; Karwitha, 2017; Oyaya, 2017; Somba, 2015; Mulu, 2016; Muchelule, 2018; and Ogero, 2014) while others perceive project success in terms of project effectiveness as measured by long term objectives of the project while yet other stakeholders assess project success from very different viewpoints (Pinto & Slevin, 1988; Belassi & Tukel, 1996; Cooke-Davies, 2002; Chan, Scot & Chan, 2004; Hyvari, 2006; Koutsikouri et al. 2006; Fortune & White, 2006; Alias, et al., 2014; Muller and Judgev, 2012; Mbaabu, 2012; Munano, 2012; Zawawi, Yusof, & Abra, 2014; Daib, 2014; Mokua, 2014; Williams, 2015).

2.6. 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 (TQCS)	Project delivered on schedule (Time) 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 3: 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 operationalized by their respective attribute enablers or manifest variables shown in Table 3. 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 4 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 8 shows the conceptual model in which the five CSFs, operationalized by their attribute enablers, are the independent variables while the success criteria as operationalized 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 4: Critical Success Factors

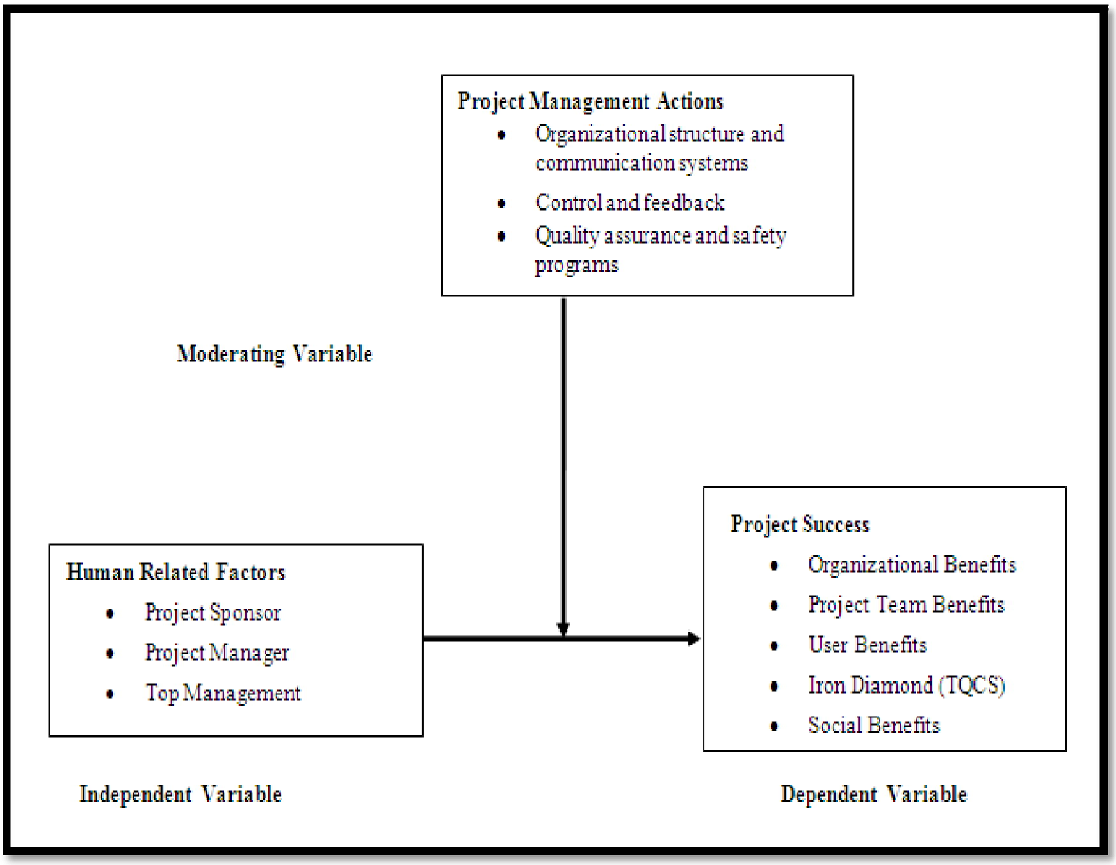

Figure 8: Conceptual Model

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, these results cannot be purely objective.

3.2. Research Design

This study sought to find out the influence of the human related factors on project success. The human related factors were further subdivided into client related factors, project manager related factors, and top management support. Table 4 shows the attribute enablers for the client related factors and for the project manager related factors that were used in this study. These attribute enablers were adapted from Chan et al. (2004). Since project success is an abstract concept, 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. Due to the constraints of both time and financial resources, a cross sectional research type for data collection using the quantitative survey design was adopted. A hierarchical multiple regression analysis was performed between Project Success as the dependent variable and the CSFs as the independent variables. The human related factors variable was entered first and the other CSFs entered one at a time and the significance of the generated models in predicting project success evaluated.

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 followed 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
Total	**15753**	**100**

Table 5: 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:

$$\boldsymbol{n} = \frac{\boldsymbol{q}}{\boldsymbol{1}+(\boldsymbol{q}-\boldsymbol{1})/\boldsymbol{N}}$$ -- 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 6: Sample Size for the Consultants Group

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.

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 7: Required Sample Sizes for Each Population

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.

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. Hierarchical Multiple Linear Regression

The purpose of the hierarchical multiple linear regression was to assess the strength of the relationship between each of the set of 'p' explanatory variables ($x_1, x_2, x_3, x_4, \ldots, x_p$) 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. Table 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 0.3

Where $i = 1, 2, 3 \ldots q$

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. The human related factors variable was entered first and the other CSFs were entered one at a time thus forming different models. The R^2 change and the F change statistics from one to the next were analysed and evaluated.

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	**15753**	**380**	**100.00**	**239**	**100.00**	**62.89**

Table 8: 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 (listwise)	238						

Table 9: 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 (listwise)	239						

Table 10: 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 11: Respondents' Level of Education

Figure 9 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.

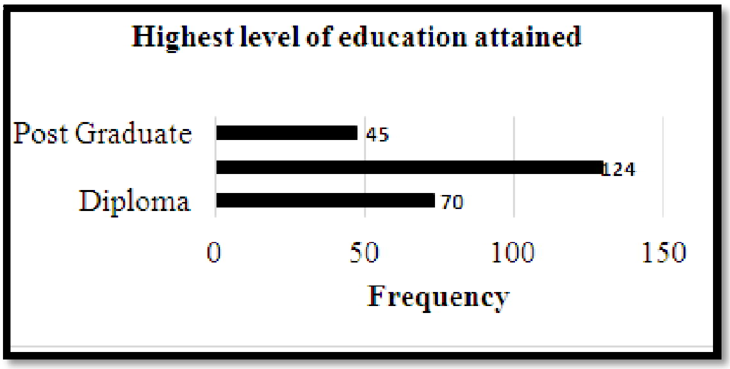

Figure 9: Highest Level of Education Attainted by the Respondents

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 10 shows a pie chart of the percentages of the respondents by gender (Male, Female) in the Kenyan construction industry.

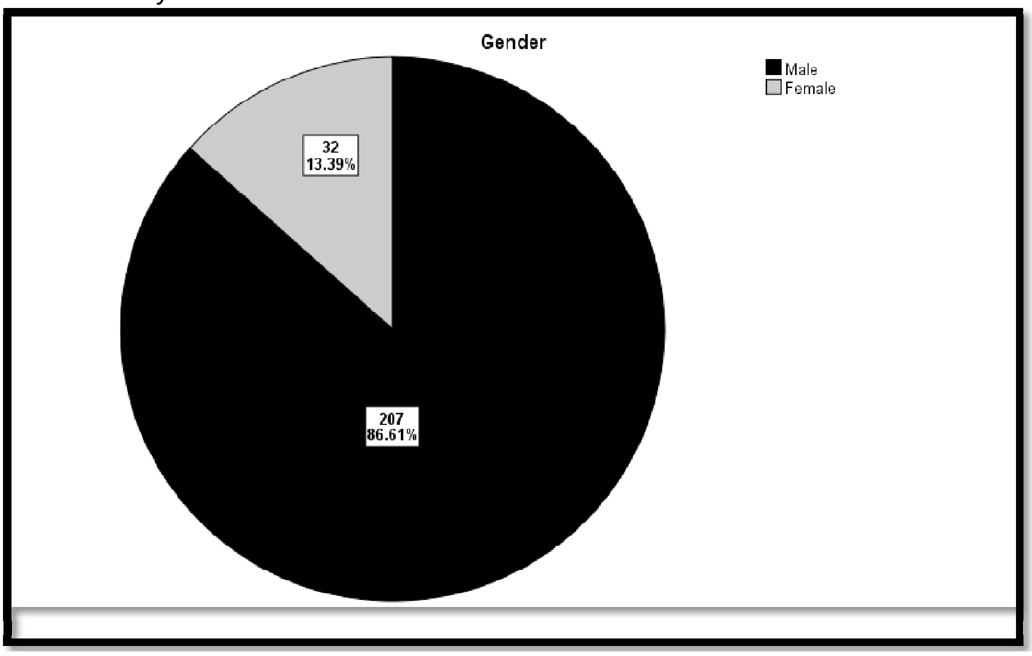

Figure 10: Percentages of the Respondents by Gender

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 12. 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
1,001-10,000	46	19.2	97.5
More than 10,000	6	2.5	100
Total	239	100	

Table 12: 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	100.0
Total	239	100	

Table 13: 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 14: 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. Human Related Factors

The human related factors variable was obtained by getting the mean of the project manager related factors, client related factors, and top management support. The project manager related factors were operationalized by the following attributes of the project manager: technical skills, business skills, leadership skills, organizational skills, motivational skills, communication skills, commitment to the project, involvement in the project, ability to adapt to changes in the project plan, and working relationship with stakeholders. The attributes of the client were experience, nature (e.g. PPP), emphasis on cost of construction, emphasis on speed of construction, ability to brief, ability to make decisions, ability to define roles, ability to contribute to design, and emphasis on quality of construction. These attributes were adapted from Chan et al. (2004).

	Conceptualization	**Planning**	**Execution**	**Termination**	**Overall**
Mean	4.012	3.967	4.062	3.899	3.985
Std. Deviation	0.507	0.597	0.598	0.639	0.515
Skewness	-0.435	-0.559	-0.468	-0.629	-0.354
Std. Error of Skewness	0.157	0.157	0.157	0.157	0.157
Skew Ratio	-2.762	-3.550	-2.971	-3.995	-2.255
Kurtosis	-0.110	-0.608	-0.695	-0.604	-0.951
Std. Error of Kurtosis	0.314	0.314	0.314	0.314	0.314
Kurtosis Ratio	-0.350	-1.938	-2.217	-1.926	-3.029

Table 15: Descriptive Statistics for The Human Related Factors
N=239

Table 4.8 shows the descriptive statistics for the human related factors across the four phase of the project life cycle. The results show the human related factors are most critical to project success at the execution phase (M = 4.062, STDDEV = 0.598) followed by conceptualization phase (M = 4.012, STDDEV = 0.507). Planning phase was third (M = 3.967, STDDEV = 0.597) while termination phase came in last with (M = 3.899, STDDEV = 0.639). The skew ratio for all four phases were greater than 2.58 (1% level of significance for two-tail test) and were all negative implying that the human related factors had a negative skew distribution at each phase of the project life cycle. Their respective kurtosis ratios were -0.350, -1.938, -2.217, and -1.926 meaning that the peakedness is somehow flatter than that of a normal curve but since the values are all less than 2.58 in magnitude then the peakedness can be assumed to be normally distributed at all four phases of the construction projects. However, the human related factors overall had skew and kurtosis ratios of -2.255 and -3.029 respectively meaning that normal distribution can be assumed but the peakedness was platykurtic. Figure 4.3 shows the mean scores at each project phase displayed graphically in a chart.

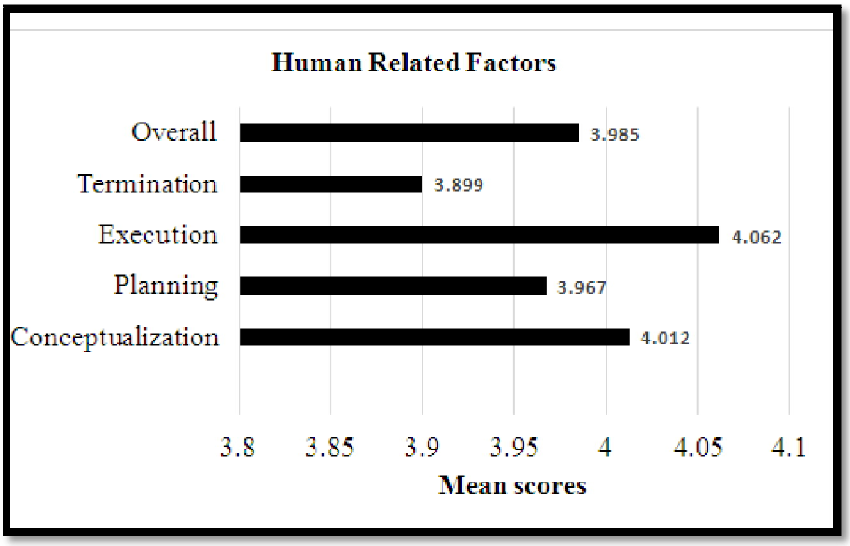

Figure 11: Bar Chart for the Mean Scores of the Human Related Factors

4.4.2. Human Related Factors during Conceptualization Phase

Figure 4.4 shows the frequency distribution of the human related factors at the conceptualization phase. A normal curve is superimposed for comparison.

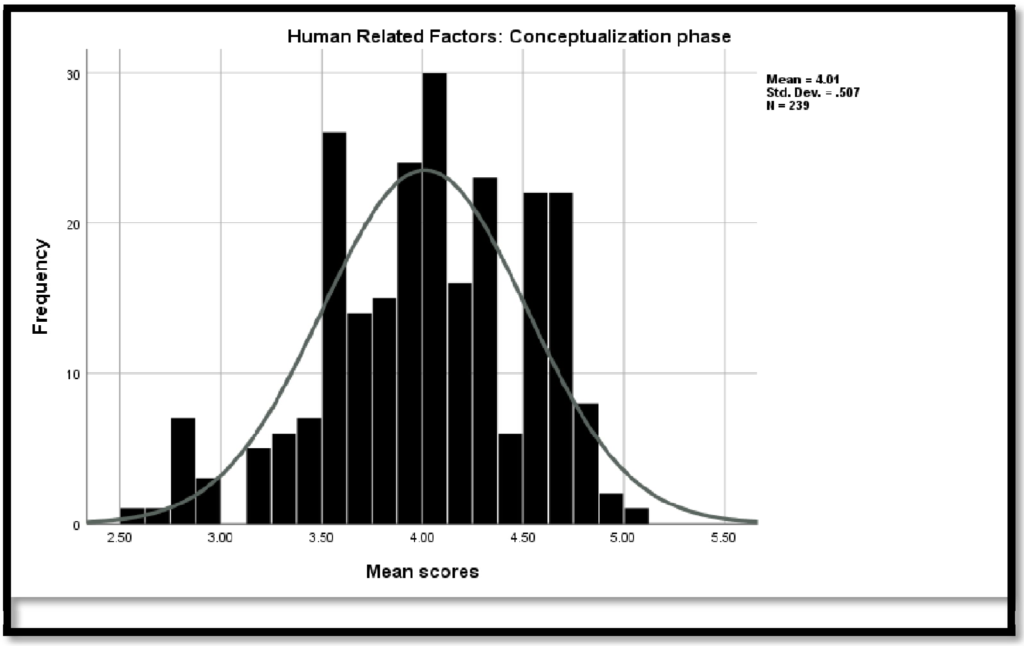

Figure 12: Histogram of Mean Scores of the Human Related Factors at the Conceptualization Phase

Figure 4.5 shows the quartile-quartile (Q-Q) probability plot for this variable. Both figures, together with the skew and kurtosis ratios of -2.762 and -0.35 respectively suggest that this variable has a negative skew distribution.

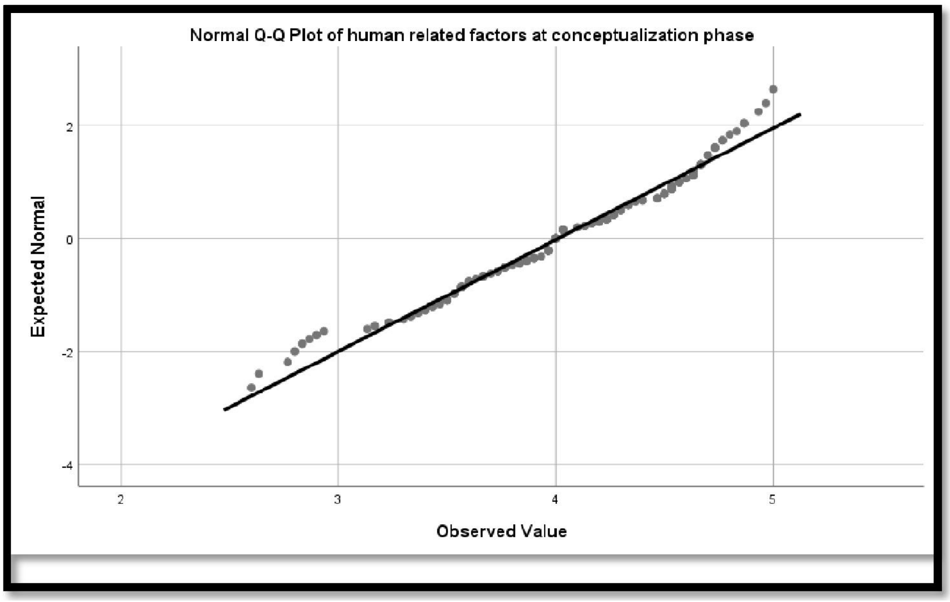

Figure13: Q-Q Normality Plot for Human Related Factors at Conceptualization Phase

4.4.3. Human Related Factors during Planning Phase

Figure 4.6 shows the frequency distribution of the human related factors at the planning phase. A normal curve is superimposed for comparison.

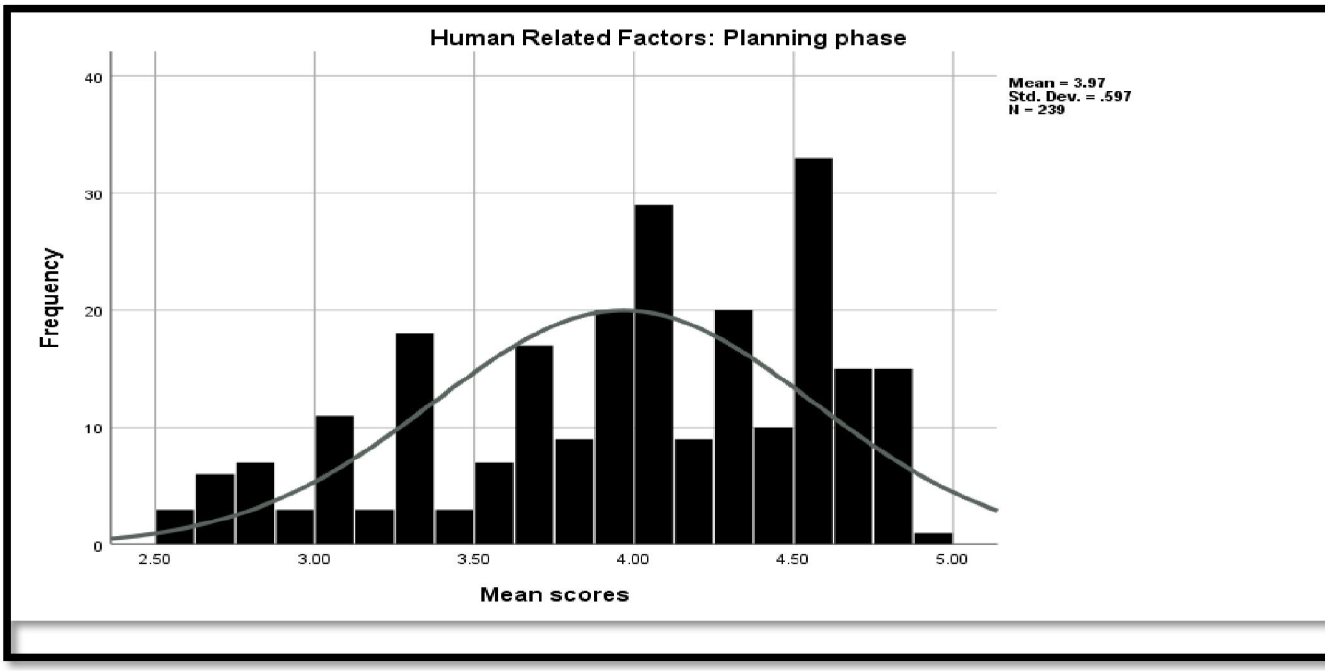

Figure14: Histogram of Mean Scores of the Human Related Factors at the Planning Phase

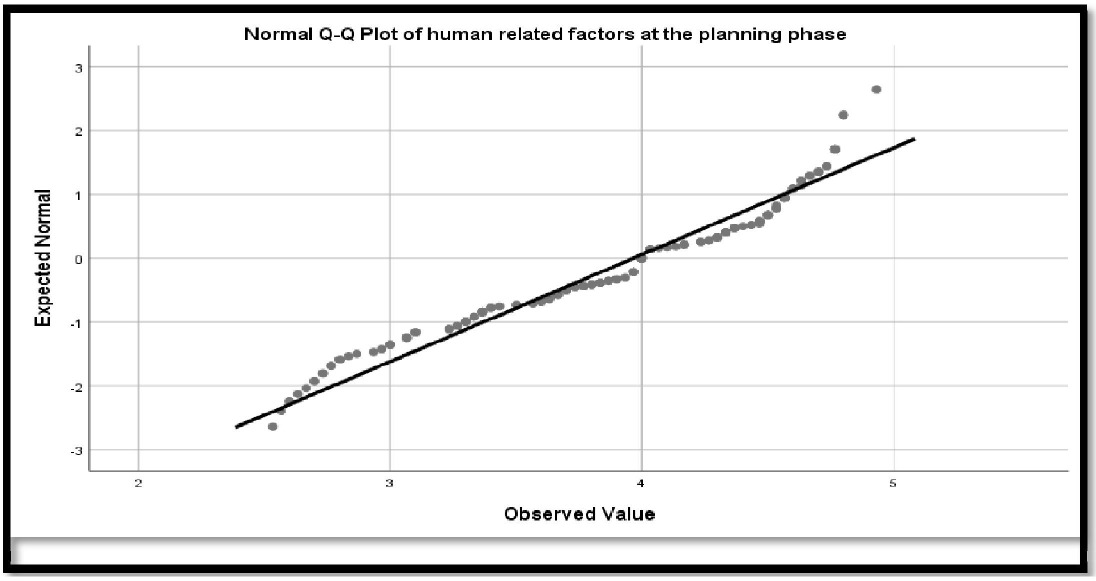

Figure15: Q-Q Normality Plot For Human Related Factors At Planning Phase

Figure 4.7 shows the quartile-quartile (Q-Q) probability plot for this variable. Both figures, together with the skew and kurtosis ratios of -3.55 and -1.938 respectively suggest that this variable has a negative skew distribution. Therefore, non-parametric analysis can be carried out on human related factors variable at the planning phase. Internal reliability of the 20 items scale (human related critical success factors i.e. from items of question 9 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.

4.4.4. Human Related Factors during Execution Phase

Figure 4.8 shows the frequency distribution of the human related factors at the execution phase. A normal curve is superimposed for comparison

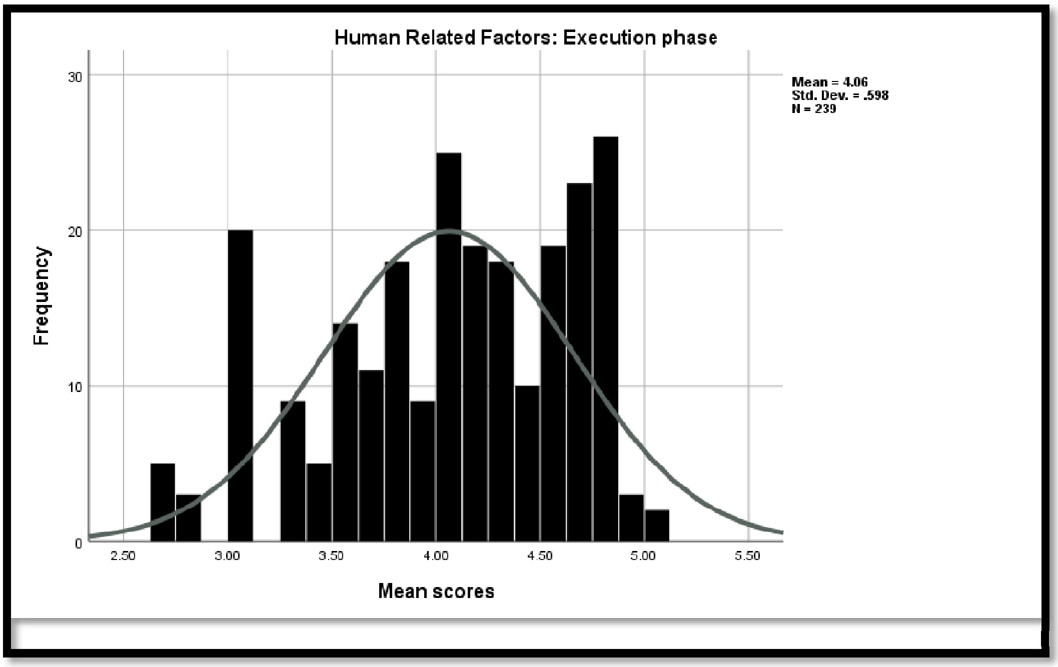

Figure16: Histogram of Mean Scores of the Human Related Factors at the Execution Phase

Figure 4.9 shows the quartile-quartile (Q-Q) probability plot for this variable. Both figures, together with the skew and kurtosis ratios of -2.971 and -2.217respectively suggest that this variable has a negative skew distribution. Therefore, non-parametric analysis can be carried out on human related factors variable at the planning phase.

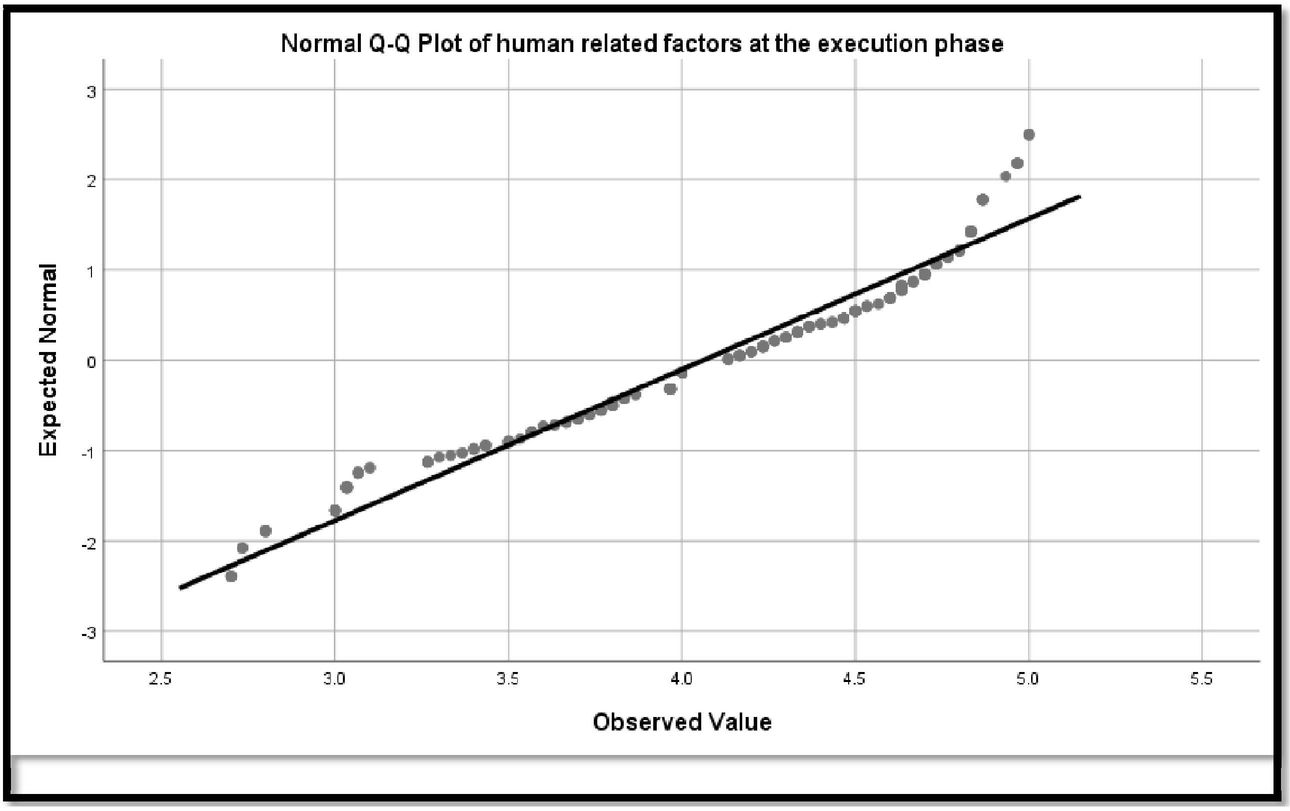

Figure 17: Q-Q Normality Plot for Human Related Factors at Execution Phase

<u>4.4.5. Human Related Factors during Termination Phase</u>

Figure 4.10 shows the frequency distribution of the human related factors at the termination phase. A normal curve is superimposed for comparison.

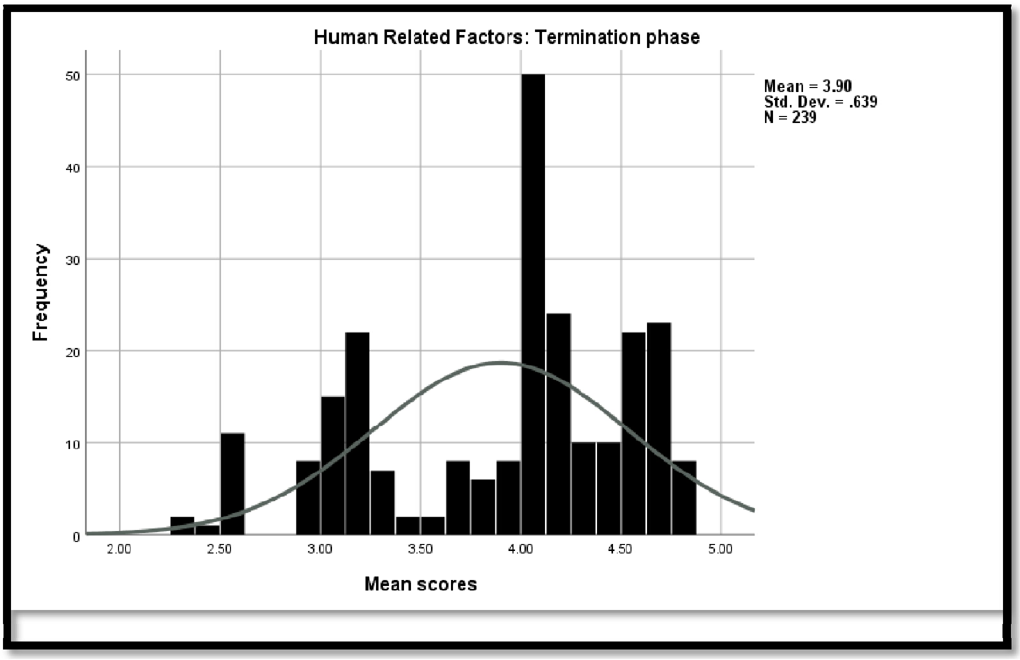

Figure 18: Histogram of Mean Scores of the Human Related Factors at the Termination Phase

Figure 4.11 shows the quartile-quartile (Q-Q) probability plot for this variable. Both figures, together with the skew and kurtosis ratios of -3.995 and -1.926 respectively suggest that this variable has a negative skew distribution. Therefore, non-parametric analysis can be carried out on human related factors variable at the planning phase.

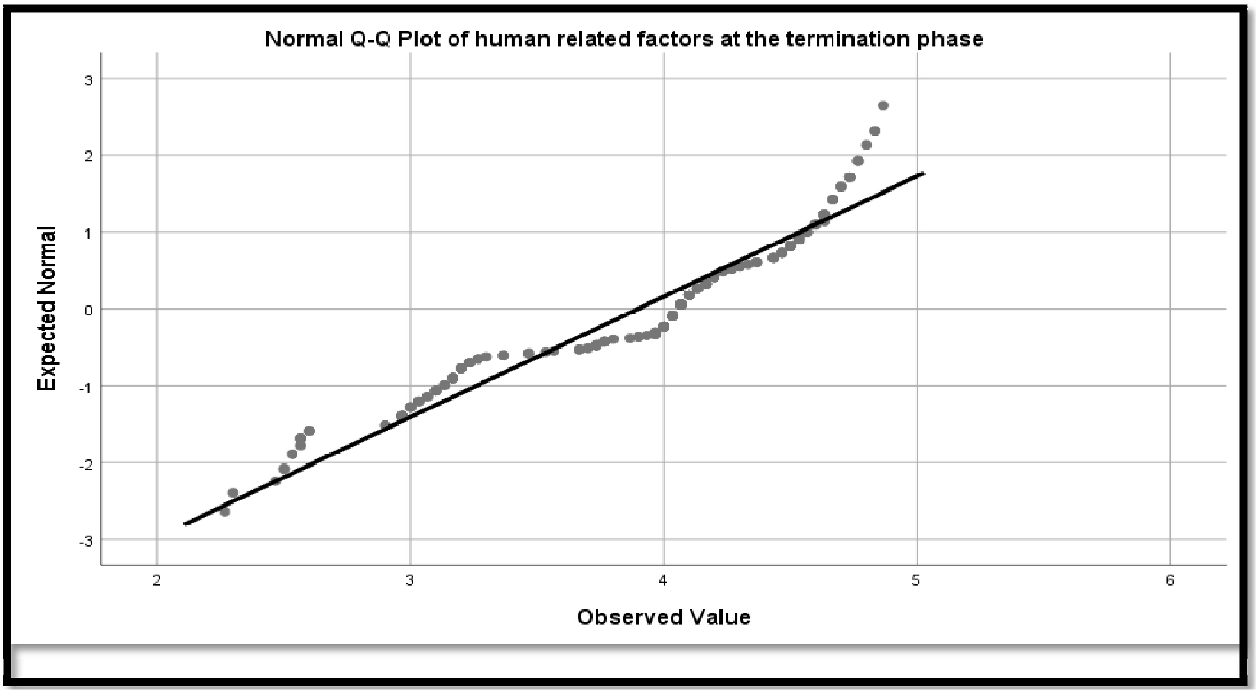

Figure 19 : Q-Q Normality Plot for Human Related Factors at Termination Phase

4.4.6. Human Related Factors Overall

Figure 4.12 shows the frequency distribution of the human related factors. A normal curve is superimposed for comparison.

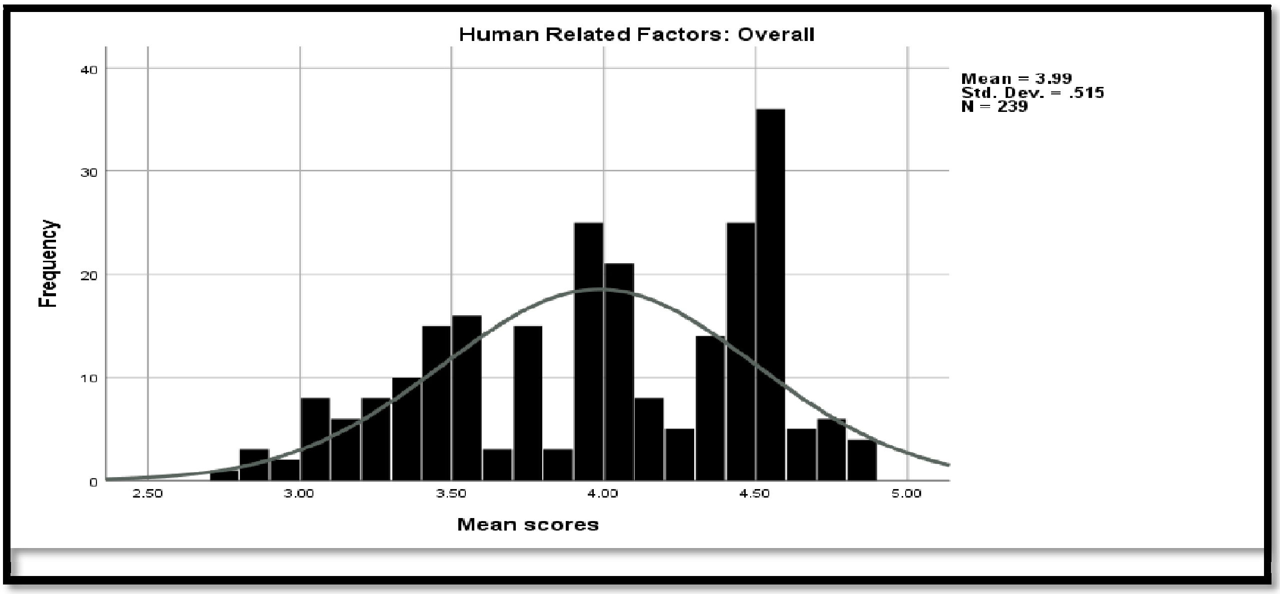

Figure 20: Histogram of Mean Scores of the Human Related Factors Overall

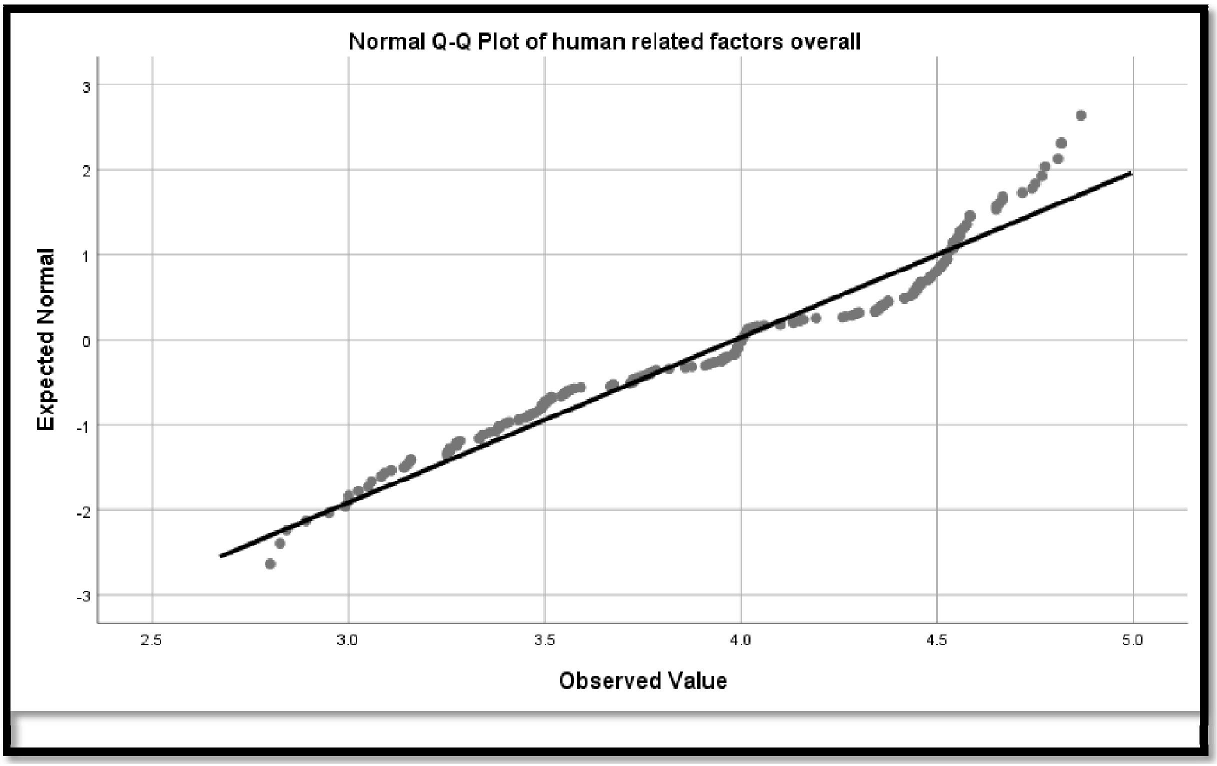

Figure 21 : Q-Q Normality Plot for Human Related Factors Overall

Figure 4.13 shows the quartile-quartile (Q-Q) probability plot for this variable. Both figures, together with the skew and kurtosis ratios of -2.255 and -3.029 respectively suggest that this variable has an approximately normally distribution. Therefore, parametric analysis can be carried out on human related factors variable at the planning phase.

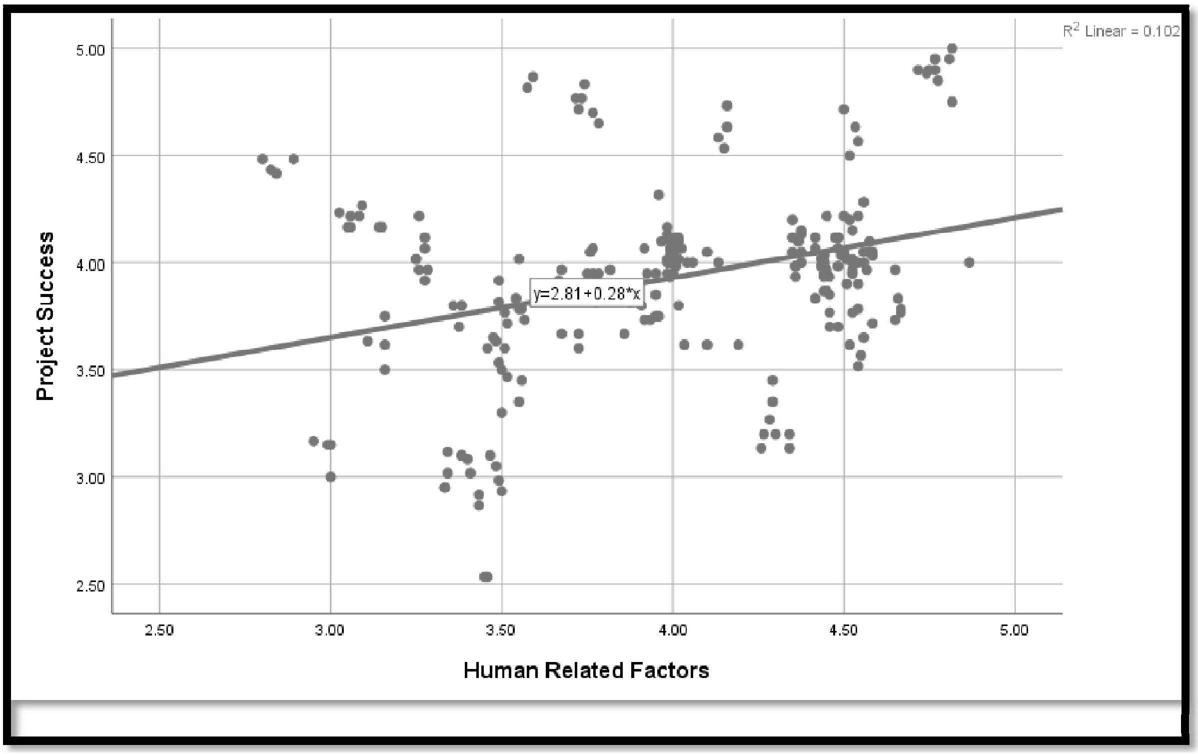

Figure 22: Scatter Plot Matrix for Human Related Factors

shows the scatter plot for the project success variable against the human related factors variable. It shows that the relationship between the variables can be estimated using the linear function:

Project Success = 2.81 + 0.28 ∗ Human Related Factors ------- Equation 4.1

The Likert scale of 1 – 5 was used to measure the human related factors as well as the project success. Therefore, Equation 4.1 applies for values of human related factors between 1 and 5. The range of values of project success predicted by human related factors varies from 2.81 to 4.21. However, the values are not closely clustered around the regression line meaning that the data may be accurate but not precise resulting in lower R^2 of 0.102.

4.4.7. Multiple Regression Analysis at the Execution Phase

Human related factors and project management actions are highly correlated (r = 0.866, P < 0.001). Furthermore, the multiple regression analysis with forward entry at the execution phase showed that external environmental factors was the only variable that was important in predicting project success. Hence, a correlation analysis was performed between human related factors variable and project management actions during the execution phase. The correlation was significant (r = 0.793, P < 0.01). A test for interaction effect between human related factors and project management actions produced positive results as shown in Figure 4.15.

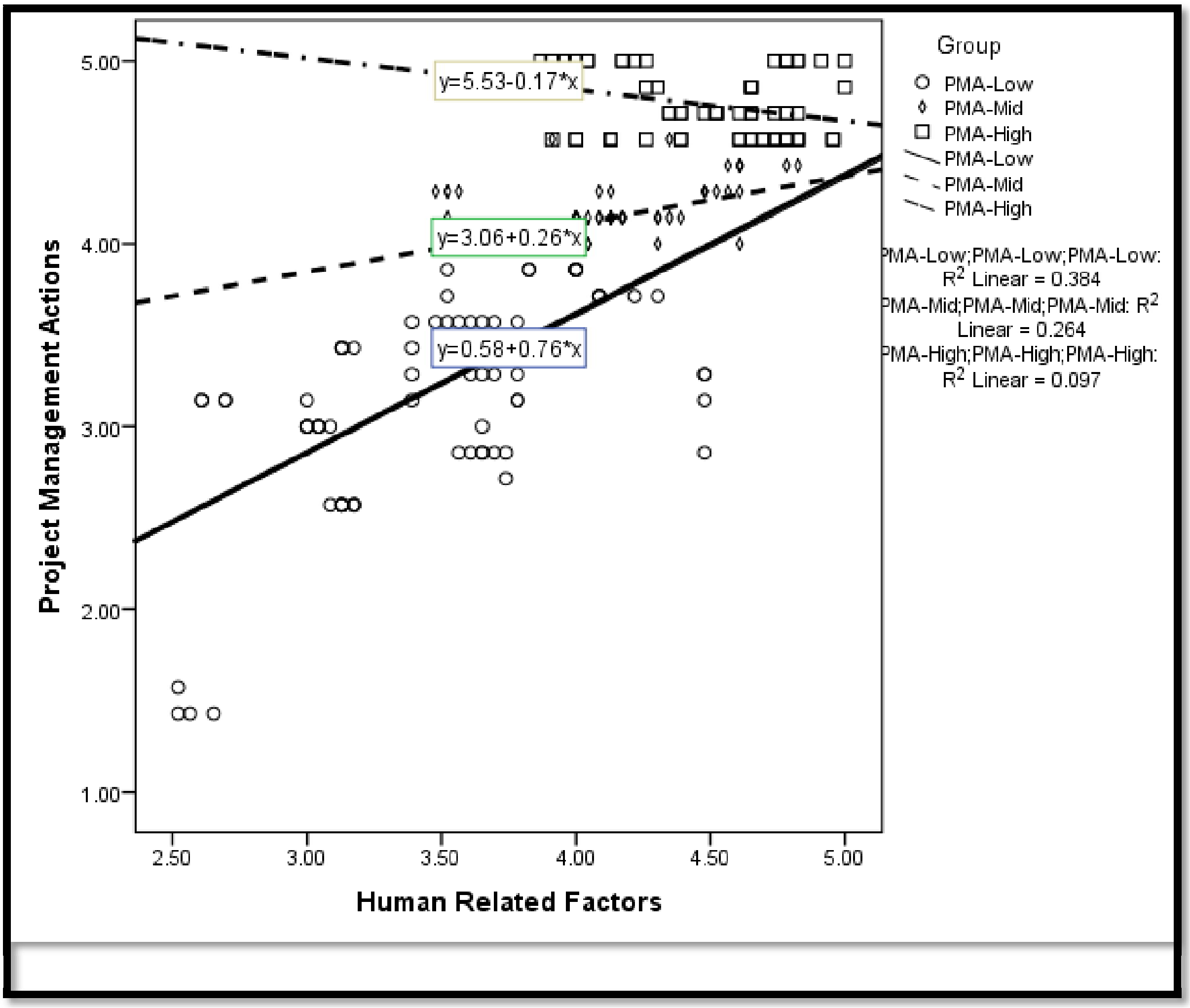

Figure 23: Interaction between Human Related Factors and Project Management Actions

It was found that the effect of human related factors on project success was dependent on the level of human management actions. High levels of project management actions corresponded with low influence of human related factors on project success while low levels of project management actions corresponded with high influence of human related factors on project success. Medium levels of project management actions had little moderating effect on the relationship between human related factors and project success.

A multiple regression with forward entry was performed on external environmental factors, human related factors, project procedure factors, project management actions, project related factors, and the interaction between human related factors and project management actions, labeled CP3PMA_CP3HRF. Table 4.9 shows the model summary of the results.

Model Summary[d]									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.303[a]	0.092	0.088	0.42961	0.092	23.917	1	237	0.000
2	.364[b]	0.132	0.125	0.42076	0.041	11.074	1	236	0.001
3	.404[c]	0.163	0.153	0.41406	0.031	8.698	1	235	0.004

Table16: Multiple Regression Model Summary For The Execution Phase
A. Predictors: (Constant), P3externalenvironment
B. Predictors: (Constant), P3externalenvironment, CP3PMA_CP3HRF
C. Predictors: (Constant), P3externalenvironment, CP3PMA_CP3HRF, P3hrfactors
D. Dependent Variable: Projectsuccess

Only three variables were found significant and included in the analysis. These were the external environmental factors, CP3PMA_CP3HRF, and human related factors. The interaction between the project management actions and the human related factors, CP3PMA_CP3HRF, had a strong influence on project success explaining 21.6% of the variation of project success variable only second to external environmental factors that explained 37.4% of the variation. Project management actions variable on its own was not found to significantly influence project success at the execution phase. The greatest *R^2 Change = 9.2%* for the external environmental factors variable acting alone was significant, *F Change = 23.917, $P < 0.01$*. When the human related factors variable was added at model 2, the *R^2 Change = 4.1%* was significant at 0.01 level. Addition of the project procedure factors variable at model 3 resulted in an increase in *R^2 Change = 3.1%* which was also significant at 0.01 level. Table 4.10 shows the multiple regression coefficients.

Coefficientsa											
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	3.141	0.163		19.280	0.000					
	P3ExternalEnvironment	0.202	0.041	0.303	4.891	0.000	0.303	0.303	0.303	1.000	1.000
2	(Constant)	2.898	0.175		16.511	0.000					
	P3ExternalEnvironment	0.249	0.043	0.374	5.814	0.000	0.303	0.354	0.353	0.890	1.123
	CP3PMA_CP3HRF	0.173	0.052	0.214	3.328	0.001	0.090	0.212	0.202	0.890	1.123
3	(Constant)	2.502	0.219		11.448	0.000					
	P3ExternalEnvironment	0.146	0.055	0.219	2.671	0.008	0.303	0.172	0.159	0.528	1.893
	CP3PMA_CP3HRF	0.222	0.054	0.275	4.136	0.000	0.090	0.260	0.247	0.803	1.246
	P3HRFactors	0.192	0.065	0.255	2.949	0.004	0.283	0.189	0.176	0.477	2.096

Table 17: Hierarchical Multiple Regression Coefficients for the Execution Phase
A. Dependent Variable: Projectsuccess

The interaction of project management actions and the human related factors, at model 3, has the highest beta of 0.275 and dominates the external environmental factors with beta = 0.219 in influencing project success. The human related factors has a strong influence on project success with beta = 0.255. All three variables are significant at the 0.01 level.

5. Discussions and Recommendations

The human related factors considered in this analysis were those that relate to the client, the top management, and those relating to the project manager as they perform their respective responsibilities in delivering successful projects. The specific factors considered in this study are itemized in Table 4. The results of the analysis of the human related factors variable is as depicted in Table 4.10. It shows that the introduction of external environmental factors variable and project procedure factors variable to a model involving human related factors improved the predictive ability of the model. When project related factors variable was entered at model 4, the predictive ability remained unchanged. However, when project management actions were entered at model 5, the predictive ability of the model decreased.

The results showed that model 3 which consisted of the human related factors, external environmental factors, and project procedure factors had the greatest influence on project success. The human related factors variable was significant at the 0.05 level with a standardized Beta of 0.188. In comparison, the external environmental factors variable was significant at the 0.01 level with a standardized Beta of 0.414 depicting its strong influence on project success, which dominated that of the human related factors. The project procedure factors variable was also significant at the 0.01 level with a standardized Beta of -0.259 meaning that it had a strong negative influence on project success. This finding implies that though human related factors positively influence success of construction projects, the strength of that influence is marginal. This finding is contrary to popular expectations that human related factors, the so-called soft factors, are essential for success of construction projects as they are in general management.

Only a few studies have investigated the influence of human related factors on project success. Pinto & Prescott (1988) conducted a field study to investigate changes in the importance of project critical success factors across four stages in the project life cycle. Their study targeted project managers or project team members who were actively involved in project management. They used the ten critical success factors identified in Slevin & Pinto (1986) known as the Project Implementation Profile; a diagnostic tool prepared for the use of the project manager. They found significant correlations in the ten critical success factors, which implied that they had multi-collinearity problems. Therefore, they used the ridge regression method of analysis that reduced their independent variables from ten to eight. They reached the unexpected conclusion that the personnel factors were not significant at any of the four phases of the project life cycle. The finding of this study on the influence of the human related factors on project success is not very different from that of Slevin & Prescott. Its influence was dominated by that of the external environmental factors and its significance was marginal (P = 0.043).

Belout (1988) critique challenged the finding of Pinto & Prescott (1988) on three grounds. The first ground was that no theoretical framework was advanced for the inclusion of the personnel factors in the model. He proposed that researchers should use the eight dimensions of assessing human resource management identified in Tsui and Milkovich working paper of 1985 that he cited. However, a critical look at these ten dimensions of assessing human resource management reveals that they are best performed and actioned by a fully-fledged human resources department in functional or matrix organizational structures and not applicable for project oriented organizations. The influence of power and politics often limits what the project manager can do and achieve in functional or matrix based organizations. The project managers often find themselves with huge responsibilities but without the necessary power and authority required to ensure success. Their main weakness is that they do not control organizational resources. As Pinto (1996) rightly stated, the project managers cannot promote or fire employees and so often they lack the influence necessary to steer the project team members whose royalty goes to their functional managers, in the case of functional and matrix based organizations, who has the capacity to recommend a pay raise for example.

The second critique was on the definition of project success which Belout (1988) argued lacked rigor and its measurement was not precise. The concept of project success is still a subject of conjecture and no agreement has been reached yet. Pinto & Prescott (1988) used an aggregated list of 13 items, obtained from the Project Implementation Profile that measured project success using various criteria including adherence to budget and schedule, perceived quality and utility of the final product, client satisfaction with the project, and their likelihood of using the project in the future. The current study measured project success on five criteria: organizational benefits, project team members' benefits, user benefits, the TQCS, and the social benefits. Without an agreed definition of project success, this kind of critique will continue being relevant and a challenge to the project management community whose primary responsibility is to deliver successful projects.

The third critique was on the method of analysis used by Pinto & Prescott (1988) and the fact that there were multi-collinearity problems in their original model. The ridge regression is a method that solves such problems. The variables are first standardized and then a constant small value 'k' is added to the diagonal elements of the correlation matrix. The greatest challenge to ridge regression is the determination of 'k'. The usual procedure is to plot a ridge trace and use it to pick the most appropriate value of 'k'. The introduction of that small value biases the model and reduces its variance. Consequently, unlike ordinary least square, the ridge regression produces biased least square estimates. However, when there are high levels of multi-collinearity in the model the ordinary least square method produces unstable estimators and the P-values can no longer be relied upon; a problem that the ridge regression method solves. The other method often used is to eliminate the predictor variable with the highest VIF. Structural multi-collinearity can be solved by centering the predictor variables and so ridge regression may not be required. The use of ridge regression when the independent variables are highly correlated has its merits and should not be dismissed offhand without due consideration of the specific circumstance in which it is being applied.

The project manager should be aware that during project execution, there is a strong interaction between human related factors and project management actions and if the project team members are sufficiently trained and motivated, then chances of project success increase.

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