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**RESEARCH TOPIC: THE PROJECT IMPLEMENTATION PROFILE'S  
APPLICABILITY TO THE MODERN CONSTRUCTION INDUSTRY**

**DECEMBER 2017**

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## **ABSTRACT**

This research evaluated the applicability of the current project implementation profile (PIP) tool to the modern construction industry. The research also aimed to identify any new critical success factors (CSFs) to deliver successful construction projects.

The research questions were:

- a. How applicable are the success factors from the PIP tool in delivering successful modern construction projects?
- b. Are there other success factors that may be considered for inclusion in the PIP tool for modern construction projects?

Critical success factors were identified through a deep literature review. An online web-based questionnaire with the critical success factors was then developed and this tool was utilized to gather data for the research from various project management stakeholders. Collected information was summarized, analyzed and discussed leading to a conclusion.

The research identified a revised list of 10 key success factors (KSF) which comprised of 6 non-PIP factors which are: adequate budget; client requirements; competence of project manager; competence of contractors, subcontractors and suppliers; risk management and design and 4 PIP factors which are: client consultation, communication, client acceptance and top management support. From the 20 KSFs that were under investigation, "Adequate budget" was the factor that scored the highest and the lowest scored was "support from other departments."

The research also concluded that the success factors from the existing PIP tool are not sufficient in delivering successful modern construction projects and there are additional success factors that can be considered for inclusion in the PIP tool to aid modern construction projects success. To strengthen the PIP success factors in response to the research questions, it is necessary to execute additional research in this area; in particular the actual questions used by the tool and the assessment framework needs to be revised in light of this research.

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## 1. Introduction

The construction industry is regarded as being amongst the most important industries within the economy of a country. Evidence of stimulated growth to other divisions of the economy has proved this industry's uniqueness and it also links well with the other economic sectors (Duy Nguyen *et al.*, 2004). There is a positive relationship between the construction share in the gross domestic product (GDP) and the level of per capita national income (Lopes, 1998). Decrease in GDP has also resulted in the reduction of construction projects (Lopes, 1998). Many other international bodies and writers focusing on underdeveloped countries have acknowledged the significance of the construction's role in the economic growth (Turin, 1973).

Like many other industries, this industry is noted to be in the need of an improved, efficient and effective way of operation due to increased competition in the market base (Austin *et al.*, 2002). A great many projects exceed their budgets, run late or fail to meet their objectives (Fortune and White, 2006). Improved operations could infect result in a saving of both the organizations and country as a whole (Kaming *et al.*, 1997).

Lots of current organizations are now utilizing project management principles for the successful delivery of their projects (Belout and Gauvreau, 2004). By using effective project management practices, it may assist organisations to better plan, manage, execute and control projects, thus resulting in better performance and productivity and contributing the success of software projects. Although it has been widely acknowledged that good project management cannot guarantee project success, poor project management usually results in project failure. There is however still a problem of coming up with the right tool in project management to deliver successful construction projects. Researchers have picked up that projects are still being run as technical systems yet there is a component of behavioural systems (Belout and Gauvreau, 2004). From ancient literature, it is noted that an assumption has always existed that expansion and growth of project scheduling methods would lead to better chances of project success (Belassi and Tukel, 1996). Over time, many other project management tools, techniques and methodologies have surfaced to try and address the issue of project tracking but very few have attempted to track the softer human elements of project management (Pinto, 1990).

It is also noted from literature that only a few project management studies have concentrated on the critical success factors that affect project success or failure and many of these studies have generated lists of CSFs varying in its scope and purpose (Belassi and Tukel, 1996). The challenge experienced from literature is that the success factors are usually listed as either very general factors or very specific factors affecting only a particular project. Recent research has also shown that different sets of CSFs vary across the industry types (Esmaeili *et al.*, 2014). Other literature presents certain challenges experienced when the success factors are applied in developing countries where knowledge in infrastructure including state of the art managerial skills is not available (Duy Nguyen *et al.*, 2004). It is also however noted that additional future research concentrating on the relationship between critical success factors and measurement techniques and human elements in project management can be expected (Hyvari, 2006). Failure could be avoided by paying careful attention to the project management factors which caused failure (Avots, 1969).

The investigation into CSFs has been on the minds of practitioners and researchers for some time (Pinto and Mantel Jr, 1990). Also the utilization of projects to accomplish work in organizations has pushed the need for the CSFs study (Shenhar *et al.*, 2002). Lots of researchers have explored the CSFs in construction projects (Belassi and Tukel, 1996; Li *et al.*, 2005). There appears to be a widespread attention on these types of research as it would greatly assist project management practitioners with a tool that contributes to success of projects (Esmaeili *et al.*, 2014). It would give them an indicator of the necessities to successfully execute the projects (Esmaeili *et al.*, 2014). The recognition exists of the need for increased effort in this study of project success factors.

In concluding the section, the research review has revealed the gap in research of the success factors of modern construction projects. There is a need to understand the various success factors across the differing project phases and different industry types (Hyvari, 2006).

## 1.1 Background to the Study

Construction industry is a national economic sector which deals with the construction of mostly buildings and different infrastructures such as roads, airports, massive pipelines, plants, houses etc. Most uncertainty and risk lie in this field more than any other sector

(Acharya *et al.*, 2006). The projects are complex and involve time consuming pre-planning, design and construction activities. However, it is noted that lots of the construction projects are rarely completed in the specified time, within budget and of right quality and as a result continue to be regarded as failed projects.

Modern construction projects continue to face delay problems (Acharya *et al.*, 2006). Delay is a huge issue across the modern construction industry worldwide. Project stakeholders and the appointed contractor can individually or dually attribute to projects' not completed within the set timeframes or contractual agreements resulting in delays (Aibinu and Jagboro, 2002).

Delay is acknowledged to be a huge problem that can affect each party's contractual obligations leading to increased overheads and losing potential revenue (Acharya *et al.*, 2006). Delays in projects may cause cost overrun, time overrun, dispute, arbitration and total abandonment. Unexpected and unplanned issues could occur during the construction and design process that cause confusion and project delay. Inadequate planning, constant design changes and poor labour productivity are other noted factors leading to delays (Kaming *et al.*, 1997). Delays are also a source of dispute hence damaging the relationship between the project participants (Acharya *et al.*, 2006).

The factors that cause project delays may be classified into three categories according to the personnel responsible which are owners, contractors and consultants' related factors. Poor understanding of priorities, lack of stakeholders support, improper change management processes, poor risk management, inadequate resource allocation, lack of proper project mission and lack of initial planning are some of the reasons for engineering construction projects fails (Lawrence and Scanlan, 2007).

There is also a need for architects to consult their clients from the beginning of the project lest the owners deny the final end product because it's difficult for the owners to acknowledge designs which they never had knowledge of (Mrema and Mhando, 2005). Some architects make changes without the client knowing the associated financial implications resulting in budget overruns, several disputes and projects not being finished.

When construction projects fail, it can lead to construction companies shutting down leading to few large established companies remaining. Mergers and bankruptcies have resulted in fewer companies currently being listed on the Johannesburg Stock Exchange (JSE), a record of only 12 heavy construction companies were listed by year 2013 (Cottle, 2014). As an example of consequences of project failure, Table 1 below provides a summary of initially budgeted cost versus the final project cost of some of the South African stadiums constructed for the FIFA World Cup. Table 1, below, shows the extent by which the construction projects went over budget. Some of the stadiums were behind schedule for the 2009 Confederations Cup but were however in time for the 2010 FIFA world cup (Dell’Apa, 2008).

**Table 1: Budgeted cost v/s final cost for SA stadia (Eco-h2o, 2010)**

Stadium	Initial budgeted cost	Indicated final cost
Soccer City	R2.2 billion	R3.7 billion
Mangaung	R245 million	R359 million
Mbombela	R600 million	R1 billion
Moses Mabida	R1.6 billion	R3.1 billion
Loftus Versfeld	R122 million	R131 million
Nelson Mandela Bay	R2.1 billion	Not known
Ellis Park	R240 million	R253 million
Royal Bafokeng	R360 million	R483 million
Green Point	R2.9 billion	R4 billion
Peter Mokaba	R1.3 billion	Not known

Table 1 above clearly indicates that major projects are being completed over budget and it’s a problem in the construction industry. A good example is the Moses Mabida stadium which went over by 94% and the soccer city went over by 68% from its original budgets.

Expectations of the client are sometimes not delivered due to early stage design fails. The complexity of the interdisciplinary nature of design can lead to lack of understanding of project needs resulting in poor decision making, ineffective collaboration and poor communication between project stakeholders (Austin *et al.*, 2002). Poor and inadequate

communications between project stakeholders can be a problem resulting from the diversity of the project participants (Flyvbjerg, 2009).

Because of the nature of projects, construction projects are exposed to frequent design changes which may result in negative impacts on the quality, cost and time (Sun and Meng, 2009). Changes happening in construction projects include alteration to existing design, project programme or other project aspects caused by modifications to pre-existing conditions (Sun and Meng, 2009). Other typical changes include delays of start and completion of tasks, deletion and addition of tasks, variation of resource inputs (Sun and Meng, 2009). Change often leads to rework, extra cost and time loss in a construction project.

Improper scheduling and poor strategies of project implementation have also created serious problems. Some evidence points to the existence of acute planning and implementation gaps in the entire process of running projects (Mrema and Mhando, 2005). Most project difficulties are brought about by the continuous use of out-dated project planning and management tools and techniques which cannot cope with the working practices and the complexities of modern construction projects (Fellows and Liu, 2012). Financial mismanagement and management incompetence have also been cited among the attributes that lead to the high number of construction project failures.

At the organisational and site level, poor construction health and safety performance is attributable to a lack of management commitment, inadequate supervision and inadequate health and safety training. A lack of worker involvement, personal risk appreciation and work pressures also contribute to poor performance (Construction Industry Development Board, 2010). Most of the South African organisations lack formal risk management policies and procedures and there is lack of risk management training (Visser and Joubert, 2008).

The existing South African preferential procurement environment is also a challenge as it encourages historically disadvantaged professionals to establish their own firms rather than join established companies (Construction Industry Development Board, 2010). This setup reduces the pool of expertise that can be consolidated within medium and large companies through access and experience on specialised and diverse projects. There is also a mention

of inflationary increases in material cost, inaccurate material estimating and project complexity as also significant causes of cost overruns (Kaming *et al.*, 1997).

It is noted that skills shortages and skills development remains a pressing concern in the South African construction sector. The unskilled and skilled workforce constitute a large portion of the general construction production team yet there is no interest in training and development for this group (Cottle, 2014).

Some clients tend to assume the roles of their professional consultants and make decisions and changes that may affect the design and project cost and thereby leading to the intended goals not being met (Mrema and Mhando, 2005). For the purposes of wanting to save cost, other construction companies don't often engage competent project managers to run construction projects and this is noted to be a huge problem in this industry. All of these attributes have a strong bearing on escalation of project cost resulting in clients failing to cover the costs leading to project failure (Mrema and Mhando, 2005).

Most South African construction projects utilise the JBCC, GCC and NEC forms of contract. It is noted that a type of construction contract used on a project has an impact on project success. There is however bad practice from most clients and professional personnel to utilize common contracts which only provide security only to the project owners (Mrema and Mhando, 2005).

Other challenges affecting growth and development in the South African construction sector have been identified by the Construction Industry Development Board (CIDB) and listed below (Construction Industry Development Board, 2010):

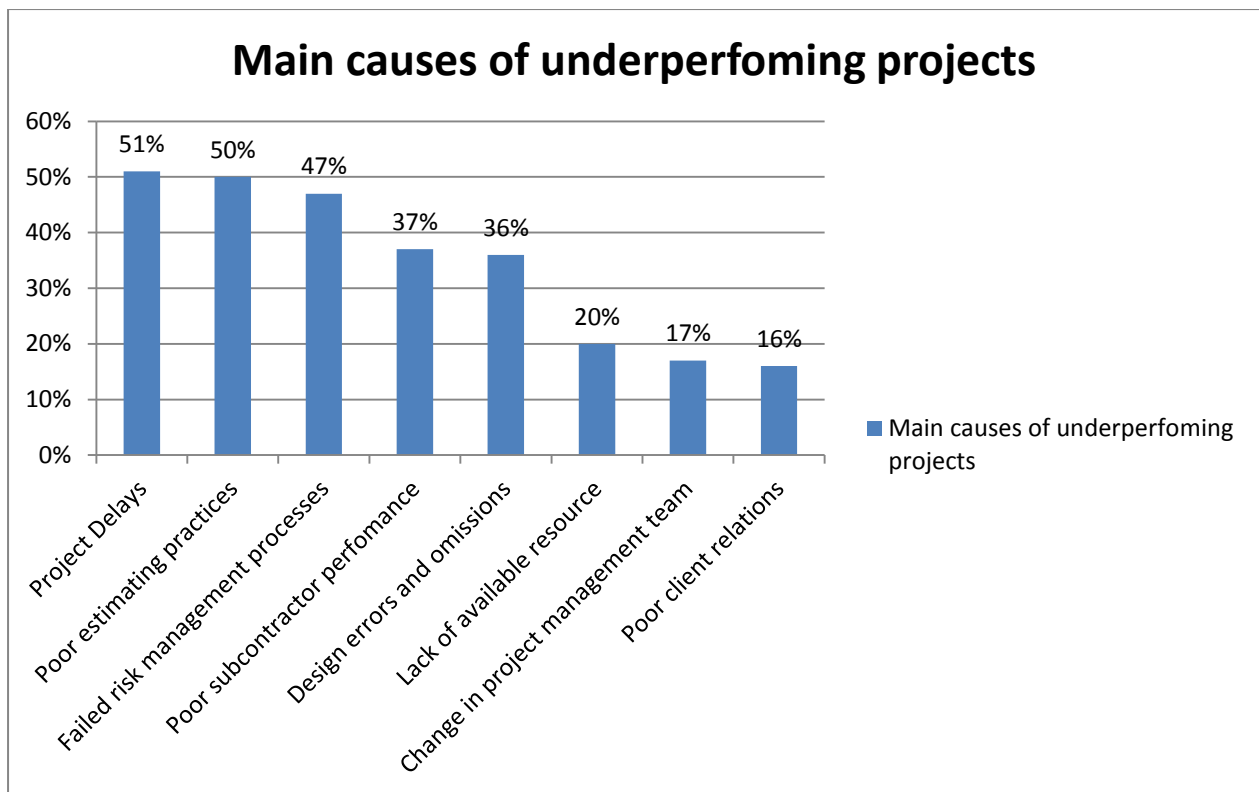
- Technology advancement
- Infrastructure availability
- Availability of the required skills
- Globalisation
- Statutes and regulations
- Procurement methods and sustainable empowerment capacity
- Accessibility to affordable mortgage/credit and interest rates
- Poverty

- Failure rate of enterprises is very high
- Increases in building materials costs
- Potential of the public sector

A study carried out on South African construction projects by KPMG reported that seventy seven percent of the respondents reported underperforming projects in their organisations. The main sources of underperforming projects in South Africa reported in that KPMG annual report are listed below (KPMG, 2013).

- Project Delay
- Poor estimating practices
- Failed risk management processes
- Poor subcontractor performance
- Design errors and omissions
- Lack of available resource
- Change in project management team
- Poor client relations`

Figure 1 below indicates the main causes of underperforming projects with percentages. The report concluded that project delays are deemed the main cause of underperforming projects.



**Figure 1: Global Construction Survey Report (KPMG, 2013)**

There is tendency of project managers monitoring quality, time and cost but forsaking other management issues within projects (Pennypacker and Grant, 2003). Other useful systems such as critical path methods, Gantt charts and Programme Evaluation and Review Technique (PERT) monitors quality, cost and time but do not track project soft skills (Pinto, 1990). From literature, it is noted that project managers still face a huge task of trying to make sense of the wide variety of human, technical and budgetary issues in projects. It is a necessity that organizations commit to establishment of CSFs as this can cause the organizations to increase their chances of project success. The study carried out by Pinto and Slevin is currently the leading study in the field of CSFs in project success (Pinto and Slevin, 1988).

This report utilizes project implementation profile (PIP) tool formulated by Pinto. It is well known for its worldwide reputation and easiness to use. The tool can be used to monitor and track the project's soft skills. The project manager is then able to track project performance in relation to the human elements (Pinto, 1990). It also puts the manager at a position of being able to execute strategic project implementation techniques to deliver successful projects (Pinto, 1990). Literature however acknowledges that there is a

generalization of the ten CSFs across the different types of projects (Pinto, 1990). Table 2 below gives brief descriptions of the 10 CSFs discovered in the PIP tool.

**Table 2 :Ten CSFs for project success (Pinto, 1990)**

<b>CSF</b>	<b>DESCRIPTION</b>
1. Project Mission	Clearly defined objectives and goals before commencement of project
2. Top Management Support	Commitment from top management. They authorize the project and provide resources for project success
3. Project Schedule	A detailed plan of action for project implementation
4. Client Consultation	Effective communications with the client throughout all project phases
5. Personnel	Project team members recruitment, appointment and development training
6. Technical Tasks	Accomplishment of technical activities through use of expertise with technological knowhow
7. Client Acceptance	The acceptance of the end product by end users
8. Monitoring and Feedback	Project control measures to check if the project is still on track across all phases
9. Communication	Effective management of communications taking place amongst project key stakeholders
10. Trouble-Shooting	Capabilities of handling unforeseen deviations and troubles

A conclusion was drawn that projects are unique and each one has its own CSFs and have differing importance dependent on the project type, organizational structure and project phases (Belout and Gauvreau, 2004).

## 1.2 Research Problem

The Project Implementation Profile (PIP) tool was not developed for the specific needs of the construction projects.

### 1.3 Problem Statement

Below is the problem statement to be investigated in this dissertation:

*How well does the PIP tool profile support successful modern construction projects?*

### 1.4 Research Questions

In order to address the research problem stated above, the research questions for this dissertation will be as follows:

1. How applicable are the success factors from the PIP tool in delivering successful modern construction projects?
2. Are there other key success factors that can be considered for inclusion in the PIP tool for modern construction industry projects?

### 1.5 Research Proposition

The research proposition for the research is stated as follows:

*A modified PIP with revised critical success factors can improve the proportion of successful projects in the modern construction industry.*

### 1.6 Research Purpose

Considering the research questions listed above, the purpose of this research is as follows:

Evaluate the applicability of the current PIP to the modern construction industry. The research also aims to identify any new critical success factors (CSF) to deliver successful projects.

### 1.7 Contribution of the Research

- It aims to make project managers aware on what are the CSFs to deliver successful construction projects.
- The construction industry might benefit from this framework at large.
- The research aims to provide a foundation upon which additional research can be conducted to examine further critical success factors.

## 1.8 Proposed Methodology

The methodology to execute the research and meet the objectives stated above would be as follows:

- Conduct a literature review to identify other critical success factors.
- Develop and administer a questionnaire with the critical factors.
- Use a quantitative approach to gather data through a web based tool.
- Summarize, analyze and discuss collected information.
- Draw up a conclusion to the research.
- Recommend any future studies or study areas.

## 1.9 Research Limitations

Various limitations exist and may try to hinder the success of the research, these are listed below:

- Data collection is a time consuming activity and with the limited timeframes of the research, any delay on data collection may result in delay in the analysis and conclusions.
- Access to experienced project managers in the construction industry.
- Participants may pass subjective opinions which may not reflect the actual result.
- Project managers may not be willing to participate as the information required could be termed sensitive or confidential leading to missing vital information.

Modern construction projects are evolving and because of continuous project failure in meeting set targets and stakeholder requirements, there is a need to research in this field of project critical success factors tracking tools. The current PIP tool is not sufficient as the success factors differ according to the industry type. The success factors in an Information Technology project would not necessarily be the success factors on a construction project. This research aims to add onto the existing Project Implementation Profile framework focusing on construction projects.

## 1.10 Structure of Report

### **Chapter one: Introduction**

A brief description of the background leading to the research topic will be given. It also includes introduction to the construction industry and the project implementation profile. Problem statements, research questions, research aims, objectives, methodology and limitations are also discussed in this chapter.

### **Chapter two: Literature review**

An in depth literature review of the subject matter may be carried out. Critical success factors may be uncovered from different literature sources.

### **Chapter three: Research Methodology**

Research methodology gives a brief description of how the research may be executed. Methodology of obtaining the data and information received may be analyzed to help come to a conclusion.

### **Chapter four: Results**

The data/information is presented in this chapter.

### **Chapter five: Analysis of results**

The results presented in chapter four will be analyzed. A brief discussion will explain the analysis of the results.

### **Chapter six: Conclusions and Recommendation**

The research is concluded and recommendations are made for future study areas.

## 2. Literature Review

There is a need to define a project and also distinguish success factors from success criteria, distinguish project management success from project success to kick off a discussion on project successes (Cooke-Davies, 2002). The literature review discusses CSFs' features and also describes the PIP tool before identifying the construction project success factors from various literature sources.

### 2.1 Project

A project is when nonhuman and human resources are brought together for temporal activities to attain set goals. Projects have a beginning and an end, a set budget, a mission and consists of complex interrelated activities to produce the product (Cleland and Kerzner, 1985). Having the time limits, projects have to be accomplished to meet the stipulated specifications (Munns and Bjeirmi, 1996; Project Management Institute, 2013).

### 2.2 Project Management

It is defined as the series of actions on controlling and involves application of knowledge, skills, tools and techniques to project activities to meet project requirements (Project Management Institute, 2013). It makes use of the structures in the organizations and resources without negatively affecting other functions of the organisation (Munns and Bjeirmi, 1996).

It also defines the work and establishes the extent of the work thereafter plans for works execution and allocates the required resources (Belout and Gauvreau, 2004). The progress of the project is then monitored and adjustments of the work plans are done as the project proceeds. This field was brought about through interactions, writing and combined activities of academics, practitioners and consultants (Parker, 2000). It has been noted as an important activity across various organizations (Shenhar and Dvir, 1996). Project management is the best methodology to use when organizations want to execute one-time defined projects or complex projects (Avots, 1969).

An integration of various management processes can bring about successful projects (Shenhar and Dvir, 1996). Despite the worldwide use of project management activities,

there is mention of the immaturity of literature in project management and it suffering from lack of theories to support the literature (Shenhar and Dvir, 1996). Noted in various books is the wide use of generic planning, organizing, controlling and monitoring activities (Shenhar and Dvir, 1996).

### 2.3 Project Life Cycle

Project life cycle is a sequence of phases from inception to project closure. Project life cycles helps project team managers understand the activities fully and leads to budget setting for the project (Pinto and Slevin, 1988). A project life cycle follows five key phases discussed in brief below.

**Initiating Process.** This is the initial project stage (Westland, 2007). In this stage processes are executed to define the viability of executing new projects or continuation of an existing project. The initial scope is defined and initial financial resources are committed, internal and external stakeholders who will interact and influence the overall outcome of the project are identified (Project Management Institute, 2013). Top management normally grants permission to commence with the project or phase as this signifies budget approval. Goals and mission is setup at this phase together with the preliminary methodology of works execution.

**Planning Process.** This is the second phase in which the project goes through. The group consists of those processes performed to establish the total scope of the effort, define and refine the objectives and develop the course of action required to attain those objectives (Project Management Institute, 2013). The actual plan of action for project execution to meet set goals is drawn up. The plans are also made formal and approved at this stage. As the planning activities go underway, allocation of resources takes place as well as scheduling and budgeting for the project (Pinto and Slevin, 1988).

**Executing Process.** At this stage, works are executed as defined in the plans to meet the project specifications. Resources and materials are sourced and the construction takes place (Pinto and Slevin, 1988).

**Monitoring and Controlling Process.** This is not necessarily a stage, it occurs throughout the project phases. The project goes through tracking, reviewing and regulating its performance

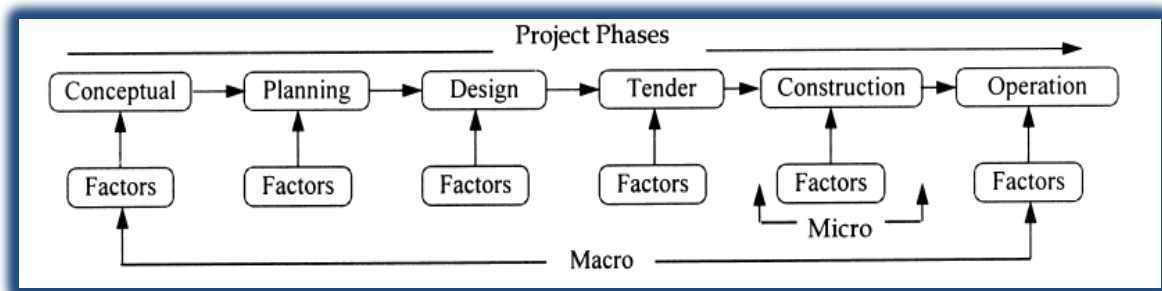
**Closing Process.** This is the final phase of the project cycle. It involves all processes executed to close off all activities across the project. On project completion, resources are released and the project is handed over to the client or the end-user, project team members are also assigned other roles somewhere else (Pinto and Slevin, 1988).

There is a variation in the significance of the PIP factors across project phases (Schultz *et al.*, 1987). The relative impact of the critical success factors on project success are subject to change at different points in the project.

## 2.4 Project Success vs Project Management Success

Project management success and project success are not necessarily directly related although success of project management has often been associated with project success (Munns and Bjeirmi, 1996). A clear distinction between the two is needed (De Wit, 1988). Success differs depending on the specific point of view of the stakeholder (Shenhar *et al.*, 2002). A project may be viewed as a success by the project implementation team yet the customers could reject the end product (Pinto and Slevin, 1988).

It is noted that success is viewed as either macro or micro (Lim and Mohamed, 1999). The distinction being that macro viewpoint is viewed by users and stakeholders yet micro viewpoint deals with the project success in smaller component levels and is viewed by the construction parties i.e. the developer and contractor. The macro and micro affect the success factors across the project phases as indicated in figure 2 below.



**Figure 2: Macro and Micro views across project phases (Lim and Mohamed, 1999)**

Project success and project management success differ on the unit of measurement. Project management has used the common quality, cost and time as a scale of measurement for success yet project success has been measured against the project mission (De Wit, 1988).

There is also an emphasis on the differing objectives across project success and project management success (Munns and Bjeirmi, 1996).

Coming on within budget, on time and having met the specifications is the definition of project success (Munns and Bjeirmi, 1996). The iron triangle criteria is the commonest method of measuring success of projects (Atkinson, 1999).

## 2.5 Project Success Criteria vs Success Factors

Project management researchers and practitioners for some time have listed the topic of CSFs leading to success in projects on the top of their list (Hartman and Ashrafi, 2004). However there needs to be a clear differentiation of success criteria against success factors definitions (Cooke-Davies, 2002). Success criteria is the standard of judgement yet factors are a set of influential contributors to a successful end product (Lim and Mohamed, 1999). Criteria is a measure by which success or failure of a project or business may be judged as distinguished from a success factor, which are those inputs to the management system that lead directly to the success of the project or business (De Wit, 1988). There are also dependent variables that measure success (Söderland *et al.*, 2012). Project success factors may be seen as inputs to the management system leading directly or indirectly to the success of the project, the factors increase the likelihood of success when influenced (Söderland *et al.*, 2012).

The application of cost, time and quality as criteria has resulted in lots of projects categorized as failures (Atkinson, 1999). It limits the criteria for determining project success. Projects can meet cost, quality and time yet the intended purpose is not met. The common assessment of the success of construction projects is that projects are delivered on time, to budget, to technical specification and meet client satisfaction (Morris and Hough, 1987; Pinto and Slevin, 1988). The criteria for success are wider, incorporating the performance of the stakeholders, evaluating their contributions and understanding their expectations (Atkinson *et al.*, 1997; Wateridge, 1998). With stakeholders meeting their requirements, successful construction project performance may be achieved (Atkinson *et al.*, 1997).

## 2.6 Key Success Factors

Key Success Factors are project elements influenced by project management to enhance the probability of achieving successful projects (Andersen *et al.*, 2006). CSFs are those few key areas of activity in which favorable results are absolutely necessary for a particular manager to reach goals (Rockart, 1979). CSFs are also defined as those measures which result in the organizational success (Ketelhöhn, 1998). The critical success factors are indicative of the subjects which could make the organization successful; if there is deficiency or lack in these fields, the organization would fail in achieving its goals (Syedsalehi, 2010). The current CSF are too general and do not contain specific enough know-how to better support project managers' decision-making hence the rate of failed projects still remains high (Zwikael and Globerson, 2006). Various researchers have tried coming up with the critical success factors as indicated in the Table 3 below. From the studies, it is established that there is evidence that there are similarities in the CSFs identified by various researchers. The various factors could be grouped into simpler general factors.

**Table 3: CSFs (Belassi and Tukel, 1996)**

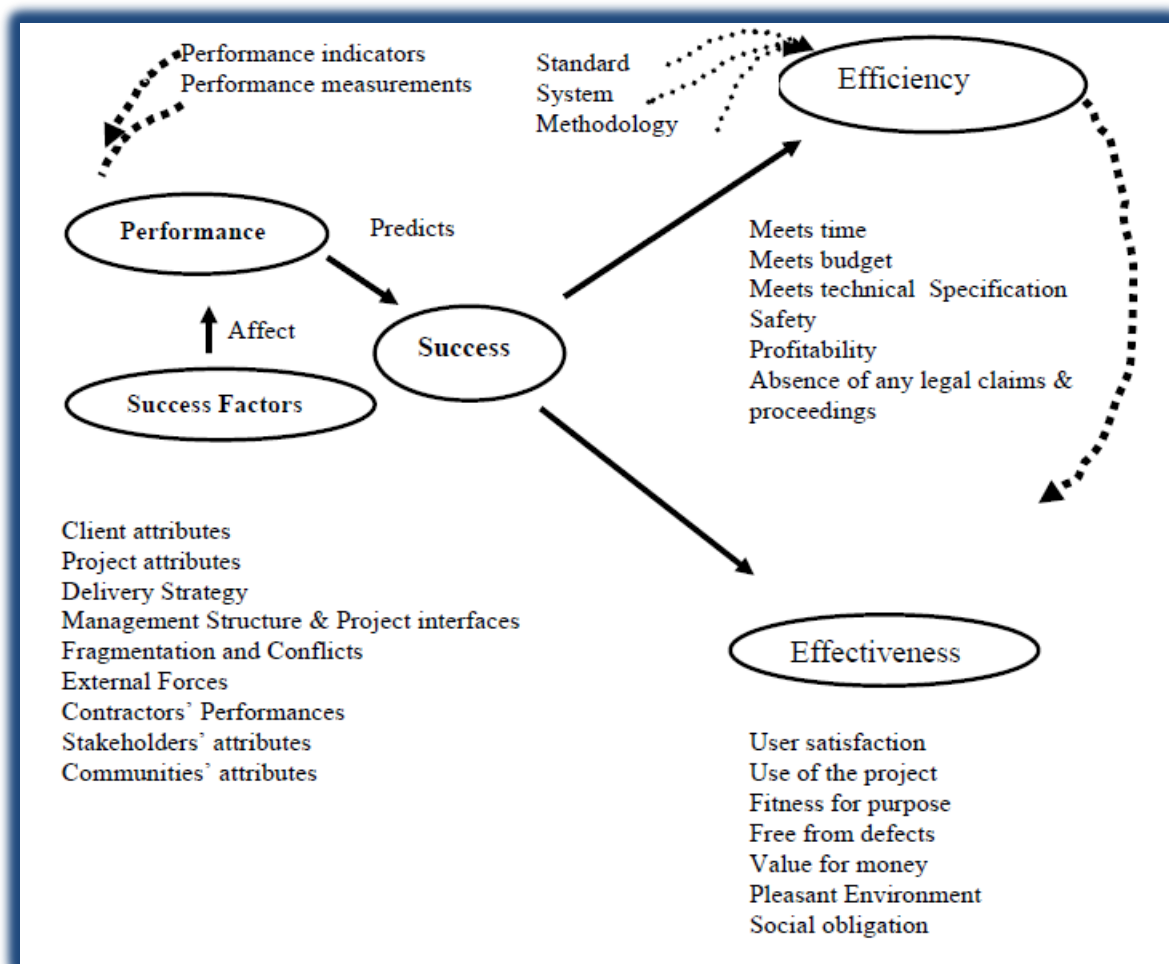
<b>Martin (1976)</b>	<b>Locke (1984)</b>	<b>Cleland and King (1983)</b>	<b>Sayles and Chandler (1971)</b>	<b>Baker, Murphy and Fisher (1983)</b>
Proper goals	Proper communications and procedures	Information and communication channels	Monitoring and feedback	Absence of bureaucracy
Organizational doctrine	Control mechanisms in place	Logistic requirements	Continuing involvement in the project	Goal commitment of project team
Planning and review	Transparency of project commitments	Project summary Operational concept	Project manager's competence	Adequate budgets
Project team selection	Project authority from the top	training and development of personnel	Effective communication	Clear goals
Support from management	Progress meetings	Top management & Financial support	Scheduling	Planning and control mechanisms Task
Adequate resources	Competence of project manager	Facility support	Control systems and responsibilities	Adequate project team capability
Delegation of authority		Market intelligence		Minimum start up difficulties
Provision of control and information mechanisms		Project schedules		On-site project manager
		Manpower and organization		
		Project review		

From Table 3 above, general critical success factors listed below are seen to emerge from different literatures which are:

- Effective communication
- Monitoring and controlling mechanisms
- Project team members competence
- Client's responsiveness

- Top management support
- Competent Project Manager
- Clearly defined goals
- Adequate resource allocation
- Feedback capabilities

Figure 3 below shows the interrelationships between project success, project factors and project performance. Performance predicts project success and success factors affects performance (Cooke-Davies, 2002). The element of success in a project refers to efficiency and effectiveness measures (Pinto and Slevin, 1994).



**Figure 3: Interrelationship between project success, project factors and project performance (Takim and Akintoye, 2002)**

Analysis of potential causes of failure or success in projects can aid the identification of CSFs (Pheng and Chuan, 2006). CSFs may be used as a decision framework that assist other organizations to make a choice regarding strategic standing on the project (Songer and Molenaar, 1997). It also enables the effective allocation of limited resources such as time, manpower and budget for the project (Chua *et al.*, 1999). It is important for the project management team to comprehend the critical factors which are likely to enhance the probability of success. Once project team members are well aware of project success factors, they easily identify and prioritize critical issues associated with implementing the project plan (Clarke, 1999).

## 2.7 Project Implementation Profile

The search for factors that influence project success or failure has been of great interest to both researchers and practitioners (Pinto and Mantel Jr, 1990). Several lines of research exist in a growing body of literature dealing with the subject, all of it an attempt to develop methods to aid project managers to evaluate their projects, if not objectively, at least systematically (Pinto and Mantel Jr, 1990). The project implementation profile (PIP) (Pinto and Slevin, 1988) made a valuable contribution to the field of project management in so far as demonstrating how to use critical success factors to diagnose a project's status (Andersen *et al.*, 2006). It has provided a solid foundation for subsequent research.

The PIP tool was developed for the purpose of monitoring and interpreting the state of a project by assessing the project condition throughout its lifecycle (Pinto and Slevin, 1988; Pinto, 1990). Its main advantage is providing the project manager with a clearer sense of the overall project strategy, as well as addressing the 'softer' aspects of the project (Pinto, 1990). PIP also gives project managers the opportunity to focus some of their attention on the strategic issues of project development (Pinto, 1990). Analysis using the PIP tool can be performed at any stage of the project lifecycle (Pinto and Slevin, 1994).

A total of over 50 project managers who had some project involvement within their last two years were approached to provide information on successful projects that they had worked on (Pinto, 1990). They were asked on what things they would change to aid the project success and would substantially help implementation success. The process was repeated until the information was then placed into categories and they came up with the 10 critical

success factors. Percentile scores based on more than 400 projects were developed to allow the project manager to monitor and track performance in comparison to a database of other successful projects (Pinto, 1990). The set of projects used in the development of the PIP tool were as follows:

- 180 construction projects (44% of the total sample)
- 40 hardware, appliance development projects
- 57 food, drug, or soft goods development projects
- 60 new or improved software development projects
- 12 service or test projects
- 13 feasibility study projects
- 17 departmental reorganization projects or movement to a new facility
- 29 miscellaneous projects

The PIP tool comprises of five questions per each success factor. An eleventh factor with 12 questions was introduced to give the overall project performance measure. Each of the 62 questions has a Likert scale measure from 1 point to 7 points with 1 point being strongly disagree and 7 points strongly agree. The scores are then summed up for each success factor to give a total score. Consensus is then used to establish an accurate assessment of the project status. Low scores that fall below the fiftieth percentile indicate future problem areas. At each project monitoring point, the project manager and significant members of the project team each fill out the PIP's 62 questions (Pinto, 1990). To eliminate any outliers, Pinto mentions the need to collect information from a wide range of project members. A table of the rating to percentile score is included in Appendix A.

## 2.8 PIP Shortfalls

A strong demand exists for a tool that may be used specifically to track construction projects and measure their success effectively. Several limitations with the implementation and applicability of the tool were identified with an ongoing need to measure project success.

Previous research has noted difficulties experienced when the success factors are utilized in developing countries because the factors are too specific and general. Managerial skills and

knowledge infrastructure are not available in these developing countries (Duy Nguyen *et al.*, 2004).

A set of CSFs may not be transferable to another project due to the differences in environmental variables, the nature of the project, the nature of the participant's organization and the prioritization of project goals (Duy Nguyen *et al.*, 2004). Different sets of success factors can be obtained from different project types in different industries (Pinto and Mantel Jr, 1990). From various project management literatures, there is a notion that projects are similar and therefore should be handled exactly the same. Failure in projects may vary depending on the project type under investigation (Pinto and Mantel Jr, 1990). The reality of project management styles seem universal yet projects exhibit considerable variations (Shenhar and Dvir, 1996).

## 2.9 10 key success factors identified by Pinto

Below is the 10 (ten) key success factors identified by Pinto and a brief description of each factor.

### **1. Project Mission**

Project mission factor involves the initial clarifying of project goals and project general direction i.e. objectives of project (Pinto and Slevin, 1994). Project mission needs to be understood clearly well by all project stakeholders, this creates buy in from everyone. The project mission has to be clearly defined as organizational resources would be invested into the project and commitments made to the project (Pinto and Slevin, 1988; Pinto, 1990). When the project mission is clear, it is easy to measure whether the project is a success or not by looking back at the project mission.

### **2. Top Management Support**

Top management through emotional support and investment is a necessity once the project mission has been established. Support can be in vocal, visible as well as inputting resources. In times when the project goes through difficult periods, top management is quite crucial as they may add more resources to extinguish the problem (Pinto and Slevin, 1988). Top management has to be convinced that the project is necessary and that it will succeed.

### **3. Project Schedule**

Project schedule is the workable plan that necessitates project success. Resources are allocated to activities regarding the use of the project resources, the necessary timelines and the milestones that are to be met to achieve project success. Successful projects are as a result of detailed project schedules that are realistic. There are realistic cash flows, resources allocations and time allocations that guide the project to success through the project phases (Pinto and Slevin, 1988; Pinto, 1990).

### **4. Client Consultation**

Client Consultation refers to the continuous communication between the client and project team. Any end user of the final product of the project is regarded as the client (Pinto and Slevin, 1988). Major clients must be identified and should make sure that their needs are met. It is important to execute client consultation as this makes client aware of any deviations or changes to the scope. This makes it easier for the client to approve the end product as they will make use of the end product. Client consultation has benefits of keeping the relationship maintained between the client and other relevant project stakeholders (Pinto and Slevin, 1988).

### **5. Personnel**

Personnel factor includes recruitment, selection and training of human resources allocated to the project. It is also concerned with developing competent project members through training and development so that they can be able to execute their roles (Pinto and Slevin, 1988). If the necessary resources are not procured, the project could fail (Pinto and Slevin, 1988). Project success is greatly affected by poor team performance and issues regarding personnel.

### **6. Technical Tasks**

Competent project personnel have to run projects as they bring in an understanding of the projects. Competent personnel with relevant technological knowhow and necessary skills relevant to the project (Pinto and Slevin, 1988). The project manager must ensure that the correct technical problems are assigned to the right people who have adequately

documented and detailed the required technology (Pinto and Slevin, 1988). The technical tasks of the project need to be completed by adequate technical resources that possess a deep understanding of the technical requirements to achieve project success (Pinto and Slevin, 1988).

### **7. *Client Acceptance***

This is the satisfaction, approval and use of the end result of a project by the client. It is important to consider client acceptance throughout the project lifecycle this helps reduce the risk of the client not accepting the end result of the project (Pinto, 1990).

### **8. *Monitoring and feedback***

Across different project phases, feedback in terms of performance has to be sent to key stakeholders. This project control processes compares the progress to date to the original project plans for the stakeholders to execute informed judgement about the project (Pinto and Slevin, 1988). Proper monitoring and feedback mechanisms need to be set in place to track the project.

### **9. *Communication***

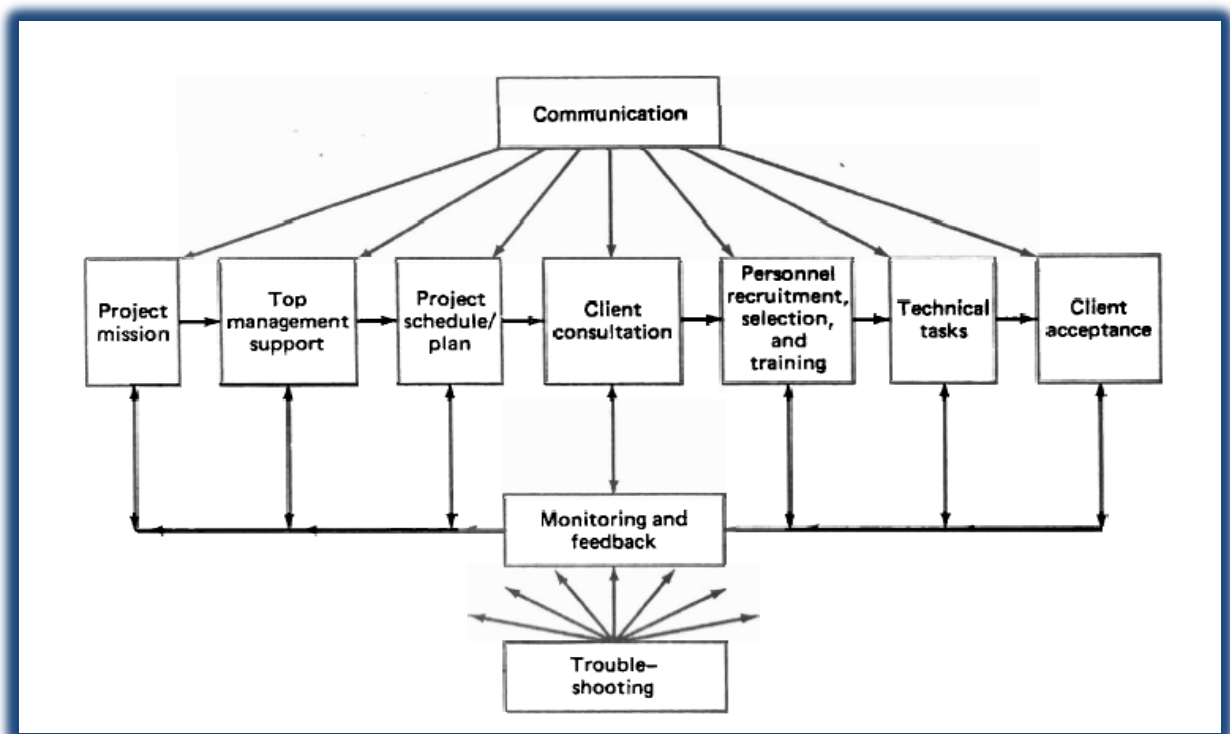
Communication factor is crucial to achieve project success. Communication is the exchange of information amongst people. There needs to be effective means of communication between project stakeholders either internal or external throughout the project lifecycle. Project success is strongly linked to stakeholder cooperation and effective communications (Diallo and Thuillier, 2004).

### **10. *Trouble-shooting***

It is possible to experience problems on a project, and troubleshooting refers to procedures to deal with the problems faced. Potential areas of trouble are picked up early in the project, which makes it easier to solve the problem in time other than reacting to problems only after they have arisen (Pinto and Slevin, 1988).

## 2.10 Framework

A framework has also been developed by Pinto and Slevin that shows the inter-relationships amongst the above 10 CSFs. Figure 4 below shows the framework with arrows indicating flows and sequences of how the factors are interlinked. The researchers emphasize the necessity of CSFs being examined taking into consideration the relationships existing amongst themselves against the impacts that they have individually on successful implementation (Pinto and Slevin, 1988). Examples of the link are as follows; to obtain top management support, it is critical that the mission and goals of the project be in place. Benefits to be realized from the project should be stipulated. Another example is that lack of client consultation from the early phases of the project greatly reduces client's chances of accepting the end product (Pinto and Slevin, 1988). To ensure project success, there is a need of a holistic approach to the area as there is inter-dependence amongst the key success factors (Clarke, 1999).



**Figure 4: Framework for critical success factors (Pinto, 1990)**

## 2.11 Construction Project Success Factors from Literature

On completion of a construction project in accordance to the client and end user's satisfaction, to desired specifications, within the allocated funds and contractual time agreed on, then the project is termed a success (Duy Nguyen *et al.*, 2004). There is a strong emphasis on the necessity to establish a group of standard CSFs that can be utilized by the project manager and the construction project team members in delivering successful construction projects (Toor and Ogunlana, 2008).

There is acknowledgement that the project management field has played a significant role in delivering successful projects but there is however other key factors outside the project manager's control. Other factors would include proper project planning, project manager's competencies, proper definition of project needs as well as managing information flow and adequate scope change mechanisms (Munns and Bjeirmi, 1996).

Across different research studies, different project boundary conditions exist across projects and its uniqueness has developed in the lack of agreement on the CSFs for the construction projects (Duy Nguyen *et al.*, 2004). Every project has different goals therefore each project should have its own set of success factors which cannot be simply moved to another project (Liu and Walker, 1998). Although projects may have the same characteristics, they will still have different success factors (Belout and Gauvreau, 2004). Specific factors and general factors affecting construction project success have been proposed by researchers (Chua *et al.*, 1999). In another research, the critical success factors were divided into four main groups as indicated below (Belassi and Tukel, 1996).

- External environment dependent factors
- Project dependent factors
- Team members and project manager dependent factors
- Organizational structure dependent factors

There is an interrelationship between these groupings of the factors. A group may influence a factor in another group and a combination of several factors from various groups might lead to project failure (Belassi and Tukel, 1996).

Project dependent factors are factors dependent on the project characteristics. Characteristics such as project's uniqueness, project value and size of the project. Also to be considered is the network density within the project, project phases and the duration of the project (Belassi and Tukel, 1996).

Team members and project manager dependent factors these are factors linked to competencies, characteristics and skills of the project team members as well as the project manager (Belassi and Tukel, 1996).

Organizational structure dependent factors these are factors dependent on the organization's structure (Belassi and Tukel, 1996).

External environment dependent factors are external factors impacting the organization.

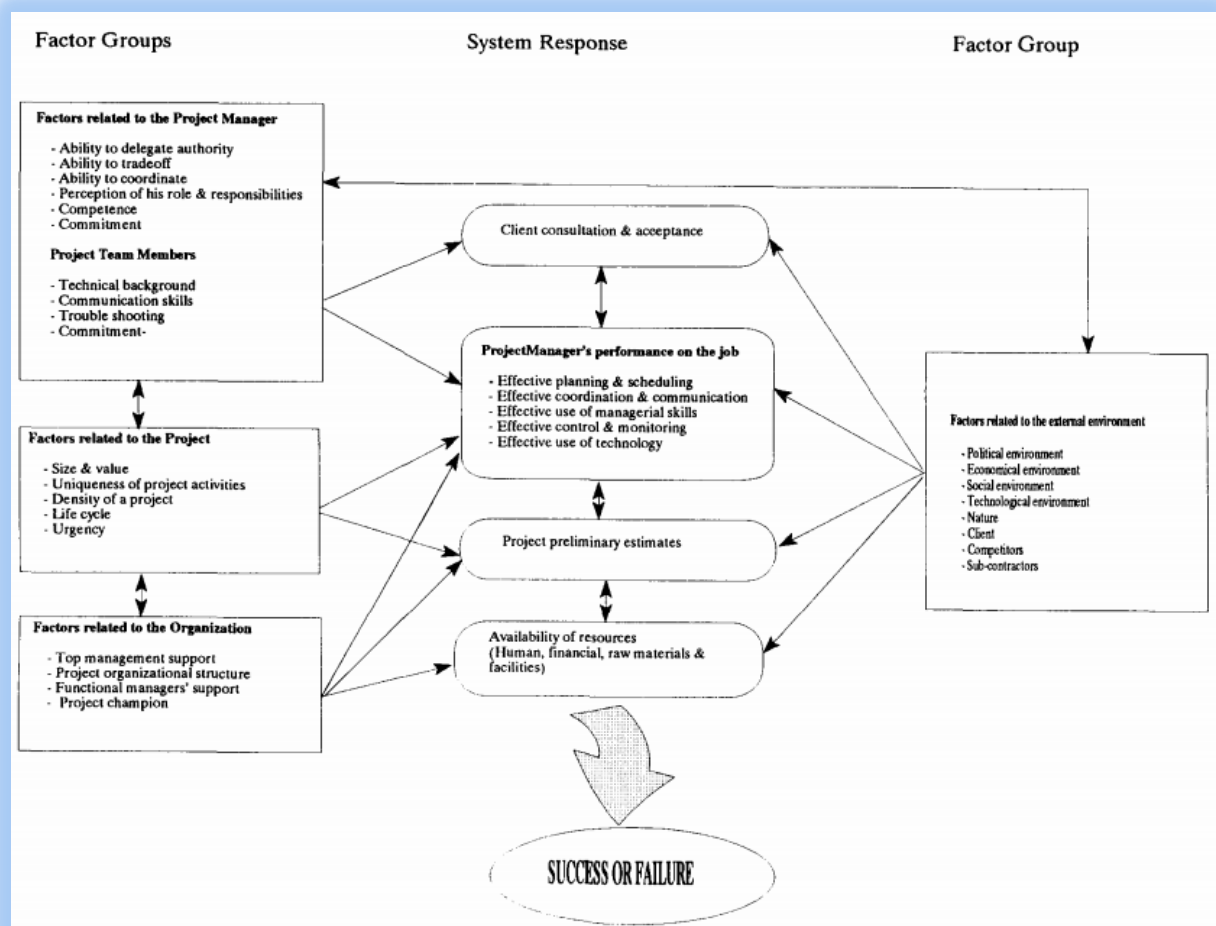


Figure 5: Factor groups (Belassi and Tukel, 1996).

Figure 5 above shows the factors related to the project manager, team members, project, organisation and external factors. It also shows the link between these various factors.

Following an investigation into 75 construction projects, more contractors' construction control meetings, proper programme of works and reducing the team turnover came up as important success factors in organizations (Esmaeili *et al.*, 2014).

Investigation into CSFs by Chua (1999), led to the identification of CSFs for various project objectives which included quality, adequate schedule and adequate budget (Chua *et al.*, 1999). The study identified other factors that were then grouped into project participants' category, project characteristics category, contractual agreements category and interactive process category.

Between 1994 and 2000 a study carried out by Cooke-Davies on 136 projects identified factors that are important to deliver successful projects (Cooke-Davies, 2002). The report mentions the need of risk management education for the company as well as maturity of risk ownership processes with the company. A risk management plan needs to be kept up to date together with the risk registers. Responsibilities of the organization on the project documentation need to be adequate. A scope change control process must be followed whenever there is a change in scope and there is a mention of keeping projects below 3 years in duration. There is need to keep the co-operation between the line management and project management (Cooke-Davies, 2002).

A study investigating public sectors' project success factors discovered that constraints imposed by the client and needs of the end-users, client's capabilities, reliability and risk assessment, contractors' capabilities are important (Chan *et al.*, 2004). The study suggests that practitioners should have more attention to partnering and team work to deliver successful projects.

Table 4 below indicates the various categories of construction projects and their key success factors (Esmaeili *et al.*, 2014). The projects are categorized into standard delivery methods, private-public partnerships and the build-operation-transfer models (Esmaeili *et al.*, 2014).

The first is that the inter-relationships between factors are at least as important as the individual factors but the CSF approach does not provide a mechanism for taking account of

these inter-relationships (Fortune and White, 2006). The factor approach tends to view implementation as a static process instead of a dynamic phenomenon, and ignores the potential for a factor to have varying levels of importance at different stages of the implementation process.

**Table 4: CSFs for different methods of project delivery (Esmaeili *et al.*, 2014)**

Categories	Critical Success factors
Standard Project Delivery Method	<ul style="list-style-type: none"> <li>Project characteristics</li> <li>Client's competencies</li> <li>Adequate contractor's plant and equipment</li> <li>Commitment of the project team</li> <li>Use of innovative project management approaches</li> <li>Risk management</li> <li>End-users' requirements</li> <li>End-users' constraints</li> <li>Contract period allowed for during tender</li> <li>Effective project management action</li> </ul>
Build-Operation-Transfer (BOT)	<ul style="list-style-type: none"> <li>Entrepreneurship and leadership</li> <li>Financial package differentiation</li> <li>Identification of the right project</li> <li>Advantage of technical solution</li> <li>Guarantees difference</li> <li>Consortium strength</li> </ul>
Public-Private-Partnership (PPP)	<ul style="list-style-type: none"> <li>The private member of the consortium must be strong</li> <li>Proper risk share</li> <li>Economically feasible</li> <li>Availability of financial market</li> <li>Environment favorable for investment</li> <li>Adequate package</li> <li>Contractual arrangements with appropriate risk share</li> <li>Strong technical strength capability</li> </ul>

Stability of the business environment, politics and economy within an area also affects success of projects. There exists a need of a technical and management personnel of high quality that takes into account risk management for projects to succeed (Takim and Akintoye, 2002).

Project values, realistic and definite goals, implementation processes, client satisfaction, availability of the market, profitability are some of links to successful projects (Morris and Hough, 1987). Figure 6 below summarizes the list of additional factors for partnering processes.

Studies	Critical Success Factors		
Cheng et al. (2000)	<i>Management skills:</i> <ul style="list-style-type: none"> <li>• Effective communication</li> <li>• Conflict resolution</li> </ul>	<i>Contextual factors:</i> <ul style="list-style-type: none"> <li>• Adequate resources</li> <li>• Management support</li> <li>• Mutual trust</li> </ul>	<ul style="list-style-type: none"> <li>• Long term commitment</li> <li>• Coordination</li> <li>• Creativity</li> </ul>
Black et al. (2000)	<ul style="list-style-type: none"> <li>• Trust</li> <li>• Communication</li> <li>• Commitment, a clear understanding of roles</li> <li>• Consistency and flexible attitude</li> </ul>		
Cheng and Li (2002)	<i>Formation:</i> <ul style="list-style-type: none"> <li>• Top management support</li> <li>• Mutual trust</li> <li>• Open communication</li> <li>• Effective coordination</li> <li>• Facilitator</li> <li>• Team building</li> <li>• Partnering agreement</li> </ul>	<i>Application:</i> <ul style="list-style-type: none"> <li>• Top management support</li> <li>• Mutual trust</li> <li>• Open communication</li> <li>• Effective coordination</li> <li>• Joint problem solving</li> <li>• Partnering goals' achievement</li> <li>• Adequate resources</li> <li>• Creativity</li> <li>• Workshops</li> </ul>	<i>Reactivation:</i> <ul style="list-style-type: none"> <li>• Top management support</li> <li>• Mutual trust</li> <li>• Open communication</li> <li>• Effective coordination</li> <li>• Long-term commitment</li> <li>• Continuous improvement</li> <li>• Learning climate</li> <li>• Partnering experience</li> <li>• Joint problem solving</li> <li>• Adequate resources</li> <li>• Workshops</li> </ul>
Chan et al. (2004)	<ul style="list-style-type: none"> <li>• Establishment and communication of a conflict resolution strategy</li> <li>• A willingness to share resources among project participants</li> <li>• A clear definition of responsibilities</li> <li>• A commitment to a win-win attitude</li> <li>• Regular monitoring of partnering process</li> </ul>		

**Figure 6: Partnering process' CSFs (Esmaeili *et al.*, 2014)**

Another study on the building construction industry, identified that at planning and design stages, there is a need for valuable optimization of information from project stakeholders. The project stakeholders need to be a well-organized project team that works as a unit in harmony with each other and a system needs to be setup to allocate risk and reward accurately on their contracts (Sanvido and Paulson, 1992). There is also mention of the importance of previous experience in the similar projects.

Construction projects differ from one another in many ways. These projects are executed in different geographic locations with different environmental and ground conditions. They possess project teams of differing composition depending on the project type and also various constraints of resources are experienced. There is also mention of the need for availability of competent contractors, suppliers or subcontractors, managerial expertise and other local technical expertise (Toor and Ogunlana, 2008).

An investigation on the frequency of mention of the CSFs cited across 63 publications came up with results listed in Table 5 below. It is noted that there is no system taking account of the inter-relationships that exists between factors yet these inter-relationships are equally significant as the single factors (Fortune and White, 2006). Factors in the top half of the list are very much related to the 10 KSFs in the PIP tool. At the top of the list is a clear goal and according to PIP tool this is the project mission. Support from senior management and realistic schedule are also on the PIP tool list.

As a result of their work provided a list containing twenty-seven critical factors. The following table presents the CSF identified across 63 publications in descending order of frequency.

**Table 5: Frequency of mention of the CSFs (Fortune and White, 2006).**

<b>CFSs</b>	<b>Count</b>
Clear goals/objectives	206
Schedule must be realistic	185
Senior management supports	176
Adequate budget and resources	164
Commitment from the end user	159
Effective communications	144
Leadership and conflict resolution capabilities	138
monitoring and feedback	135
Change management	133
Experience on previous performances	121
Ability to deal with complex issues	121
Ability to deal with external influences	120
Team motivation and building	117
Risk management	117
Provision of training	98
Contextual awareness	94
Provision of planning and control systems	88
Acknowledgement of human error effects	53
Consideration of multiple views on project	47
Competencies of project team	8
Further factors	7
Previous experience in the same field	3
Support from stakeholders	3
Project boundary clearly laid out	2

Fortune and White research investigated 63 publications focusing on CSFs and came up with key success factors (Attached in Appendix) (Fortune and White, 2006).

## 2.12 Factors from failed construction projects

Paying careful attention to the factors causing project failure may help avoid failure (Avots, 1969). Some reasons for project failures are listed below (Avots, 1969):

- Project lacking commitment from members
- Tasks not properly defined
- No proper project closedown plan
- Project manager competencies
- Lack of support from top management
- Project management techniques non-existent
- Misuse of management techniques
- No proper basis for executing the project

A study on 282 project managers identified that planning processes are crucial for projects success. Proper project plans needs to be developed which shows a clearly defines activities and processes to be executed, communication plan showing how communications will be managed, schedules also need to be developed indicating the acquisition of staff and the overall plan of the organization (Zwikael and Globerson, 2006).

Another research on the CSFs on huge construction projects in Thailand found that client involvement, adequate project personnel, proper project scheduling and controlling were deemed to be influential for the projects to be successful (Toor and Ogunlana, 2008). Also mentioned was the issue of awarding the contract to the right designers and right contractors to implement the contract, need of understanding of the project mission amongst the project stakeholders, effective and proper communication amongst the project teams and also sufficient resources to be placed on the projects(Toor and Ogunlana, 2008).

From the literature, it may be seen that some factors are the same from different literatures. An effective list of KSFs is drawn from literature through strongly assessing and grouping the synonymous factors to form tight 10 KSFs

## 2.13 PMBOK Guide

The Project management Institute (PMI)'s Project Management Body of Knowledge (PMBOK Guide) is a standard/guide developed by the Institute. It is a widely accepted standard in the project management field and is the most popular. It is an internationally recognized standard that provides the fundamentals of project management that are applicable to a wide range of projects. It comprises a collection of processes and knowledge areas generally accepted as best practice within the project management discipline. The standard is reviewed every four years.

The basic concepts are applicable to projects, programmes and operations. The five basic process groups are:

1. Initiating
2. Planning
3. Executing
4. Controlling and monitoring
5. Closing

Processes overlap and interact throughout a project or phase. Processes are described in terms of inputs, tools and techniques and outputs.

The nine knowledge areas are:

1. Project Integration Management
2. Project Cost Management
3. Project Quality Management
4. Projects Stakeholder Management
5. Project Time Management
6. Project Scope Management
7. Project Human Resource Management
8. Project Communications Management
9. Project Risk Management

## 10. Project Procurement Management

### 2.14 Conclusion to literature review

From the literature review, it is shown that the PIP tool has omitted some CSFs for construction project success. The original 10 CSFs from the PIP tool are important but previous researches have shown that there are more CSFs to aid construction project success.

#### **1. Project Mission**

This is the clear realistic objectives (Fortune and White, 2006). Project mission factor involves the initial clarifying of project goals and project general direction i.e. objectives of project. Project mission needs to be understood clearly well by all project stakeholders, this creates buy in from everyone. The project mission has to be clearly defined as organizational resources would be invested into the project and commitments made to the project (Pinto and Slevin, 1988; Pinto, 1990). When the project mission is clear, it is easy to measure whether the project is a success or not by looking back at the project mission.

#### **2. Top Management Support**

Top management through emotional support and investment is a necessity once the project mission has been established. Support can be in vocal, visible as well as inputting resources. In times when the project goes through difficult periods, top management is quite crucial as they may add more resources to extinguish the problem (Pinto and Slevin, 1988). Top management has to be convinced that the project is necessary and that it will succeed.

#### **3. Project Schedule**

Project schedule is the workable plan that necessitates project success. Resources are allocated to activities regarding the use of the project resources, the necessary timelines and the milestones that are to be met to achieve project success. Successful projects are as a result of detailed project schedules that are realistic. There are realistic cash flows, resources allocations and time allocations that guide the project to success through the project phases (Pinto and Slevin, 1988; Pinto, 1990).

#### **4. *Client Consultation***

Client Consultation refers to the continuous communication between the client and project team. Any end user of the final product of the project is regarded as the client (Pinto and Slevin, 1988). Major clients must be identified and should make sure that their needs are met. It is important to execute client consultation as this makes client aware of any deviations or changes to the scope. This makes it easier for the client to approve the end product as they will make use of the end product. Client consultation has benefits of keeping the relationship maintained between the client and other relevant project stakeholders (Pinto and Slevin, 1988).

#### **5. *Personnel***

Personnel factor includes recruitment, selection and training of human resources allocated to the project. It is also concerned with developing competent project members through training and development so that they can be able to execute their roles (Pinto and Slevin, 1988). If the necessary resources are not procured, the project could fail (Pinto and Slevin, 1988). Project success is greatly affected by poor team performance and issues regarding personnel.

#### **6. *Technical Tasks***

Competent project personnel have to run projects as they bring in an understanding of the projects. Competent personnel with relevant technological knowhow and necessary skills relevant to the project (Pinto and Slevin, 1988). The project manager must ensure that the correct technical problems are assigned to the right people who have adequately documented and detailed the required technology (Pinto and Slevin, 1988). The technical tasks of the project need to be completed by adequate technical resources that possess a deep understanding of the technical requirements to achieve project success (Pinto and Slevin, 1988).

## **7. Client Acceptance**

This is the satisfaction, approval and use of the end result of a project by the client. It is important to consider client acceptance throughout the project lifecycle this helps reduce the risk of the client not accepting the end result of the project.

## **8. Monitoring and feedback**

Across different project phases, feedback in terms of performance has to be sent to key stakeholders. This project control processes compares the progress to date to the original project plans for the stakeholders to execute informed judgement about the project (Pinto and Slevin, 1988). Proper monitoring and feedback mechanisms need to be set in place to track the project.

## **9. Communication**

Communication factor is crucial to achieve project success. Communication is the exchange of information amongst people. There needs to be effective means of communication between project stakeholders either internal or external throughout the project lifecycle. Project success is strongly linked to stakeholder cooperation and effective communications (Diallo and Thuillier, 2004).

## **10. Trouble-shooting**

It is possible to experience problems on a project, and troubleshooting refers to procedures to deal with the problems faced. Potential areas of trouble are picked up early in the project, which makes it easier to solve the problem in time other than reacting to problems only after they have arisen (Pinto and Slevin, 1988).

The research will incorporate additional 10 success factor identified from this research literature:

### **1. Client requirements**

The needs of the client have to be properly identified and agreed upon.

### **2. Change Management**

Change is continuous in projects. Scope change process has to be planned and monitored with a clear process laid out. Uncontrolled changes play havoc with a system under development and have caused many project failures.

### **3. Risk Management**

Risk management plan that is in place reduces the chances of the project failing. Risks have to be identified and mitigation measures put in place.

### **4. Political environment**

The political environment needs to be well managed to prevent negative influence in the project.

### **5. Design**

Design of the project needs to be without errors and designed to relevant specifications to suit the client's needs.

### **6. Competencies of the Project manager**

The importance of initial selection of a skilled (interpersonally, technically, and administratively) project leader (Pinto and Slevin, 1988). The individual has to have the right competencies to be able to effectively manage the project and deliver it successfully.

### **7. Project characteristics**

Project characteristics greatly influence the project success. A complex project tends to have lots of project management technicalities and there is greater risk and more chances of project not succeeding.

### **8. Support from other departments**

Support from other departments that are directly or indirectly linked with the project.

### **9. Competencies of contractors, subcontractors, and suppliers**

The appointed project stakeholders need to have the right competencies to execute the project successfully.

### **10. Adequate budget**

There needs to be an adequate budget allocation for the project.

## Conceptual framework for project success

A conceptual framework was developed after analyzing the project success factors literature. The conceptual framework helps bring together the various factors discussed in the literature with the aim of relating it to the PIP tool to determine PIP fit as a basis of using the PIP tool in assuring the construction projects success. Figure 7 below shows the various factors from the PIP and from construction literature.

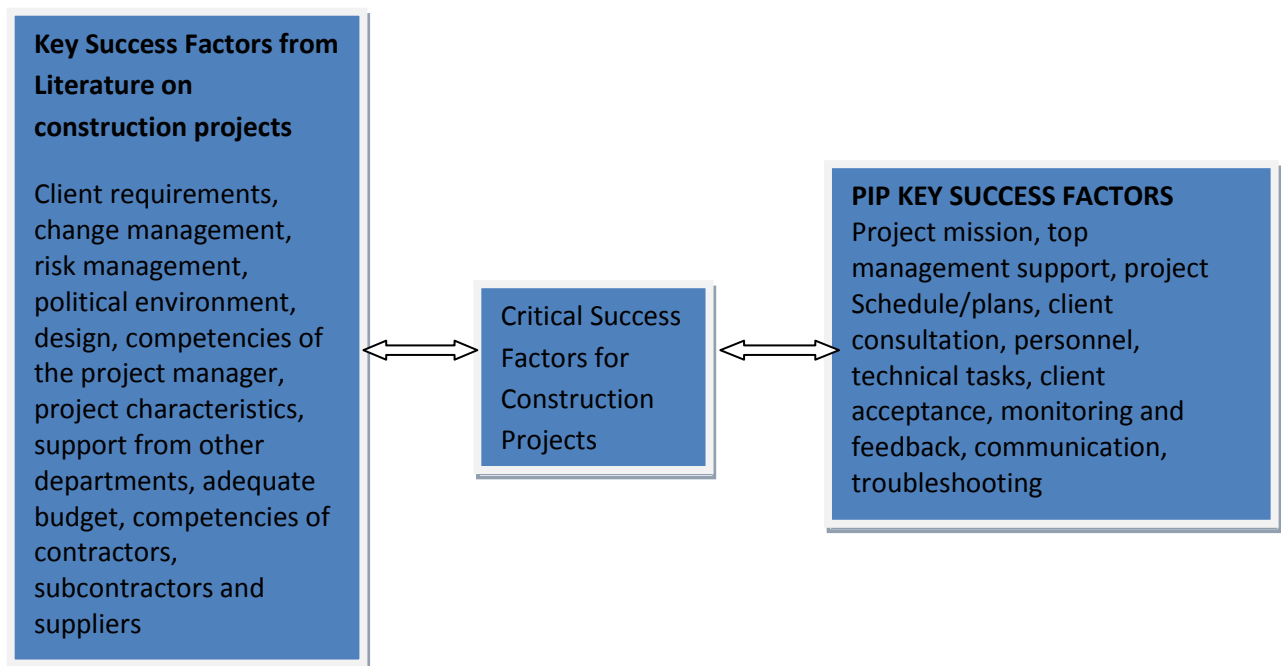


Figure 7: Conceptual Framework

## 3. Research Methodology

### 3.1 Introduction

This section serves the purpose of giving a detailed description of the research methodology used in the study. The chapter will also include a discussion of other different research methodologies. Quantitative and qualitative methodologies will be compared to justify why the researcher used the quantitative research methodology rather than the qualitative method. The section will also describe the quantitative research design to be utilized and sampling methods to be utilized. Finally, data collection and analysis techniques are elaborated further.

### 3.2 Research Requirements

Research methodology is drawn up from revisiting the research questions as follows:

1. How applicable are the success factors from the PIP tool in delivering successful modern construction projects?
2. Are there other success factors that can be considered for inclusion in the PIP tool for modern construction projects?

The research through the literature review has analysed an additional 10 KSFs for construction project success. A total of 20 KSFs from both the PIP and non-PIP will be assessed for their relative importance in achieving construction project success. The 20 KSF's will be measured and ranked according to level of importance in delivering successful construction projects.

### 3.3 Research Methodology

There are several approaches to research methodology which include quantitative, qualitative, descriptive and experimental (Kumar, 2005). Experimental approaches are normally carried out in laboratories to avoid any outside influence. While in the laboratory, the researcher can apply a substance on a selected entity and then observe the reaction in order to analyze the effects. Descriptive research relies on observation by examining the situation in order to establish what can be anticipated to occur in the given situation. Quantitative and qualitative methodologies are the most popular approaches in project

management research. The two approaches differ in research purpose, methods of inquiry and data collection strategies (Kumar, 2005). Table 6 below illustrates the difference between the two common methodologies of project management.

**Table 6: Comparison of quantitative and qualitative methods (De Vos *et al.*, 2011)**

<b>Quantitative method</b>	<b>Qualitative method</b>
Epistemology: rooted in positivism	Epistemology: rooted in phenomenology
Purpose: testing predictive and cause effect hypothesis about social reality	Purpose: detailed descriptions of social reality construction
Methods: deductive logic	Methods: inductive logic
Suitable for a study of phenomena which are conceptually and theoretically well developed.	Suitable for a study of a relatively unknown terrain; seek to understand phenomena
Concepts are converted into operational definitions. The results appear in numeric form. Reported in statistical language.	To understand the exact words, the participants' natural language is utilized.
Research design: Design can be replicated and its standardized according to a fixed methodology	Research design: unique and flexible. It develops during research process. Steps to be followed not fixed. Design can't be replicated.
Data: Systematically obtained in a standard manner	Data: Information richness of settings determines the sources; modification of observations to enrich understanding
Unit of analysis: variables are made up of separate and often disparate elements.	Unit of analysis: Focuses on wholeness and concentrates on interlinks across elements.

Table 7 below also shows the advantages of both qualitative and quantitative types of research methods. These advantages are taken into account when choosing the research method to use in this research.

**Table 7: Quantitative and Qualitative methods (Newman and Benz, 1998)**

<b>Quantitative methods</b>	<b>Qualitative methods</b>
Does not rely on specific situations but on familiarization of current research	Draws its basis from real-life context or situations
Concerned with the establishment of significant and separate interlinks across variables	Mainly concerned with the understanding of interlinks of different factors
Abstraction is achieved through repeated surveys	How people's understanding of facts affects their actions
Conveyance of variables in language of investigation	The researcher's assumptions are suspended and the language of the informants is valued and utilized

Qualitative research methods are concerned with collecting and analyzing information in non-numeric forms and are based on participants' written or spoken words. It is also concerned with understanding and describing social aspects of the worlds and is noted as the most difficult method. It is time consuming and a stressful type of methodology. A quantitative method deals with the gathering and analysis of numeric data. Quantitative data is expressed in numbers, percentages, probability, values, variances and ratios. Its approach begins with a hypothesis or theories then logical conclusions are drawn and data analysis establishes the variation in the situation, phenomenon or problem without quantifying it (Kumar, 2005).

This research will make use of the quantitative methodology as the research involves measuring variables. Gathering and analysis of numeric data is the main research purpose in contrast to qualitative research which tries to understand information received and interpreting it. Quantitative methodology will be used as it is fast, easier option of collecting information from stakeholders and economical when taking large samples.

When the data is being analyzed, there is need for flexibility in the treatment of data which is not normally provided by qualitative methodology. By using quantitative methodology, data collection may be repeated when required to verify reliability. A comparative analysis

has to be carried out to identify the KSFs hence the whole has to be reduced to the simplest possible elements to facilitate this analysis.

### 3.4 Research Strategy

Research strategy refers to the options that are available to the researcher in studying a subject area. Design is a plan of investigation considered in order to obtain answers to research problems. The strategy explains how to find answers to research questions (Kumar, 2005).

The questionnaire was designed around the simplified five-point Likert scale. The Likert scale is chosen for this research due to its ease of use, documented widespread use in literature and also the type of research to be undertaken is classified as quantitative. The survey was chosen because questionnaires are cost-effective, easy to compile and provide a confidentiality guarantee to participants. The study will use the 10 PIP KSFs and the 10 non-PIP KSFs identified from literature to form the questionnaire which will be forwarded to respondents to put in a score for each KSF. The 5 point Likert scale will be as follows:

- (5 points) Extremely Important
- (4 points) Very Important
- (3 points) Important
- (2 points) Somewhat Important
- (1 point) Not Important at All

The percentage score for each individual KSF will be calculated using the formula given below. This formula will allow the researcher to be able to normalise the data and rank the KSFs according to level of importance.

$$Sp = 20 \times \frac{\sum_0^k Sk}{k}$$

Where:

Sp is the percentage score for the particular KSF

Sk is the score from the likert scale

k is the total number of responses on that particular KSF

### 3.5 Research Population and Sampling

Population is associated with the collection of individuals from which the researcher seeks to obtain information on a subject. In order to obtain a multiple and balanced stakeholder perspective on the research needs, the research tool will be forwarded to the various construction management professionals including stakeholders such as project managers, project management team members, senior management, clients and consultants from different sub-industries such as building, mechanical, electrical, civil and structural. The involvement of these different stakeholders will help as different people have different perception of project success factors. KSFs could be viewed differently by different stakeholder. A sample size of 40 respondents was found to be a minimum to be able to analyse the data.

### 3.6 Data Collection Strategy

The researcher will use a web based tool to collect data ([www.surveymonkey.com](http://www.surveymonkey.com)). The collection instrument will comprise of 20 KSFs with a five likert scale for the respondents to measure on. Brief descriptions of the 20 KSFs will also be given to allow easy of understanding to respondents. Web based tools are preferred as they are cheap, easy to use, some of them have template questions already set up, some provide useful reporting and they have a quick turnaround time.

### 3.7 Data Analysis Technique

Data analysis will start upon receipt of completed surveys. Responses will be analysed by the researcher and will be compared to ascertain whether the results obtained were significant and did not happen by chance. Responses may be collated on an excel spreadsheet. Results will be tabulated and graphically presented using the bar chart frequency distribution for easy of analysing.

### 3.8 Research Limitations

- Data collection is a time consuming activity and with the limited timeframes of the research, any delay on data collection may result in delay of the analysis and conclusions.

- Access to project managers from the construction industry might be a challenge.
- True reflections of the actual results may be missed due to subjective opinions from participants.
- Project managers may not be willing to participate as the information required could be termed sensitive or confidential leading to missing vital information.
- Not easy to control all variables
- Respondents may skip some questions due to urgency
- Only the project manager may have sufficient information to answer all the questions in the questionnaire. Other stakeholders may have insufficient information to answer some of the questions and this may affect the analysis.

### 3.9 Research Ethical Considerations

Codes of ethics have guided professionals and have evolved over the past years. Ethical considerations are vital to accommodate the changing values, expectations and needs in professions (Kumar, 2005). The study was guided by the University of Cape Town academic research ethics. The researcher adhered to the University's policy on research guidelines. The researcher sought an ethical clearance from the Dean of research in the University of Cape Town. Written permission to conduct the study was given by the University.

The researcher ensured that ethical issues pertaining to the participants and institution were adhered to. The researcher ensured that appropriate steps were taken to protect the participants. This was done by observing ethical procedures and principles governing research with humans. Ethical principles included confidentiality, respect of respondents' autonomy and consent in participating in the study.

Moreover, seeking consent is crucial. The researcher ensured that participants were aware of the type of information the researcher needed (Kumar, 2005). The researcher did not deceive or harm participants. Informing them about the nature of the study was vital for their free and voluntary choice of participation.

Moreover, it is unethical for the researcher to be biased. The deliberate attempt to hide what the study has found out or to highlight something which does not exist is bias. The researcher was obliged to adopt an appropriate methodology in conducting the study. It is unethical to use a method that was inappropriate for the study (Kumar, 2005). Incorrect

reporting of the research findings and changing them to serve the interest of the research was also unethical.

## 4. Results

Results obtained from the online survey are furnished in this section. All individual responses are combined and summaries of data are presented in this section. The section is organised as follows; it starts by giving a summary of the participants' demographics and then a detailed discussion of the findings is given. Additional success factors from the survey responses are summarised.

### 4.1 Project Stakeholders Assessment

The online survey returned 45 responses from the 58 questionnaires that were forwarded to different project stakeholders. The response rate was 78% and was sufficient for the research to carry forward. The various project stakeholders were from different construction sub industries.

Table 8 underneath indicates the number of different roles per construction sub-industry and project stakeholder roles received from the survey.

**Table 8: Participant demographics**

	Civil & Structural	Electrical	Mechanical	Building	Other	TOTAL	%
Project Manager	6	2	1	15	0	24	53.4%
Project Team Member	3	0	0	3	0	6	13.3%
Senior Management	0	0	0	0	0	0	0%
Client	0	0	0	0	0	0	0%
Consultant	9	0	0	0	0	9	20%
Other	0	2	1	3	0	6	13.3%
<b>TOTAL</b>	<b>18</b>	<b>4</b>	<b>2</b>	<b>21</b>	<b>0</b>	45	
<b>%</b>	<b>40%</b>	<b>8.9%</b>	<b>4.4%</b>	<b>46.7%</b>	<b>0%</b>		100%

From the table 8 above, It should be noted that from the selected construction sub-industries, building stakeholders constituted 47% of the respondents and was the highest.

Project managers constituted 53% of the overall respondent's based on project roles. No responses were received from senior management personnel and client personnel.

## 4.2 Research Findings

From the figure 8 below, adequate budget 60% received the highest consensus that it is extremely important for construction project success. From survey, support from other departments with 40% is deemed somewhat important. From the survey, all success factors are deemed to be at least somewhat important.

The percentage score for each individual KSF was calculated using the formula below, this allowed the researcher to normalise the data and was able to rank the KSFs according to level of importance.

$$Sp = 20 \times \frac{\sum_0^k Sk}{k}$$

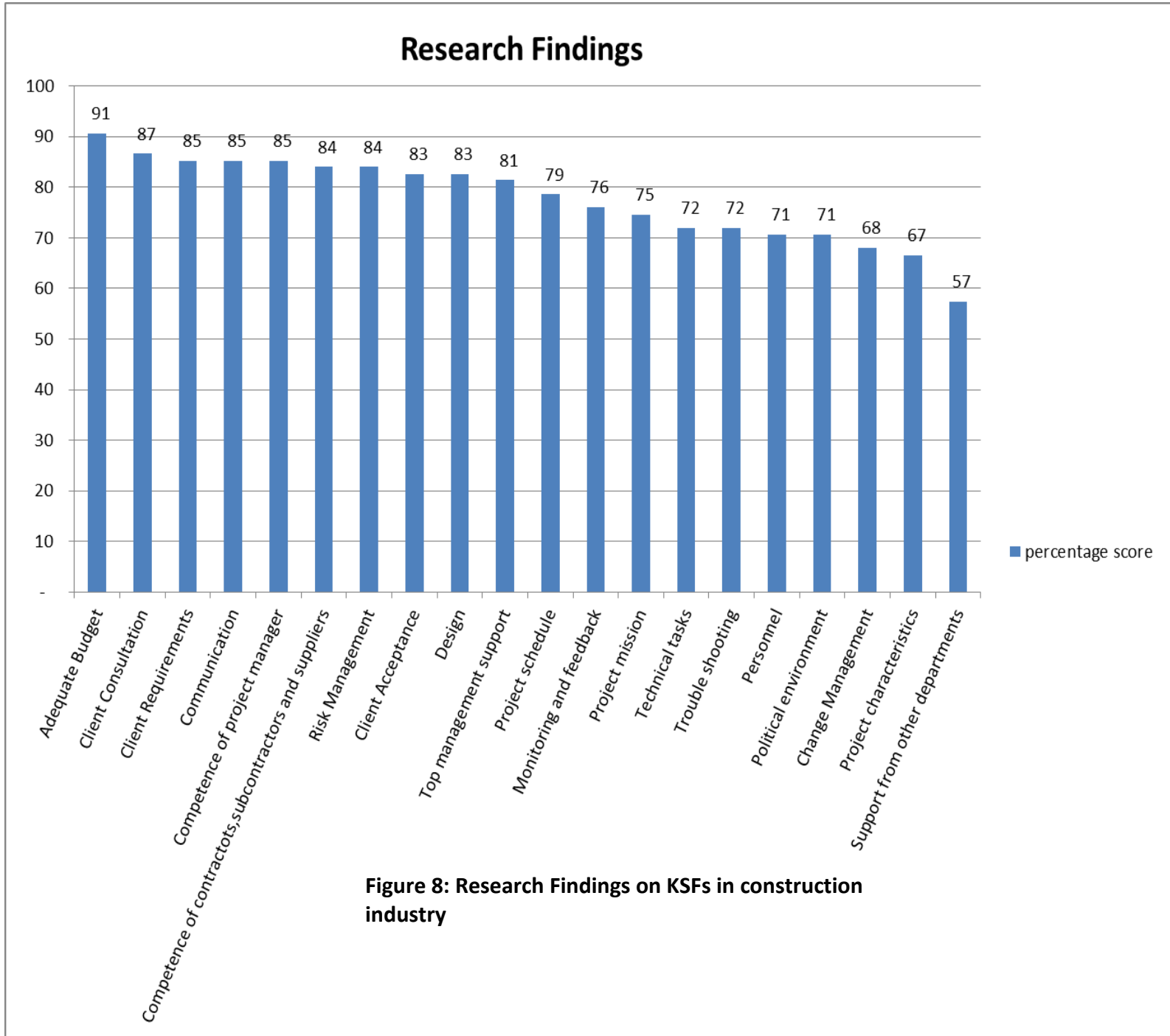
Where

Sp = the percentage score for the particular KSF

Sk = the score from the likert scale on a particular KSF (Score from a single point to to 5points)

k = the summation of responses on that particular KSF

Figure 8 below shows the bar chart with the KSF arranged in descending order according to the score after the data had been normalised.



From the figure 8 above, it can be observed that

- All KSFs scored above 50% from a minimum of 57% to the highest 91%.
- Adequate budget scored the highest importance value with 91% and it is a non-PIP KSF.
- Support from other departments had the lowest importance rating with 57% and it is a non-PIP KSF.
- The 10 highest scoring KSFs comprised of 4 PIP KSFs.
  - Client consultation 2<sup>nd</sup> with 87%
  - Communication 4<sup>th</sup> with 85%
  - Client acceptance 8<sup>th</sup> with 83%
  - Top management support 10<sup>th</sup> with 81%
- The 10 lowest scoring KSFs comprised of 6 PIP KSFs
  - Project schedule 11<sup>th</sup> with 79%
  - Monitoring and feedback 12<sup>th</sup> with 76%
  - Project Mission 13<sup>th</sup> with 75%
  - Technical tasks 14<sup>th</sup> with 72%
  - Trouble shooting 15<sup>th</sup> with 72%
  - Personnel 16<sup>th</sup> with 71%

Thus the deduction from the data is that the most important 3 KSFs are adequate budget, client consultation and client requirements and the least important 3 KSFs are change management, project characteristics and support from other departments.

### 4.3 Additional KSFs

The survey allowed for additional key success factors to be gathered from the comments section at the end of the survey pages. However no scoring was given that would have allowed the comparison with the 20 KSFs under investigation. Table 10 below shows the additional key success factors obtained from survey. The factors have been coded for easy of understanding. Coding enables the factors to be put in different categories.

**Table 9: Additional Key Success Factors**

	<b>Success Factors</b>	<b>Coding</b>
1	Clearly defined contractual obligations	Project Mission
2	Accuracy in project cost estimate	Adequate budget
3	Turnaround time in decision making by the management	Top Management Support
4	Proper planning	Project Schedule
5	Project team motivation	Team dynamics
6	Managing the quality of the project output	Project management processes
7	Proper planning and managing scope, schedule, budgets, quality	Project management processes
8	Relationship with community	Project management processes (Stakeholder management)
9	Good interface management between stakeholders	Project management processes
10	Quality	Project management processes
11	Time management	Project management processes
12	Resource	Personnel
13	Competence of professional team	Competence of contractors, subcontractors and suppliers
14	Procurement	Project management processes
15	Project Integration	Project management processes
16	Stakeholder engagement and buy in	Project management processes
17	Contract Management	Project management processes
18	Quality Management Systems	Project management processes
19	Stakeholder involvement	Project management processes
20	Project manager well versed in contracts such as GCC, SCC and NEC as the glue that binds the project from start to finish.	Competency of project manager

After the coding, it was realised that most of the success factors had been accommodated in the list of the 20 KSFs under investigation. However, project management processes seemed to be common with most respondents.

## 5. Analysis of Results

Discussion of the results from the previous chapter will be analysed and discussed in detail in this section. The section provides explanations of the results in the primary findings.

In this research of construction project success factors, a score of between 90-100% is regarded as extremely important; a score of 80-89% is regarded as very important; 70-79% is regarded as important; 50-70% is somewhat important and below 50% is regarded as not important at all.

### 5.1 Discussion of primary findings

The table 9 indicates that building project professionals formed a significant number of the research respondents with a total percentage of 62.5%. On the same table, it can conclude that there is no adequate representative data set. Gathered data could be termed to be inclined more to project professionals as there are no results from client representatives.

From the figure 7 above, the normalising of the data allowed the researcher to produce graphs that represent the relative importance of the KSFs to construction project success. This visual representation allows the comparison of one factor to the other to be possible. From the graphs, it was observed that the 20 KSFs achieved greater than 50% score on relative importance to construction project success. The lowest was “support from other departments” with a percentage score of 57%.

From the research, it is observed that the top 10 factors consist of 6 non-PIP factors which are: adequate budget ranked first; client requirements ranked third; competence of project manager ranked fifth; competence of contractors, subcontractors and suppliers ranked sixth; risk management ranked seventh and design ranked ninth. Adequate budget, client consultation, client requirements, communication, competence of project manager, competence of contractors, subcontractors and suppliers, risk management, client acceptance, design and top management support scored a score of at least 80% indicating the high rating that they received from the respondents.

From the research, it is observed that the bottom 10 success factors consist of 6 PIP factors which are: project schedule; monitoring and feedback; project mission; technical tasks; trouble shooting and personnel.

Below is the discussion of the top 10 scoring KSFs

### **Adequate Budget**

The highest percentage of responses agreed that adequate budget is extremely important in achieving construction project success. This factor was scored at 91%. Adequate budget is a non-PIP KSF yet it was ranked the highest. Because adequate budget was on the top of the list in the survey questionnaire, it could be argued that this is the reason why it scored so high. The importance of adequate budget could have been rated high because of the high number of the respondents being project managers and consultants hence deal directly with setting the budgets in projects. From literature review, it is noted that most construction projects fail due to lack of adequate funds, this may explain why it's ranked the highest as well.

### **Client Consultation**

This PIP factor had the second highest percentage score of 85%. It falls within the very important factors category. Client consultation and client requirements with scores of 87% and 85% respectively were also deemed to be very important in achieving construction project success. It is not surprising to see that client-orientated factors are next to each other and also amongst the top factors, this shows that construction project success evolves from the client interaction as opposed to internal project relations. Literature also supports the importance of client consultation in construction projects success. The high score may be due to the fact that most respondents extensively engage in communications with clients.

### **Client Requirements**

Client requirements also came high in the ranking due to the fact that the respondents realised that what's important is to recognise the needs of the client and the client has to

sign off their requirements. This is a non-PIP factor that came up third with a score of 85% and is regarded as very important.

### **Communication**

This PIP factor had the third highest percentage score of 85% regarded as very important. Communication had the same score with client requirements and competence of project manager. Communication is very important as this is the transfer of information amongst the stakeholders and is supported by the high scoring from the respondents.

### **Competence of Project Manager**

This non-PIP factor had the third highest percentage score of 85%. It falls within the very important factors category. Competence of project manager was raised up from literature because for the project to succeed there is need of a competent project manager with the right knowledge and skills. This goes as well for the competence of contractors, subcontractors and suppliers. It does not surprise that competency of project manager and competency of contractors, subcontractors and suppliers are next to each other.

### **Competency of contractors, subcontractors and suppliers**

This non-PIP factor had the sixth highest percentage score of 84%. It falls within the very important factors category. The contractors, subcontractors and suppliers have to have the right competencies.

### **Risk Management**

This non-PIP factor had the sixth highest percentage score of 84%. It falls within the very important factors category. From section 2, the importance of risk management in projects is explained. This factor had the same score as the competence of contractors, subcontractors and suppliers.

### **Client Acceptance**

This PIP factor had the seventh highest percentage score of 83%. It falls within the very important factors category. In most construction projects, the client is the funder and once

the project is finished it is then handed over to the client. It is important to involve the client at every stage as this reduces the chances of the client not accepting the end product.

### **Design**

It scored 83% and is regarded very important. This is actually a non-PIP factor that has come up in the top 10 KSFs. The literature indicated that most construction projects fail due to improper design.

### **Top Management Support**

This is also a PIP factor ranked 10<sup>th</sup> with a score of 81% and is also a very important factor.

Project schedule, project mission, technical tasks, trouble shooting, personnel and monitoring and feedback are the KSFs from the PIP that have been moved down the order. The low importance of these factors could have been due to the fact that only a specific sub-group within the project stakeholders deals with these factors. This would ultimately result in an overall lower impact in achieving construction project success. This finding can be confirmed through Table 8, whereby the majority of the sub-group comprises of project managers and consultants than team members.

### **Bottom 10 KSFs**

The scores for the bottom 10 KSFs ranged from 57% to 79%. In this region, they are regarded as important. The lowest is “support from other departments” with 57% the reason could be because the respondents feel they do not really need any support from other departments. It’s surprising to note the presence of 6 PIP factors in this bottom category. One can easily conclude that there is definitely a need for more research on these success factors to ascertain exactly which ones are crucial for construction projects success as there is a small margin of difference on the scores.

## **5.2 Additional Key Success factors from comments**

Most information received in the comments section of the web based questionnaire already falls under project management processes. Project management processes such as scope, integration, time, stakeholder, procurement and quality.

After coding some of the factors, most of them fell in the already identified 20 KSFs under investigation. The likes of project mission, adequate budget, top management support, project schedule, competency of project manager, personnel and team dynamics.

There was however no scoring done on the factors in the comments section. This would have helped to compare them to the 20 KSFs under investigation.

### 5.3 Chi-Square ( $\chi^2$ ) Test

#### Chi-Test on the PIP factors

$H_0$ : No difference in PIP rating across the five rating categories (i.e. Not important at all to extremely important).

$H_1$ : There is a statistically reliable difference between the observed and the expected frequencies.

#### **Comparison data under $H_0$ :**

Table 10 below was drawn up by summing up all the frequencies on PIP factors and obtaining an average per category.

**Table 10: PIP factors observed**

Level of importance	Not important at all	Somewhat important	Important	Very important	Extremely important
<b>Success factor</b>					
PIP Factors Observed ( $P_o$ )	0	1	16	16	12

#### **Expected data under $H_1$ under table 11**

Because there are 45 respondents, the expected frequency for each category when no difference exists would be 9 (i.e. 45 students divided by the five possible categories equals 9 in each category)

**Table 11: PIP factors expected**

Level of importance	Not important at all	Somewhat important	Important	Very important	Extremely important
<b>Success factors</b>					
PIP Factors Expected (Pe)	9	9	9	9	9

The chi-test makes use of the below formula to compute the chi figure

$$\chi^2 = \frac{\sum(P_o - P_e)^2}{P_e}$$

Where  $P_o$  refers to the observed frequency and  $P_e$  is the expected frequency under  $H_0$  for that category.

Table 12 below shows the calculations of a chi-test statistic using tabular format.

**Table 12: Chi-test statistic tabular format**

	$P_o$	$P_e$	$(P_o - P_e)$	$(P_o - P_e)^2$	$(P_o - P_e)^2 / P_e$
Not important at all	0	9	-9	81	9
Somewhat important	1	9	-8	64	7.11
Important	16	9	7	49	5.44
Very important	16	9	7	49	5.44
Extremely important	12	9	3	9	1

Check  $\sum P_o = 45$   $\sum P_e = 45$   $\sum (P_o - P_e) = 0$

$\sum (P_o - P_e)^2 / P_e = 9 + 7.11 + 5.44 + 5.44 + 1 = 27.99$

$\chi^2 = 27.99$

For the calculation of degrees of freedom we use the following formula:

$DF = (k - 1)$  where  $k$  is equal to the number available categories.

$$DF = (5-1) = 4$$

Selecting a significance level  $\alpha=0.05$

From the  $\chi^2$  table,  $\chi^2(4)=9.488$

In conclusion

$\chi^2(4)=27.99 > \chi^2_{\text{critical}}(4)=9.488$  so reject  $H_0$

There is a statistically reliable difference between the observed and the expected frequencies

## 6. Conclusion

This section concludes the research by summarizing the purpose of research, giving research findings; research shortcomings and future study recommendations are proposed.

### 6.1 Research Purpose

The research problem highlighted the following research questions:

1. How applicable are the success factors from the PIP tool in delivering successful modern construction projects
2. Are there other success factors that can be considered for inclusion in the PIP tool for modern construction industry projects

These research questions led to the formation of the research aim of evaluating the applicability of the current PIP to the modern construction industry. The research aimed to identify new critical success factors (CSF) to deliver successful projects.

### 6.2 Research Findings

From the results from the data obtained, it can be concluded that the current PIP tool is not adequate to measure construction project success. It therefore answers research question (1) that success factors from the PIP tool are not applicable in delivering successful modern construction projects. Furthermore, research question (2) is answered in that there are other success factors that can be considered for inclusion in the PIP tool for modern construction projects.

The primary research findings revealed that from the 20 KSFs the top 10 factors consist of 6 non-PIP factors which are: adequate budget; client requirements; competence of project manager; competence of contractors, subcontractors and suppliers; risk management and design and 4 PIP factors which are: client consultation, communication, client acceptance and top management support. From the research, it is observed that the bottom 10 factors consisted of 6 PIP factors which are: project schedule; monitoring and feedback; project mission; technical tasks; trouble shooting and personnel and 4 non-PIP factors which are:

political environment, change management, project characteristics and support from other departments.

The analysing of the data in the study concludes that the following 10 identified KSFs are suggested for the inclusion in the existing PIP to be applicable to the construction industry:

1. Adequate budget
2. Client consultation
3. Client requirements
4. Communication
5. Competence of project manager
6. Competence of contractors, subcontractors and suppliers
7. Risk management
8. Client acceptance
9. Design
10. Top management support

The factors that were rated the lowest are project schedule, monitoring and feedback, project mission, technical tasks, trouble shooting, personnel, political environment, change management, project characteristics and support from other departments. The study concludes that factors vary across projects and industry types. From this research, there is however no clear break in the level of importance of the tenth factor and those below in the ranking leading to a question of perhaps a suitable instrument for construction requires more than ten items to be assessed.

The relative impact of the critical success factors on project success are subject to change at different points in the project. A life cycle analysis done on the factors were found to fall in the following as per table 11 below.

**Table 13: Success Factors on Project Life Cycle**

Initiation	Planning	Execution	Closing
	Client Acceptance		Client Acceptance
Client Consultation	Client Consultation	Client Consultation	Client Consultation
Adequate Budget	Design		
Client Requirements	Client Requirements		
	Competence of Project Manager	Competence of contractors, subcontractors and suppliers	Competence of contractors, subcontractors and suppliers
	Risk Management	Communication	
	Top management support		

From table 13 above, client consultation was found to be relevant across the whole cycle. Client requirements appear during initiation and planning; client acceptance appears on planning and closing. Client consultation, adequate budget and client requirements are strategically placed in the earlier stages and tactical factors (client consultation, communication).

Table 14 below shows the critical success factors across the PMBOK knowledge areas. Risk management falls under the risk management knowledge area. Top management falls in the integration knowledge area as this were it is critical to gain support. Competence of project manager also falls in this area as the project manager is identified at project charter. Adequate budget is under cost management as this is where the cost baseline is determined and at that point one can know if there is adequate budget for the project. Competence of contractors, subcontractors and suppliers falls in procurement management as the criteria for selection is set in this area. Client Acceptance, design and client requirements all are in scope management. Client consultation and communication fall under communication management as this is where communications are planned, executed and controlled.

**Table 14: Critical Success Factors across the PMBOK knowledge areas**

PMBOK Knowledge Area	Critical Success Factors
Risk Management	Risk Management
Integration Management	Top Management Support, Competence of project manager
Cost Management	Adequate Budget

Procurement Management	Competence of contractors, subcontractors and suppliers
Scope Management	Client Acceptance, Design, Client requirements
Communication Management	Client consultation, Communication

### 6.3 Research Limitations

Various limitations existed that hindered the progress of the research. The limited time for data collection greatly reduced the number of respondents. Sufficient numbers were not received across the different construction sub-industries. The research would have been able to compare the additional success factors from respondents.

### 6.4 Recommendations

Additional research should be carried out on the KSFs to gain in-depth knowledge and hopefully aid project success. Make use of a larger sample size to minimize errors. Research would be treated as a quantitative and qualitative research to avoid missing crucial information. A suitable assessment instrument needs to be developed for each of the identified success factors. PIP tool asks several questions that indicate that a particular factor is not being adequately addressed on a particular project. A larger sample size would warrant use of factor analysis.

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## 8. Appendices

Support from senior management	Clear realistic objectives	strong/detailed plan kept up to date	Good communication/feedback
user/client involvement	Skilled/suitably qualified/sufficient staff/team	effective change management	competent project manager
organisational adaptation/culture/structure	sufficient/well allocated resources	competencies of project manager	proven/familiar technology
strong business case/sound basis for project	risks addressed/assessed/managed	project sponsor/champion	effective monitoring/control
adequate budget	political stability	good leadership	realistic schedule
donors and recipient government have clear policies to sustain project activities and results	clear understanding of project environment by funding and implementing agencies and consultants	compatibility of development priorities of the key stakeholders	there is strong local ownership of the project
adequate local capacities are available	effective consultation with key stakeholders	adequate provisions for project closing in the project plan	effective consultation with all stakeholders
commitment to project goals and objectives	competencies of project management team	planned close down/review/acceptance of possible failure	adequate resources and competencies available to support the project plan
size/level of complexity/number of people involved/duration	correct choice/past experience of project management methodology/tools	good performance by suppliers/contractors/consultants	compatible rules and procedures for PM

**Table 15: CSFs from 63 different publications (Fortune and White, 2006)**

**Construction Projects Key Success Factors**

**Introduction**

Thank you for participating in my survey. Your feedback is important.

My name is Moses Chiropa and I am studying towards my Master's Degree in Project Management in the Faculty of Construction Economics & Management at University of Cape Town.

My research topic is **the project implementation profile's applicability to modern construction industry**

In fulfillment of the research requirements for my Master's Degree, I would like to invite you to voluntarily and anonymously participate in a short online survey on key success factors (KSFs) for construction projects. Your input will make a contribution towards better understanding the key success factors to deliver successful construction projects. You are not required to identify yourself and your response cannot lead to your identification. All responses are strictly confidential and will be used for academic research purposes only. Information gathered will not be published but will be shared through my research.

It should take you approximately 5 minutes to complete the survey online.

The survey will be available online until 18 September 2015

If you have any questions about the survey or if you would like to have access to the findings, please don't hesitate to contact the researcher at [CHRMOS001@myuct.ac.za](mailto:CHRMOS001@myuct.ac.za).

Please click the "Next" button to proceed with the survey

Figure 9: Web questionnaire page 1

**Construction Projects Key Success Factors**

**Project Information**

1. From the dropdown list below, please select the type of construction project that you are/were involved:

2. From the dropdown list below, please indicate the role that you undertook in the project that you mentioned above:

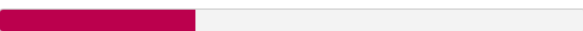
2 / 6  33%

Figure 10: Web questionnaire page 2

## Brief descriptions of the 20 Key Success Factors

Key success factors are the elements of a project that can be influenced by project management to enhance the probability of achieving project success.

This research has identified 20 Key success factors and below are the brief descriptions of each of them. The research aims to identify the 10 key success factors to deliver successful construction projects. The next page will request you to rate the level of importance of each one of the 20 Key success factors.

**After perusing through, you can proceed to the rating scales on the next page**

1. Adequate budget - Sufficient approved funding for the project
2. Change management - Management of scope change and other variations
3. Client acceptance - Act of selling the final project to its ultimate intended users
4. Client consultation - Communication, consultation and active listening to all impacted parties
5. Client requirements - Needs of the client
6. Communication - The provision of an appropriate network and necessary data to all key stakeholders in the project implementation
7. Competence of contractors, subcontractors and suppliers - Abilities and capabilities
8. Competence of the project manager - Ability and capability of the appointed project manager to execute the job
9. Design - Creation of a workout plan to produce the end product
10. Monitoring and feedback - Timely provision of comprehensive control information at each stage in the implementation process
11. Personnel - Recruitment, selection and training of the necessary personnel for the project team
12. Political environment - Public and private stakeholders influencing the project
13. Project characteristics - These are defining features of the project
14. Project schedule - A detailed specification of the individual action steps for project implementation
15. Project mission - Initial clearly defined goals and general directions
16. Support from other departments - Willingness of other departments to support the project
17. Risk management - Process of identifying, analyzing and mitigating risks in a project
18. Technical tasks - Availability of the required technology and expertise to accomplish the specific technical action steps
19. Top management support - Willingness of top management to provide the necessary resources and authority for project success
20. Trouble shooting - Ability to handle unexpected crisis and deviations from plan

**Figure 11: Web questionnaire page 3**

**Construction Projects Key Success Factors**


Rating the KSFs

**\* 3. Please rate the level of importance of each individual key success factor in achieving construction projects success**  
**Choose one answer per key success factor**

	Not important at all	Somewhat important	Important	Very important	Extremely important
1. Adequate budget	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Change management	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Client acceptance	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Client consultation	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Client requirements	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Communication	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Competence of contractors, subcontractors and suppliers	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Competence of project manager	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Design	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Monitoring and feedback	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Personnel	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Political environment	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Figure 12: Web questionnaire page 4**

13. Project characteristics	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. Project schedule	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. Project mission	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. Support from other departments	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. Risk management	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. Technical tasks	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19. Top management support	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20. Trouble shooting	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4 / 6  67%

**Figure 13: Web questionnaire page 4**

**Construction Projects Key Success Factors**

Additional Key Success Factors and Comments

**4. Please list any other key success factors that you think have been left out in this research**

1

2

3

**5. Please feel free to provide any additional comments**

5 / 6  83%

[Prev](#) [Next](#)


Figure 14: Web questionnaire page 5

**Construction Projects Key Success Factors**

Thank You

**Thank you for your time spent taking this survey.  
Your response has been recorded.**

Please click "Done" button to exit

6 / 6  100%

[Prev](#) [Done](#)

Figure 15: Web questionnaire page 6

RE: [UCT Ethics in Research] THE PROJECT IMPLEMENTATION PROFILE'S APPLICABILITY TO THE MODERN CONSTRUCTION INDUSTRY Inbox x



UCT Ethics in Research zakiya.chikte@uct.ac.za via email.submittable.com  
to me ▾

Aug 20 ☆

Dear Mr Moses Chiropa,

Thank you for your submission.

Upon review, your application has been accepted with the following comments made by the reviewers to be taken into consideration:

On the survey form please indicate whether the information gathered will be shared or published.

Please find signed ethics form attached.

All the best!

Regards,  
Zakiya Chikte  
021-650-5739

You can go here to view the submission:

<http://universityofcapetown.submittable.com/user/submissions/4321356>

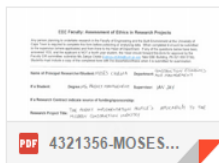


Figure 16: Ethics Clearance Approval

## EBE Faculty: Assessment of Ethics in Research Projects

Any person planning to undertake research in the Faculty of Engineering and the Built Environment at the University of Cape Town is required to complete this form before collecting or analysing data. When completed it should be submitted to the supervisor (where applicable) and from there to the Head of Department. If any of the questions below have been answered YES, and the applicant is NOT a fourth year student, the Head should forward this form for approval by the Faculty EIR committee: submit to Ms Zakiya Chikite ([Zakiya.chikite@uct.ac.za](mailto:Zakiya.chikite@uct.ac.za)), New EBE Building, Ph 021 650 5739. Students must include a copy of the completed form with the dissertation/thesis when it is submitted for examination.

Name of Principal Researcher/Student: MOSES CHIKOPA Department: CONSTRUCTION ECONOMICS AND MANAGEMENT

If a Student: Degree: MSc PROJECT MANAGEMENT Supervisor: IAN JAY

If a Research Contract indicate source of funding/sponsorship:

Research Project Title: THE PROJECT IMPLEMENTATION PROFILE'S APPLICABILITY TO THE MODERN CONSTRUCTION INDUSTRY

Overview of ethics issues in your research project:

Question 1: Is there a possibility that your research could cause harm to a third party (i.e. a person not involved in your project)?	YES	<input type="radio"/> NO
Question 2: Is your research making use of human subjects as sources of data? If your answer is YES, please complete Addendum 2.	<input checked="" type="radio"/> YES	<input type="radio"/> NO
Question 3: Does your research involve the participation of or provision of services to communities? If your answer is YES, please complete Addendum 3.	YES	<input type="radio"/> NO
Question 4: If your research is sponsored, is there any potential for conflicts of interest? If your answer is YES, please complete Addendum 4.	YES	<input type="radio"/> NO

If you have answered YES to any of the above questions, please append a copy of your research proposal, as well as any interview schedules or questionnaires (Addendum 1) and please complete further addenda as appropriate.

I hereby undertake to carry out my research in such a way that

- there is no apparent legal objection to the nature or the method of research; and
- the research will not compromise staff or students or the other responsibilities of the University;
- the stated objective will be achieved, and the findings will have a high degree of validity;
- limitations and alternative interpretations will be considered;
- the findings could be subject to peer review and publicly available; and
- I will comply with the conventions of copyright and avoid any practice that would constitute plagiarism.

Signed by:

	Full name and signature	Date
Principal Researcher/Student:	<u>MOSES TINASHE CHIKOPA</u> <div style="border: 1px solid black; padding: 2px; display: inline-block;">Signed by candidate</div>	<u>28/07/2015</u>

This application is approved by:

Supervisor (if applicable):	<u>I. JAY</u> <div style="border: 1px solid black; padding: 2px; display: inline-block;">Signed by candidate</div>	<u>29/07/2015</u>
HOD (or delegated nominee): Final authority for all assessments with NO to all questions and for all undergraduate research. Chair: Faculty EIR Committee	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Signed by candidate</div>	
For applicants other than undergraduate students who have answered YES to any of the above questions.	<u>G. Sithole</u>	<u>17/8/2015</u>

Figure 17: Ethics clearance form page 1

**ADDENDUM 1:**

Please append a copy of the research proposal here, as well as any interview schedules or questionnaires:

**ADDENDUM 2:** To be completed if you answered YES to Question 2:

It is assumed that you have read the UCT Code for Research Involving Human Subjects (available at <http://web.uct.ac.za/depts/educate/download/uctcodeforresearchinvolvinghumansubjects.pdf>) in order to be able to answer the questions in this addendum.

2.1 Does the research discriminate against participation by individuals, or differentiate between participants, on the grounds of gender, race or ethnic group, age range, religion, income, handicap, illness or any similar classification?	YES	<input checked="" type="radio"/> NO
2.2 Does the research require the participation of socially or physically vulnerable people (children, aged, disabled, etc) or legally restricted groups?	YES	<input checked="" type="radio"/> NO
2.3 Will you not be able to secure the informed consent of all participants in the research? (In the case of children, will you not be able to obtain the consent of their guardians or parents?)	YES	<input checked="" type="radio"/> NO
2.4 Will any confidential data be collected or will identifiable records of individuals be kept?	YES	<input checked="" type="radio"/> NO
2.5 In reporting on this research is there any possibility that you will not be able to keep the identities of the individuals involved anonymous?	YES	<input checked="" type="radio"/> NO
2.6 Are there any foreseeable risks of physical, psychological or social harm to participants that might occur in the course of the research?	YES	<input checked="" type="radio"/> NO
2.7 Does the research include making payments or giving gifts to any participants?	YES	<input checked="" type="radio"/> NO

If you have answered YES to any of these questions, please describe how you plan to address these issues (append to form):

**ADDENDUM 3:** To be completed if you answered YES to Question 3:

3.1 Is the community expected to make decisions for, during or based on the research?	YES	NO
3.2 At the end of the research will any economic or social process be terminated or left unsupported, or equipment or facilities used in the research be recovered from the participants or community?	YES	NO
3.3 Will any service be provided at a level below the generally accepted standards?	YES	NO

If you have answered YES to any of these questions, please describe how you plan to address these issues (append to form)

**ADDENDUM 4:** To be completed if you answered YES to Question 4

4.1 Is there any existing or potential conflict of interest between a research sponsor, academic supervisor, other researchers or participants?	YES	NO
4.2 Will information that reveals the identity of participants be supplied to a research sponsor, other than with the permission of the individuals?	YES	NO
4.3 Does the proposed research potentially conflict with the research of any other individual or group within the University?	YES	NO

If you have answered YES to any of these questions, please describe how you plan to address these issues(append to form)

Figure 18: Ethics clearance form page 2

ORIGINALITY REPORT

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18%

SIMILARITY INDEX

14%

INTERNET SOURCES

6%

PUBLICATIONS

13%

STUDENT PAPERS

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PRIMARY SOURCES

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Figure 19: Turnitin Report