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EVALUATING THE IMPACT OF THE PROJECT IMPLEMENTATION PROFILE (PIP) TOOL ON INTERFACE MANAGEMENT IN PUBLIC SECTOR PROJECTS: CASE STUDY KZN DEPARTMENT OF HEALTH FACILITIES

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Abstract

Purpose - The research study investigated the impact of the Project Implementation Profile (PIP) tool on Interface Management (IM) in Public sector facilities projects focusing on KZN Department of Health as a case study. The study identified the interface management challenges encountered by the department and also the advantages that can be realised in using the PIP tool. Lastly the study outlined the impact the PIP tool can bring in improving interface management between stakeholders.

Design and Findings - From the existing literature the interface challenges were categorized as financial, contract and specification, environmental and lastly other common problems. The research determined their relevance through a survey. Respondents listed additional challenges and highlighted the advantages and impact of the PIP tool in mitigating interface challenges during project implementation.

Practical Implications - The findings outlined the interface management challenges, the advantages of using the PIP tool to mitigate the challenges and the impact the tool has in improving project success rate. However constraints were encountered as some stakeholders were skeptical in answering all the questions. Subjectivity of the information couldn't be avoided as respondents were giving their opinions. It is suggested that this research be expanded in scope to verify that the findings can be generalized.

Background – KwaZulu Natal Department of Health (KZNDOH) experience Interface Management challenges in implementation of its infrastructure projects. This has lead scope creeps, time and cost overruns thereby reducing the project success rate. The PIP tool could be the answer in resolving challenges faced.

Aim – The research intention is to establish the impact of the PIP tool when applied to the IM with the purpose of improving the probability of project success in KZNDOH.

Methods – A Likert Scale questionnaire was used to establish the current IM challenges. This was coupled with an Action Research method establish additional challenges, the impact of the PIP tool and its advantages.

Results – The research delineated IM challenges which reduce the project success rate. It also outlined the impact of the PIP tool which includes improved planning, monitoring and execution of projects.

Conclusions - The PIP has a positive impact to the IM challenges as established by the research. Risks are mitigated early during planning, teamwork, efficiency is improved and scope is managed. There is reduction in time and cost overruns resulting in improved project success rate.

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Nomenclature

List of abbreviations

BAC – Bid Award Committee

BEC – Bid Evaluation Committee

CSF – Critical Success Factors

DOH – Department of Health

DoPW – Department of Public Works

HSRC – Human Science Research Council

IDT – Independent Development Trust

IDMS – Infrastructure Delivery Management System

IM – Interface Management

IPC – Infection Prevention Control

KSFs – Key Success Factors

KZN – KwaZulu Natal

NDOH – National Department of Health

PAC – Plans Approval Committee

PHC – Primary Health Care

PIP – Project Implementation Profile

PMBoK – Project Management Body of Knowledge

1 INTRODUCTION

KZN Department of Health Background

There are more than 450 projects in the KZN Infrastructure Development Programme. These include new infrastructure, renovation upgrade, and maintenance projects. Most of the existing infrastructures were built more than forty years ago and has since gradually deteriorated with time and hence for the past four years more than 500 projects have formed part of the Infrastructure Development programme. Within this period, some projects have been completed while new projects have been added to the programme depending on social needs and availability of funding.

The department is committed to providing equal access to healthcare for the total population in South Africa. The vision of the department is to achieve optimal health status for all persons in the province. Its mission is to develop and deliver a sustainable, coordinated, integrated and comprehensive health system at all levels of care based on the Primary Health Care approach.

The infrastructure that has been in place for the past forty years has over time experienced some upgrades and renovations. However over time the population has increased, rendering current capacity of existing structures insufficient to handle the demand placed on them.

The core business of the department is to deliver health services to all KZN communities. Infrastructure development is the enabling arm for the department. Any project undertaken has to contribute to the achievement of the objectives of the department.

Project success can be measured using three criteria; cost, time and quality (Atkinson; 1999). However this has not been achieved within the department only 50% of the projects have been successfully completed within time and cost. This is caused by interface management challenges as there are many stakeholders involved during a project lifecycle. A delay in decision making results in extension of project time and additional costs. Planned milestones will then be delayed.

When the projects duration and budget are exceeded a financial burden is created on the department. Delays in project delivery deny institutions the benefits that are attained from completed structures.

In one project the department is paying R1,5 million per month for temporary office rental, while the contractor is delaying the delivery of offices and is incurring R300 000 as penalties per month. In another hospital there was a delay in the delivery of the accommodation project. The institute has housed the staff members in Bed and Breakfast lodges. This is expensive for the department to sustain in the long term. The department loses skilled personnel to the private sector because of its inability to provide accommodation for doctors.

The delay also causes some departments in hospital to operate in park homes and this poses health risks.

A key question is, "what can be done to improve the success rate of projects in the department." This thesis argues that the Project Implementation Profile (PIP) tool can be employed as a diagnostic tool to improve the chances of succeeding (Pinto and Slevin, 1988). Project monitoring and control are normally a problem within the department. The tool allows the project managers to assess the softer behavioural side of the project management process to determine the status of the project in relation to its human elements and also gives the project managers the opportunity to focus on strategic issues of project development (Pinto, 1990).

BACKGROUND TO THE STUDY

The study will focus on KwaZulu Natal Province (KZN) Department of Health (DOH) as a Case Study.

Infrastructure Development

KZN is one of the nine provinces in South Africa. It is the second most populous province after Gauteng. KZN's population is almost 20% of the total population of South Africa. For the past forty years, the population has increased more than four times and as a result the hospital facilities have to cater for the increasing number of patients and clients (Africa, 2012; S.A, 2015).

Access to health care is a right to every person; this is stated in the South African Constitution. As a social responsibility, the government prioritizes healthcare. Upgrading, renovating and construction of new facilities have become critical. A component or section within the department is responsible for Infrastructure Development (HSRC, 2012/13).

The facilities that are constructed include Primary Health Care (clinics), Community Health Care, Hospitals, Nursing College, Forensic and Accommodation (Health, Annually Annual Implementation Plan). After completion of a project, the maintenance period commences. In the past two decade there has been an increase in HIV Infection rate and related diseases which stands at 16.9% currently (HSRC, 2012/13). This has influenced the prioritization of facilities that specializes in these diseases. The provincial disease profile is critical in decision making.

The government is funding more than 95% of the projects including equipment and furniture. External donors have funded some projects in the past for example the King Edward VIII Hospital Paediatrics & Child Health building (Health, Annual Implementation Plan).

Interfaces Within and Outside the Department

The stakeholders involved in a project participate in different stages and review gates during the project lifecycle. Their collaboration is crucial to the success of the project.

Some projects are large and complex and they require bringing together independent multi-disciplinary teams, materials, systems, budgets and schedules for a determinate amount of time (Daniels *et al.*, 2014). There are many variables involved which further complicate the nature of construction.

The interface starts at facility level where hospital management together with end users compiles a list of infrastructure project requirements that need to be addressed. These are proposed renovations and upgrades that cannot be catered for under the hospital maintenance budget. The project proposals are forwarded to the Strategic Planning component that will review the project list with the National Department of Health (NDOH). The list is reviewed to prioritize the critical projects in relation to needs of the communities or province (Health, 2014-19).

The Treasury department with NDOH approves funding for each project. The approved list is sent to the province to initiate the planning and implementing processes. The initial planning is done at portfolio level where an Annual Implementing Plan is produced. This outlines projects to be implemented in the current financial year and other years with budget allocations (Health, 2014-19; Health, IDMS; Department, National Treasury Generic document).

A project manager from DOH is allocated a few projects to manage. A project charter document is first produced justifying the existence of the project. The Implementing agent (for example the Department of Works) is appointed who will then appoint all required consultants. The Implementing agent executes what is approved by DOH with the assistance of DOH project manager. The consulting team is briefed of the client's requirements and they produce a design report that is sent to NDOH for approval. The design report outlines the scope of the project and cost estimate. This assists in allocation of required funding for projects (Health, IDMS; Department, National Treasury Generic document).

To define the project scope, heads of components, hospital facility management, NDOH, KZN DOH, Implementing agent and the consulting team participate in project planning meetings. The implementing agencies are the Department of Public Works (DoPW) and the Independent Development Trust (IDT). Some projects are done in-house depending on skills capacity (Health, IDMS; Department, National Treasury Generic document).

When a design report is reviewed and approved at NDOH, it is sent to the implementing agent's Plans Approval Committee (PAC). It is technically reviewed to ascertain whether it adheres to the norms and standards of the Department of Health. During this time, the Deeds office is engaged for land acquisition, Environmental affairs, Power supplier, Water affairs, local community, Local Municipality, consultants and suppliers especially for medical equipment that is imported, and IT equipment.

After PAC approval, tender documentation commences and the scope at this stage is signed off and locked or frozen. The contractor procurement strategy that is normally used is the open tender system and in some cases the selective tender system. The adjudication report is approved at the implementing agent's Bid Evaluation Committee (BEC) and Bid Award Committee (BAC). The service providers are

appointed without the influence of DOH. Fig 1 summarizes the processes involved (Health, IDMS; Department, National Treasury Generic document).

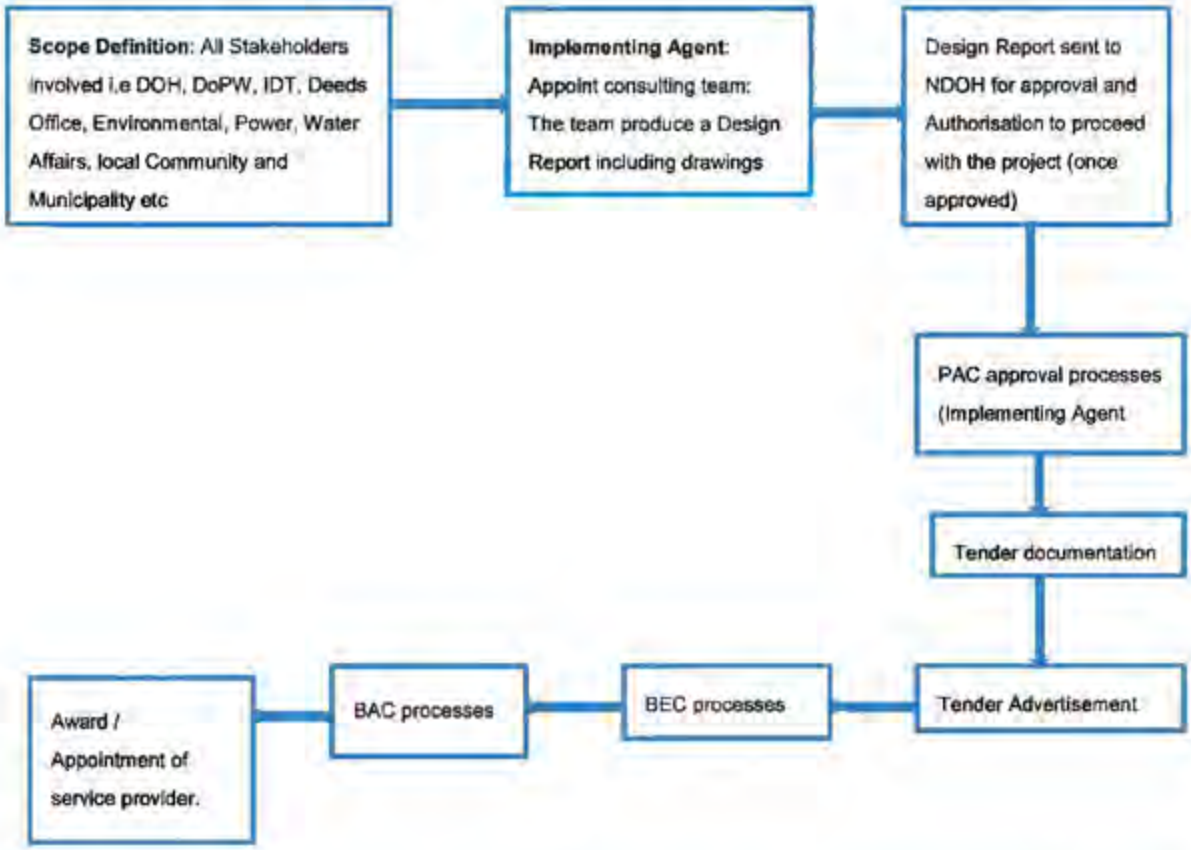


Figure 1.1: Summary of Process from Scope Definition to Appointment of service provider.

When the site works begins, the interface activity is mainly between the DOH, implementing agent, consulting team, contractor, subcontractors and suppliers. Progress meetings are held on a regular basis to review progress and mitigate any risks. When there is a variation order (change of approved scope), funding has to be approved by DOH before BEC and BAC approve and process it. The contractor cannot proceed before approvals. The DOH confirms availability of additional funding if the variation order requires it (Health, IDMS; Department, National Treasury Generic document).

On a monthly basis the contractor prepares a payment claim that is approved by the consulting team for payment. At different stages the consultants claim fees. Different

stages have different deliverables that are expected from consultants (Health, IDMS; Department, National Treasury Generic document).

At completion, a project is handed over to the client and is signed off. All snags need to be attended to before final sign off. The buildings are then equipped.

In all these processes during the project life cycle, coordination, cooperation and communication among stakeholders is expected and required.

Problems Encountered Related to Interface Issues

Interface Management (IM) serves as a link between different construction elements, stakeholders and project scope. Lack of proper IM could lead to deficiencies in the project cost, time, and quality during execution or may result in project failure (Shokri *et al.*, 2012). Various problems are experienced during the project life cycle which directly affects the project progress and acceptance by end user. These problems in the case of KZN DOH include the following; delays in approval of the design report by NDOH which makes it difficult to plan on milestones, poor collection of client requirements and scope definition, poor specifications, lack of enough experienced personnel to manage projects, less experienced contractors and subcontractors who deliver poor quality product. As a result, many projects end up being terminated or the contractor would be penalized and that affects their cash flow.

Variation Orders are approved by many committees and this procedural burden affects project duration as the contractor cannot continue without approval in writing. There are 'Extensions of Time' claims, and 'Variation Orders' which are a result of poor investigation work by consulting teams, or in some instances, the team would have failed to get full access to buildings earmarked for upgrade and renovations (Health, IDMS; Department, National Treasury Generic document).

Other problems includes increased costs, poor communication between stakeholders, poor planning and scheduling, land acquisition delays, delayed response from external organisations, delays in payments of consultants, contractor, subcontractors and suppliers, violation of conditions of contract and conditions of appointment, poorly detailed tender documentation, insufficient funding. Imported equipments price fluctuations, unauthorized scope changes and high turnover of decision making staff. These are some of the problems experienced which affect expected results of the project.

Some projects are terminated due to poor performance of the contractor. When that happens, documentation to complete the contract is prepared by the implementing agent. This increases overall project costs and project duration.

The problems described above are mainly contractual and involve the organisational interface. The Project Implementing Profile (PIP) tool could be the answer in resolving challenges faced by interface management in projects. PIP is a project tracking and control tool designed to improve project management.

The PIP tool can improve stakeholder efficiency as early intervention to solve challenges is required. Project planning is improved and the risk management is prioritized. Teamwork is encouraged including involving top management to support the project. The turnaround time for making decisions is reduced thereby improving efficiency.

The PIP tool is based on a ten factor model according to Pinto and Slevin (1987). It's development was informed by responses from project managers who had been involved in projects that were considered successful (Pinto and Slevin, 1987). These factors are considered critical in achieving what is necessary to meet the expected outcomes of the project stakeholders (Pinto, 1990). In a study of 408 successful projects, ten critical success factors were validated against a wide variety of project types (Finch, 2003;Pinto, 1990).

The PIP tool can be applied at any stage of the project from inception to completion, and it can be used several times to help identify areas of concern (Finch, 2003).

Pinto and Slevin (1987) identified two groups of factors as being strategic and tactical. These factors influence project performance during the project life cycle. The strategic factors include the follows;

- *Project mission*; where goals and objectives of the project are clarified,
- *Top Management support*; willingness and ability to provide required resources by top management, including authority and influence over the project,
- *Project schedule*; includes detailed specifications of all action steps required for project implementation and schedule,

While tactical factors includes the following;

- *Client consultation*; adequate on-going communication between stakeholders,
- *Personnel;* required personnel selected, recruited and trained,
- *Technical tasks*; availability of required technologies and expertise,

The following are important throughout the project life cycle

- *Client acceptance*; approval by the end user of the final end product or deliverables,
- *Monitoring & Feedback*; project progress monitoring and providing feedback to all stakeholders in all stages of the project,
- *Communication*; circulating necessary information to all stakeholders during implementation of project,
- *Trouble shooting*; ability to handle unexpected crises and deviations from original plan

Figure 1 displays the key success factors and their sequential relationship throughout the project lifecycle.

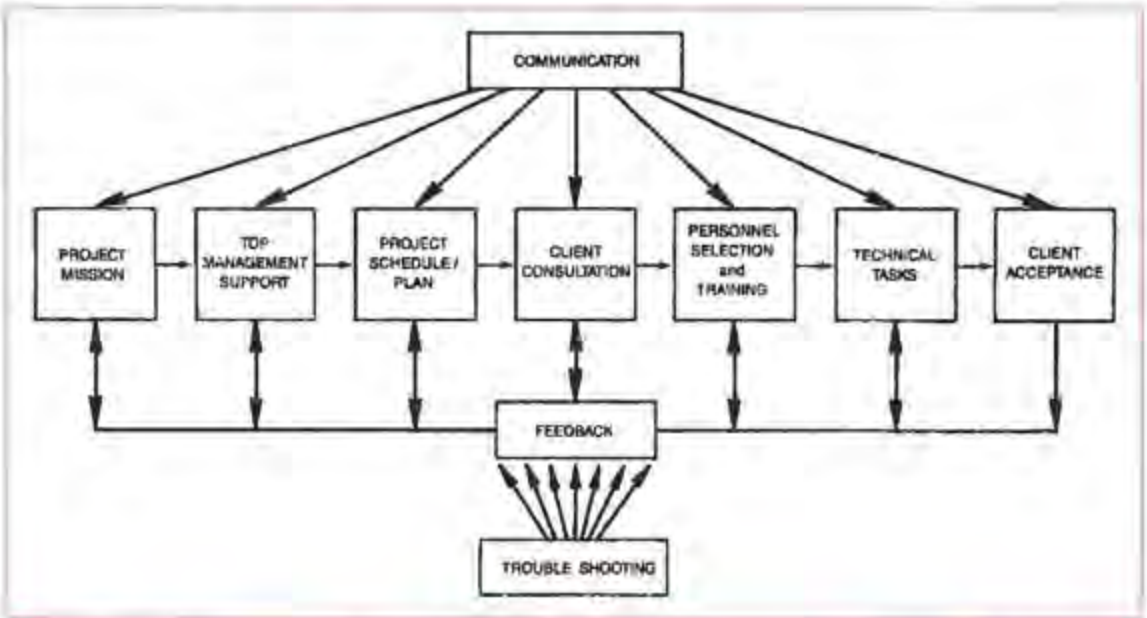


Figure 1.2: The relationship between the ten PIP key success factors (Schultz et al., 1987)

Communication, monitoring and feedback and troubleshooting are considered important throughout the project life cycle (Finch, 2003). Other factors are important at inception or the end of the project. Strategic factors involve early planning, policies and general objective setting while on the other hand tactical factors consider resources allocation and implementation of tasks (Finch, 2003; Pinto and Slevin, 1986).

Project managers need to periodically monitor the project using the PIP tool (Finch, 2003). The consensus of surveyed team members is used to develop a collective picture of the project. The manager then pays close attention to low scoring factors.

Based on the research by Pinto and Slevin (1987), a questionnaire has been developed based on the ten factors which feeds the PIP tool. Projective information was obtained from 54 projects managers who were asked to indicate activities that they could address that would significantly increase project success (Pinto, 1990). This was repeated until a set of ten critical success factors were identified as well as a 50-item instrument which can be used to measure project implementation performance in relation to the critical factors. The ten critical success factors were subsequently validated and found to be generalizable to a wide variety of over 400 projects (Pinto, 1990).

"A 100-item instrument (10.items per factor) was developed and has been used to measure the relative level of each of these critical success factors. This instrument was further refined and reduced to a 50-item instrument (5 items per factor) and is a useful diagnostic tool for project implementation" (Pinto and Slevin, 1978:177)

There are fifty (50) questions covering the ten success factors of the PIP with five (5) per factor. The responses are used to obtain raw scores. Each set of questions per factor is ranked from a scale of 1 to 7, where 7 is 'strongly agree' and 1 is 'strongly disagree'. The scores per factor are converted to a percentile where 80-100% is classed as good performance, 50-80% is fair performance and lastly 0-50% is classed as critical needing attention to avoid affecting the implementation of the project. Low scores highlight potential barriers to successful implementation of future projects. The higher the percentage the better handled is the critical area and the project manager can turn attention towards problematic areas.

The PIP can identify areas in a project that are problematic (Finch, 2003). This could be of great benefit to IM in mega projects which combine many smaller different projects that require IM to be properly managed.

It is common in public sector organisations to have many people involved in making decisions that affect the project implementation from inception to completion. A lot of interaction happens between stakeholders from different levels. With hospital construction projects such as those by KZN DOH, engagement happens between politicians, environmental affairs, municipality, public works, consultants, local community, water affairs, power supplies, deeds offices, internal sections of the health department. Interface management becomes crucial to the successful implementation of the project. This has proved to be a challenge in the KZN health department projects.

The benefits of IM in relation to KZN DOH projects can be drawn as follows (Chua and Godinot, 2006; Daniels *et al*., 2014): In DOH projects there are different departments and different DOH sections involved in project planning and scope definition, therefore it improves efficiency among stakeholders involved as teamwork is encouraged from inception to completion of the project. The stakeholders' involvement also assists in understanding project requirements, and policy expectations.

This assist in understanding the complexity of DOH projects and improves work packaging and subcontracting to reduce existing interfaces challenges. Future projects are planned better with lessons learned from previously implemented projects.

The risks involved are managed early before they affect the implementation of the projects and procedures get standardized of attending to challenges normally experienced.

1.1 PROBLEM STATEMENT

Public sector construction projects have complex interface requirements. These impede the successful completion of projects. What can be done to improve the success rate of projects in the department?

1.2 RESEARCH AIM

The aim of this research is to find out if the PIP tool can be applied to Interface management and improve the probability of project success in the context of KZN Health Department.

1.3 RESEARCH OBJECTIVES

The objectives of the research are as follows;

- Identify Interface management challenges encountered by health facility projects,
- Identify the advantages that can be realized in using the PIP tool,
- Outline how the PIP tool can bring about project success by improving Interface management between stakeholders.

1.4 RESEARCH QUESTIONS

The research questions to be investigated are;

- What are the challenges with Interface management in KZN health facility projects?
- What are the advantages of using the PIP tool for interface management quality assurance?
- How does use of the PIP tool make a positive contribution to the processes of interface management?

1.5 RESEARCH PROPOSITION

The research proposition is;

The PIP tool can contribute to project success by improving Interface management.

1.6 RESEARCH METHOD

- To achieve the first objective of this research, a case study approach using KZN health projects that are completed will be analysed in terms of Interface management challenges and how PIP can assist.
- To achieve the second objective of this research, a qualitative survey will be conducted among stakeholders to determine the importance of the ten KSFs in achieving project success,
- To achieve the third objective, the data will be analysed, evaluated and results would be used to advise future projects.

1.7 LIMITATIONS

The research limitations include:

- Information obtained would be subjective as stakeholders would be giving their opinions,
- Time available to gather information per project. It was going to be more effective to monitor and implement PIP tool on a project from inception to completion,
- Some participants might be skeptical in releasing information especially Treasury department, MEC and HOD offices,
- A truly representative sample of all the stakeholders involved might be a problem as some are highly placed in politics and won't be accessible.

1.8 STRUCTURE OF RESEARCH REPORT

The research report will be structured as follows;

Chapter one will outline the introduction and background to study, problem statement will follow, then research questions to be tackled, the research aim, research proposition, research objectives, methodology to be used, limitations and finally research structure.

Chapter two will provide a extensive literature review where measures of project success and failure are outlined, interface management and its challenges within

KZN health projects. This chapter will also detail the PIP tool and determine its suitability at all levels of project implementation.

Chapter three will expand and focus on the research methodology used in addressing research questions, strategical positioned stakeholders will respond to questionnaires. The analysis and interpretation of gathered information from research methodology will be covered in ***chapter four*** while the discussions of the findings will be covered in ***chapter five***.

Finally ***chapter six*** will conclude the research and provide recommendations for future research that will build on findings made in this dissertation. The chapter will be followed by references and Appendix with questionnaire.

2 LITERATURE REVIEW

2.1 INTRODUCTION

Project success: It is the ultimate goal for every project to be successful (Chan and Chan, 2004). There is no standardized definition of the term or accepted methodology for measuring it. Historically, success has been defined as meeting the customer's expectations regardless of whether or not the customer is internal or external (Kerzner, 2009) However the criteria for project success must be agreed at the commencement of the project to avoid differences amongst stakeholders (Ahadzie *et al.*, 2008).

One size does not fit all as projects differ in terms of size, complexity, risk involved and other variables (Shenhar *et al.*, 2001). One source suggests success is achieved when stakeholders are satisfied with the outcome (Morris and Hough, 1987; Westerveld, 2003). It is measured in subjective and objective ways to the extent that "*Doubts often arise about what and who actually determine project success*"(Lim and Mohamed, 1999:243).

Project success implies different things to different people or organisations and is context dependent (Chan and Chan, 2004;Jugdev and Müller, 2005; Shenhar *et al.*, 2001). Stakeholders can have different definitions of success for example;

- Customers: safety in its use
- Employees: guaranteed employment
- Management: bonuses
- Stockholders: profitability
- Government agencies: compliance with federal regulations (Kerzner, 2009).

The definition fails to openly highlight some of the characteristics found in construction such as the project environment, site conditions including topography, weather, bulky materials and design consideration (Ahadzie *et al.*, 2008).

Project success has, in the past been limited to the implementation phase of the project life cycle. That has changed to include the product life cycle (Jugdev and Müller, 2005). Success can be viewed from two points of view, the degree to which technical project performance objectives were attained, and the contribution made by the project to the strategic mission of the firm and customer organisation (Cleland and Ireland, 2002). Project success could mean; meeting design goals, benefits to the customer, and benefits to the developing organization (Tishler *et al.*, 1996). These conditions must be achieved to gain success but they do not guarantee success (Turner, 2014).

Success conditions include a number of elements, first, the success criteria should be agreed on with the stakeholders before the start of the project, and repeatedly at configuration review points throughout the project. Second a collaborative working relationship should be maintained between the project owner (or sponsor) and project manager, with both viewing the project as a partnership. Third, the project manager should be empowered with flexibility to deal with unforeseen circumstances as they see best, and with the owner giving guidance as to how they think the project should be best achieved, and lastly the owner should take an interest in the performance of the project (Davis, 2014).

Major distinct success dimensions includes, i) project efficiency in terms of meeting time, budget and other requirements; ii) impact on the customer in meeting functional performance, technical specifications, customer needs; iii) business success commercially and market share, and iv) preparing for the future in creating a new market, new product line and developing technology (Jugdev and Müller, 2005; Shenhar *et al.*, 2001). See summary on Table 1

Table 2.1: *Success Dimensions* (Shenhar et al., 2001)

SUCCESS DIMENSION	MEASURES
Project efficiency	Meeting schedule goal, Meeting budget goal
Impact on the customer	Meeting functional performance, Meeting technical specifications, Fulfilling customer needs, Solving a customer's problem, The customer is using the product and customer satisfaction.
Business successes	Commercial success, Creating a large market share.
Preparing for the future	Creating a new market, Creating a new product line and developing a new technology.

These dimensions should be considered during the project definition, planning, and execution phases and provides guidelines to management. The product life cycle includes the operational phase followed by decommissioning or retirement phases, and the project life cycle is a subset of the product life cycle. The project life cycle incorporates conceptualization, planning, execution and close out (Guide, 2008; Pinto and Prescott, 1988). Project success is often mistakenly analysed at project completion as project management results are available and can be measured (Jugdev and Müller, 2005; Munns and Bjeirmi, 1996). Though good project management can contribute towards project success, it is unlikely to be able to prevent failure. Project management success can be defined as a measure against time, cost and quality while project success is measured against the overall objectives of the project (Cooke-Davies, 2002).

A project can be a success or failure depending on whether it meets the success criteria defined at inception. There is a set of success criteria that each stakeholder puts in place that would define if the project was successful or not. Factors that contribute greatly to project success are for example proper planning and communication. A criteria can be defined as a standard of judgment which are established in the early stages of the project while factor can be defined as an element that brings about a certain result or outcome (Cooke-Davies, 2004; Jugdev and Müller, 2005; Lim and Mohamed, 1999). The relationship can be represented diagrammatically as in Fig 2;

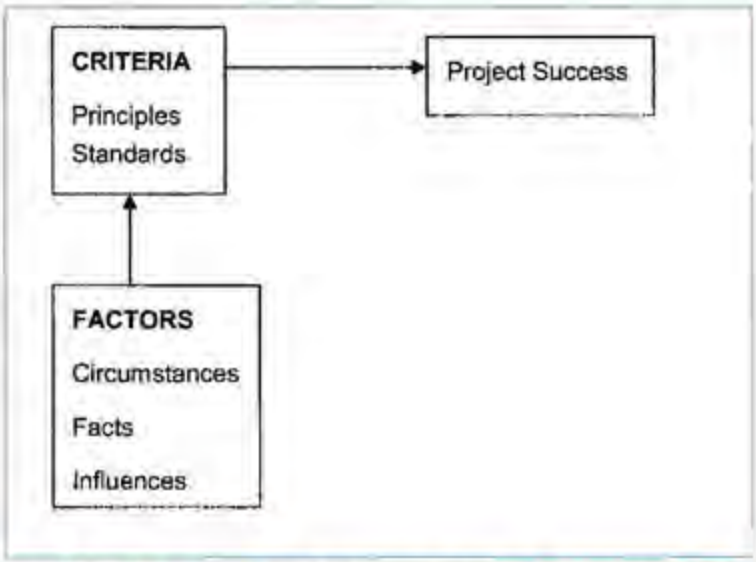


Figure 2.1: Relationship between project success factors and criteria (Lim and Mohamed, 1999)

"*Successful completion of a project may require several years of development, implementation, and evaluation of a successful project management strategy*" (Sutterfield *et al.*, 2006: 26). Project implementation success can be defined in many ways to incorporate a large variety of measures such as implementing within time, budget, performance and acceptance to the end user. For the past fifty years success has been measured using the Iron triangle *Time, Cost and Quality* (Atkinson, 1999) *(see Fig 3)*.

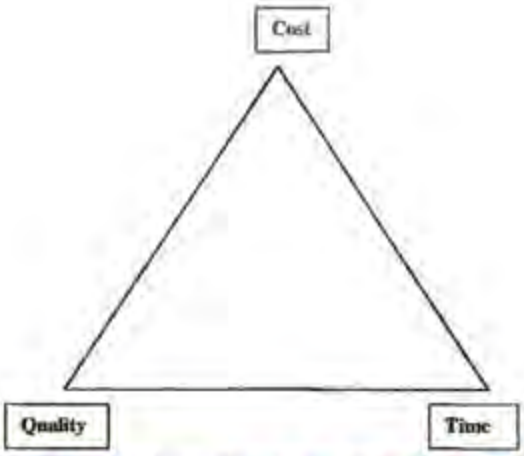


Figure 2.2: The Iron Triangle (Atkinson, 1999)

Recently, more research has been done leading to other factors being identified, such as definition of stakeholder needs, expectations, safety, efficient use of resources, effectiveness, satisfaction of stakeholders, reduced conflicts and disputes, and project tasks (Atkinson, 1999; Jugdev and Müller, 2005; Shenhar *et al.*, 2001; Ogunlana, 2010).

With the iron triangle criteria achieved, failure is still recorded in many projects. Normally the term failure is used when a project is terminated prior to completion which might be because of legal, social, political, technological and economic environment reasons (Pinto and Mantel Jr, 1990). Failure can be due to the implementation process, perceived value of the project, and client satisfaction with the delivered project (Pinto and Mantel Jr, 1990). These can also be grouped as controllable (internal) factors and uncontrollable (external) factors. Internal factors include project characteristics, service providers' influences and client organisational influence while external factors include socio-cultural issues, unforeseen

circumstances, economic and global dynamics and governmental controls (Mbachu and Nkado, 2007).

It has been argued that one way to define project success is to consider the answers to three separate questions: "*What factors lead to project management success*?" "*What factors lead to a successful project*?" and "*What factors lead to consistently successful projects*?" See Fig 4 (Cooke-Davies, 2002:185)

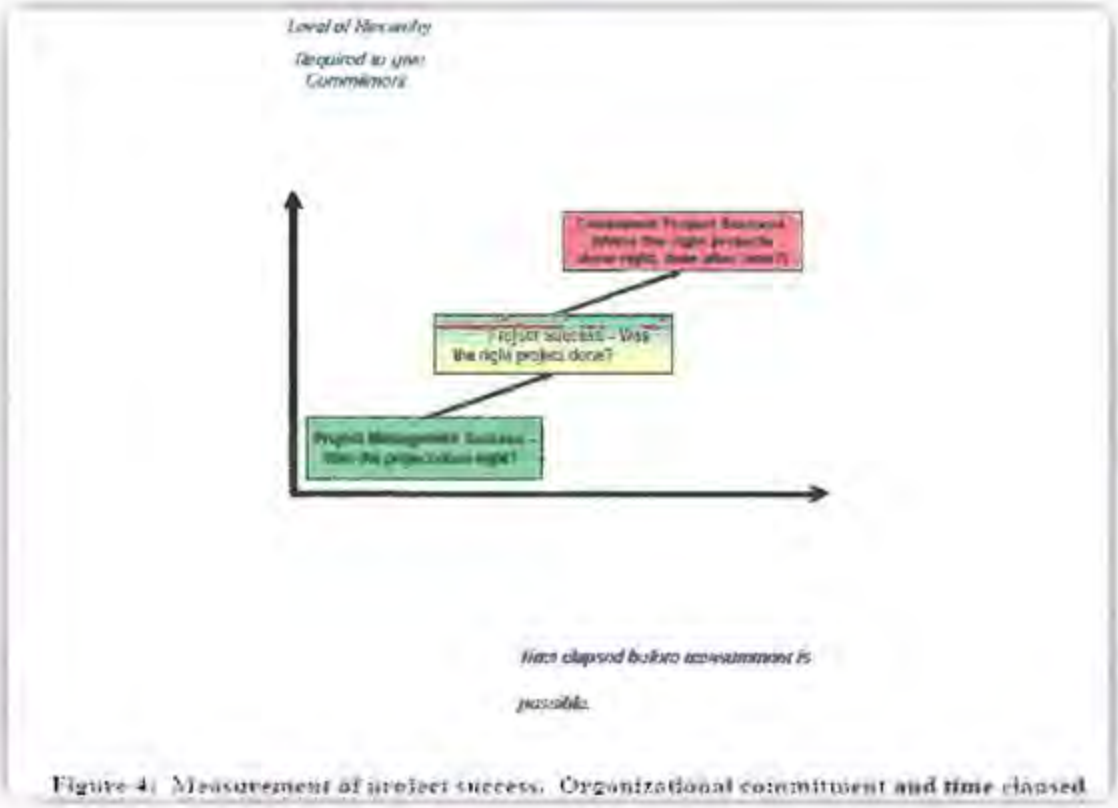
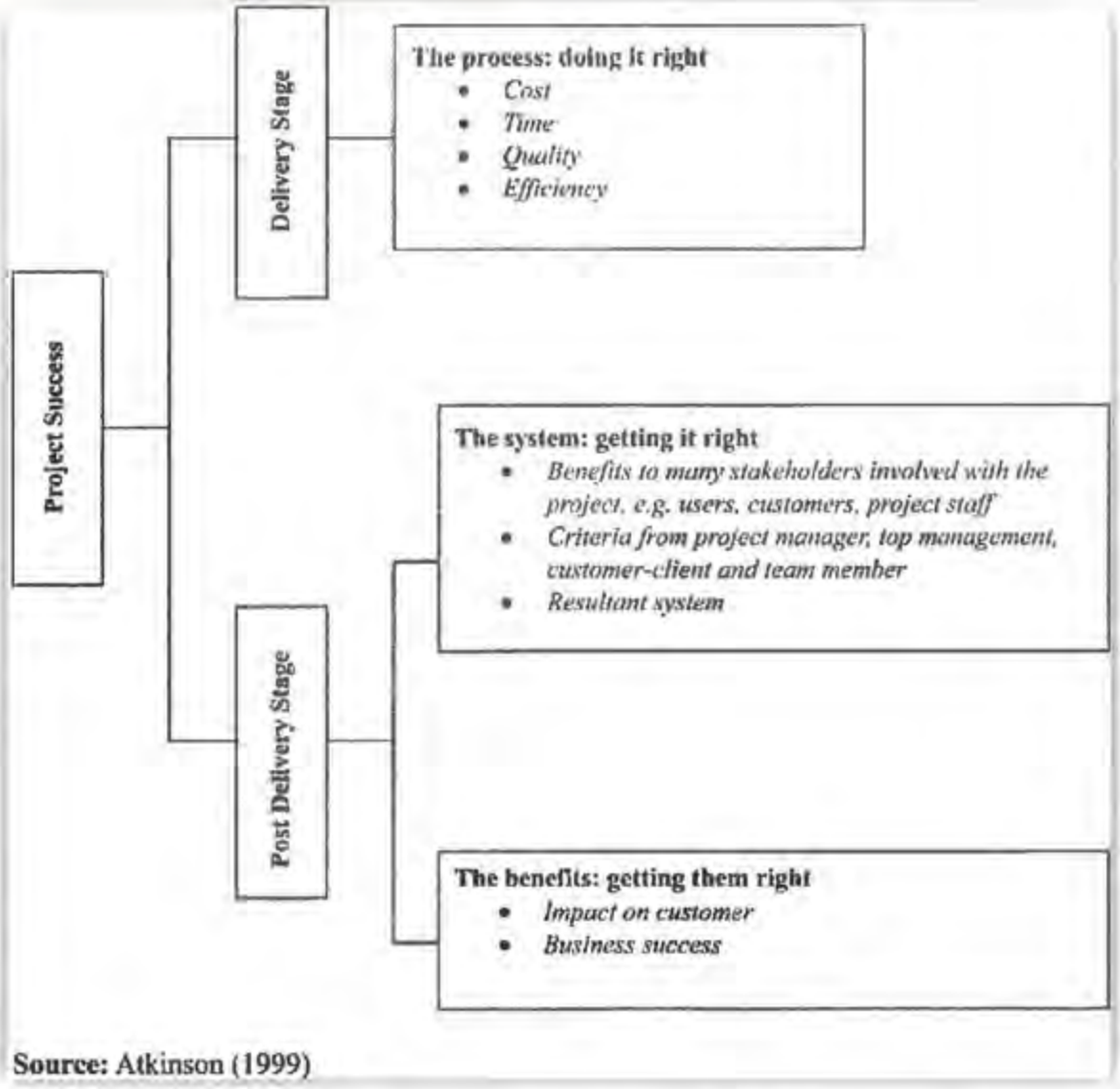


Figure 4: Measurement of project success. Organizational commitment and time elapsed

Figure 2.3: Measurement of Project success. Organizational commitment and time elapsed: (Cooke-Davies, 2004)

Similarly, Atkinson divided project success into three stages, "thus the delivery stage: doing it right"; the second is "post-delivery stage: the system: getting it right" and the lastly the "the post-delivery stage: the benefits: getting them right" see Fig 5 (Atkinson, 1999; Chan and Chan, 2004).

Figure 2.4: Success Stages (Atkinson, 1999)



Source: Atkinson (1999)

The delivery stage measures the efficiency of the project; the impact on customers is measurable within a couple of weeks after implementation. Business success is measurable after one or two years after implementation while preparation for the future is measurable after about four to five years (Atkinson, 1999).

Project management success is about time, cost and quality while project success is obtaining value for money with the assumption that the project will be successful only if it is successfully operated achieving the planned benefits by stakeholders. Lastly consistent project success where the right projects are done time after time as

organisations compete in markets for scarce resources such as customers and finance (Cooke-Davies, 2004).

The organisation would incorporate all three levels of success as outlined Table 1 to understand and improve its success in the field of projects (Cooke-Davies, 2004).

Table 2 summarizes the success criteria and success factors in relation to success level,

Table 2.2: *Three Levels of Project Success Summarized* (Cooke-Davies, 2004).

Success "Level"	Typical criteria for success at this level	Possible factors critical for success at this level	Organizational level accountable
Level 1: Project management success "Was the project done right"	* Time * Cost * Quality * Technical performance * Scope * Safety	1 Clear and doable project goals. 2 Well-selected, capable and effective project team 3 Adequate resourcing. 4 Clarity about technical performance requirement. 5 Effective planning and control 6 Good risk management.	* Project manager * Project team.
Level 2 Project success. "Was the right project done"	* Benefits realized. * Stakeholder satisfaction	1 Clear and doable project goals. 2 Stakeholder commitment and attitude. 3 Effective benefits management and realization processes. 4 Appropriate project strategy.	* Project sponsor. * "Client", "owner" or "operator" (recipient of benefits)
Level 3 Consistent project success. "Are the right projects done right, time after time?"	* Overall success of all projects undertaken. * Overall level of project management success. * Productivity of key corporate resources. * Effectiveness in implementing business strategy.	1 Continuous improvement of business, project and support processes. 2 Efficient and effective portfolio, programme and resource management processes. 3 Comprehensive and focused suite of metrics covering all three levels.	* Shareholders (or equivalent) * Top managers. * Directors of project management. * Business unit managers. * Portfolio managers.

Ownership is established at each target level between governance and project team. Different levels are concerned with different kinds of decisions and different job functions are interested in different aspects of project success, though all job functions are interested in project costs, resource utilization, financial benefit, quality, and technical performance of the product (Cooke-Davies, 2004).

Other factors need to be taken into consideration (Atkinson, 1999). There is a need for a measuring tool that would take into consideration the subjective and objective aspect in analysing project success. Each project is different and therefore the tool should be flexible and cater for all. This becomes critical to stakeholders and the project team as it contributes to efficient execution of projects. The difficulty in determining success in projects stems from a lack of a standardized methodology.

Objective factors can be easily quantifiable but subjective factors are dependent on the personal perspective of the stakeholder in ascertaining how a project performed (Hughes *et al.*, 2004)

2.2 PROJECT SUCCESS CRITERIA

Success criteria are the measures against which success or failure of a project will be judged (Cooke-Davies, 2004). It can also be defined as the set of principles or standards by which favourable outcomes can be completed within a set specification (Chan and Chan, 2004). Identifying success criteria helps project managers to plan resource allocation (Ahadzie *et al.*, 2008). Success criteria for project management are often measured on the basis of cost, time and quality. This has proved to be limited. There are other suggestions in terms of criteria which have been outlined by many authors who have added to the criteria of time, cost and quality. *"It is impossible to generate a universal checklist of project success criteria suitable for all projects"* (Westerveld, 2003: 412)

When the objectives of the project have been clearly established and challenges spelled out, then the project team can use their best endeavors to deliver the project so that it meets the objectives within the constraints (Cooke-Davies, 2004). The problem that sometimes arises is identifying which stakeholders should decide the criteria. Until there is an agreement on the determinants of success, it would be difficult to accurately monitor and predict project results effectively. This makes the identification of project success criteria critical especially for project based organizations (Atkinson, 1999).

A success criterion has no consistent interpretation or accepted methodology for measuring it, though the criteria must be agreed at inception of the project to avoid differences amongst project teams. All stakeholders need to approve the criteria (Wateridge, 1998). The project team needs to concentrate on the agreed success criteria and the factors to bring about these results (Wateridge, 1998).

Criteria can be consistently reviewed with project progress as they are subjective (Wateridge, 1998). The subjective measures include quality, functionality, end user satisfaction, clients' satisfaction, design team satisfaction and construction team satisfaction. The Objective measures include construction time, speed of

construction, time variation, unit cost, percentage net, variation over final cost, net present value, accident rate and environmental Impact assessment scores (Chan and Chan, 2004).

The criteria could be unique depending on the type of project, size, uniqueness and complexity (Ahadzie *et al.*, 2008; Westerveld, 2003). Traditionally the criteria have been the iron triangle but that excludes the long-term satisfaction of the relevant stakeholders. In recent times it includes measure of benefit to stakeholders, safety, efficient use of resources, effectiveness, reduced conflicts and disputes, strategy and sustainability friendliness of environment, health and safety (Ahadzie *et al.*, 2008; Chan and Chan, 2004; Ogunlana, 2010; Wateridge, 1998; Westerveld, 2003). Please see Fig 6. Temporary criteria are available during the delivery stage to measure whether the project is progressing as planned and also are a method of control (Atkinson, 1999).

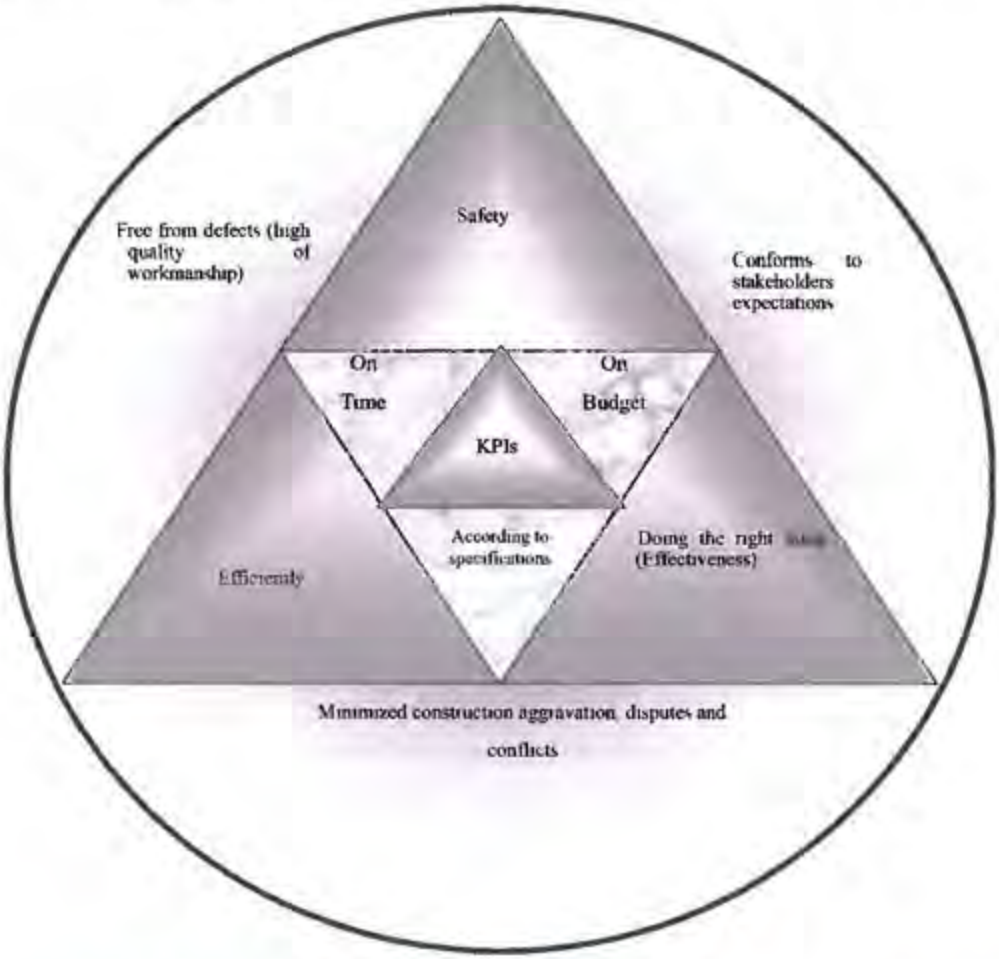


Figure 2.5: Performance measurement criteria for mega projects (Ogunlana, 2010)

The success criteria evaluation can also include operational flexibility, maintainability, energy efficiency, sustainability, modern needs, future demands and contribution to the overall well-being of end users (Ogunlana, 2010).

A project can fail to meet the cost and time expectations but still be considered a success (Hough and Morris, 1987). The Thames Barrier project in London took twice the duration to build and cost four times the original budget but was profitable to the contractors hence it was a success (Wateridge, 1998). The Sydney Opera House took 15 years to build and was 14 times over budget but yet it is proudly considered as an engineering masterpiece. This was a failure in terms of project management success but it was a success in terms of project success (Jugdev and Müller, 2005). Often projects that are perceived to have failed have time and cost as the main criteria for judging success (Wateridge, 1998).

Pinto and Slevin (1987) are the drivers behind a number of studies. Their framework incorporates three criteria, including technical validity, organizational validity and organizational effectiveness. A comprehensive framework developed includes: i) project functionality – if the project meets the financial and technical requirements, ii) project management – if the project meet the budget, schedule and specifications, iii) contractors' commercial performance – if the contractor benefited commercially and lastly iv) project termination – in the event the project is cancelled, was this decision made reasonably and efficiently (Jugdev and Müller, 2005).

The criteria is equally important both inside and outside of the project organisation. The criteria can either be quantitative or qualitative for large-scale public sector development projects. Quantitative includes, cost, on time, resource management, quality control, percentage complete and lost time accounting. These also appear in the costing systems used by the majority of construction firms. Qualitative includes safety, turn-over, absenteeism and motivation, however the qualitative indicators are not reliable as they are difficult to measure (Ogunlana, 2010).

Table 3 presents systems measure based on system quality, information quality, information use, user's satisfaction, individual impact and organisation impact (Atkinson, 1999; Delone and McLean, 2003).

Table 2.3: *Systems measures* (Atkinson, 1999)

- System quality
- Information quality
- Information Use e Users satisfaction
- Individual impact
- Organisational impact

The five most commonly used criteria includes, technical performance, efficiency of execution, managerial and organisational implications, personal growth and manufacturer's ability and business performance (Ogunlana, 2010).

In a case of client vs, contractor; the success criteria differ in the sense that the contractor prioritizes minimizing project costs and duration while the client is more concerned about meeting the needs of other stakeholders. The contractor emphasis is on customer rather than other stakeholders (Bryde and Robinson, 2005). Such a failure to agree leads to failed projects and hence the need for an improved relationship between client and contractor.

A summary of project success criteria as highlighted by different authors from previous years is shown in Table 4;

Table 2.4: *Summary of the research on projects success criteria* (adapted from, (Kerzner, 1992; Lim and Mohamed, 1999; Wateridge, 1998; Westerveld, 2003)

SUCCESS CRITERIA	DESCRIPTION
Time	Project done on time.
Cost	Project done within allocated budget.
Quality & Specification	The project produced to acceptable quality and specification with minimum scope changes.
Client satisfaction	It should meet its defined objectives, goals, achieve its business purpose, be profitable to the client, meet quality expectations, improve workflow, and offer long-term benefits to the organisation.
End-user's satisfaction	The end-user should be satisfied and accept end product, adhere to health and safety norms, environmentally friendly, offer long term benefits.
Project team satisfaction	The implementation process should be relatively understandable, original business concept maintained.
Contracting parties	The project should be profitable, and offer short term benefits.
All other stakeholders	The project should meet objectives, goals, be acceptable, profitable and be happy with implementation plan.

2.3 PROJECT SUCCESS FACTORS

Success factors are elements that bring about a certain desired result (Cooke-Davies, 2002). They identify what is necessary to meet the desired deliverables of the customer (Kerzner, 2009). They predict success on projects and are considered to be a means to improve the effectiveness of projects (Chan *et al.*, 2004). Countless efforts were made by different researchers to determine critical success factors in construction. A number of variables appear to more than one list, but yet there is no general agreement on variables (Chan *et al.*, 2004). The list varies in scope and purpose thus either very general factors or very specific factors affecting only a particular project (Belassi and Tukel, 1996).

Success factors are inputs to the management system that lead directly to the success of the project. They are dependent on three questions which are; '*what factors lead to project management success*', '*what factors lead to a successful project*' and '*what factors lead to consistently successful projects*' (Cooke-Davies, 2002:185). Success factors are also known as a set of characteristics, conditions and variables which should be adequately sustained in order to influence success in an organisation (Bruno and Leidecker, 1984). They are the fields which are restricted in which positive results will bring about successful competitive performance for the project (Bullen and Rockart, 1981).

Initial research on factors focused mainly on control aspects of the projects developing standard tools and techniques for project management. More factors have emerged over time than scheduling alone. These were grouped to factors within the control of the project manager and those outside the control of the project manager (Westerveld, 2003).

The success factors were firstly introduced by Rubin and Seeling in 1967 where they concluded that the project manager's experience is critical to the success of the project (Belassi and Tukel, 1996). Later this was agreed to by Avots who highlighted the need for a good project manager, top management support and avoiding unplanned project termination (Belassi and Tukel, 1996).

The following Table 5 highlights success factors from different research as identified in the study.

Table 2.5: *Summary of Critical Success factors adapted from Literature* (adapted from Baker *et al.*,1983; Belassi and Tukel, 1996; Cleland and King, 1983; Locke, 1984; Morris and Hough, 1987; Munns and Bjeirmi, 1996; ; Pinto and Slevin, 1989; Sayles and Chandler, 1971; Westerveld, 2003;)

CRITICAL SUCCESS FACTORS	DESCRIPTION
Define Goals	Goals for the project need to be clear
Project Objectives	Objectives need to be properly outlined and known to all stakeholders
Project Managers' Competence	Should have good leadership characteristic, experienced to lead the project team. This includes on-site project manager, good planning and control techniques.
Project schedules	These need to be properly defined and outlined
Senior Management Support and Commitment	The management support is critical thus financially, resource allocation and decision making to avoid delays.
Minimum start-up difficulties and near accurate cost estimates	Assist in allocating adequate funding and avoid disruption to project progress.
Information and Communication channels	Distribution of required information to stakeholders within agreed channels.
Personnel Recruitment & Training	Involves the acquiring of skilled and experienced personnel including training
Monitoring and Feedback and Project review	Includes setting up of control mechanism for monitoring project progress and constant communication with relevant stakeholders.
Client Requirements	Understanding clearly the client's needs and expectations.
Project Management	Proper implementation of project plan which includes management of costs, time, risk, quality and risks.
End-User Acceptance	If included from inception and during implementation stage, the acceptance of the end product is certain
Legal Agreements	The agreements involved should be properly done between all contracting parties to avoid delays and possible termination of the project.
Organisational Culture or Philosophy	The way organisation implement projects. In some there is red tape which delays procedures.
Trouble shooting	This is a contingency plan to cater for the unknown during implementation
External Factors	These include social, political, economic, physical, industrial and technical systems.

Five major groups of independent variables which are; project related, project procedures, project management actions, human-related factors and external environment (See Fig 7). Nowadays, building projects are becoming complex and difficult and the project team faces extraordinary changes hence the need to study critical success factors (Chan *et al.*, 2004).

The project related factors talk to the scope of the project and its complexity. The procurement factors are the framework within which construction is brought about, acquired or obtained thus the procurement method and tendering method. Project management factors enable the project manager to plan, execute and maximize project chances of success (Chan *et al.*, 2004). The influence of project participants is significant especially the client and client's representative. Consultants' involvement is vital as their work commences from inception and continues to completion of a project. The main contractor and subcontractors start their main duties when the project reaches the construction stage. Their reputation in all aspects of construction is critical. The key ingredient amongst project participants is team spirit (Chan *et al.*, 2004).

The attributes of project participants' related factors can be grouped in two categories, one related to client and the other to the project team. The first category includes clients' experience, ability, nature of client, and size of client organisation, clients' emphasis on cost, time, quality, and client contribution to the project. The second category includes project team experience and skills, commitment on time, cost, quality, project team leaders' involvement, project team leaders' adaptability and working relationship and support of the project team leaders' parent companies (Chan *et al.*, 2004)..

Lastly external environment factors include social, political, economic, physical, industrial and technical systems (Chan *et al.*, 2004).

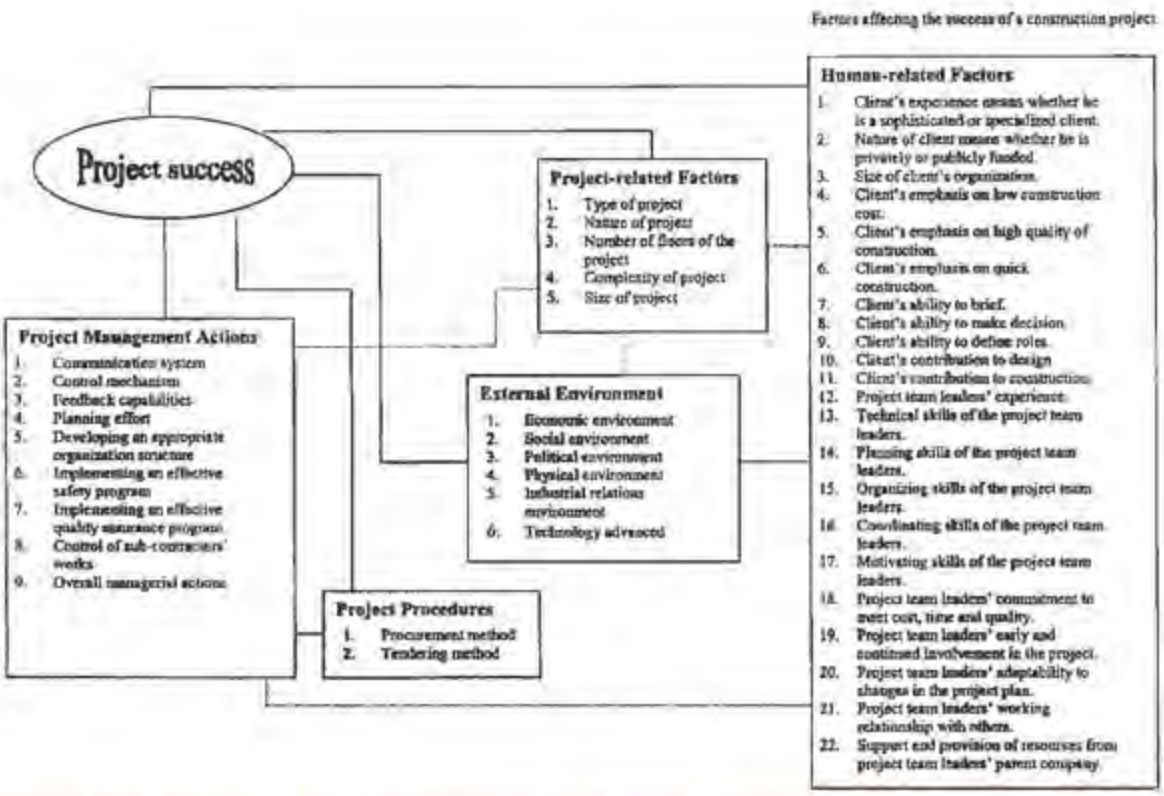


Figure 2.6: New conceptual framework for factors affecting project success (Chan *et al.*, 2004).

Success factors can also be grouped under four main project aspects, thus project characteristics, contractual arrangements, project participants and interactive processes in the hierarchical model of the project. These can also be identified based on expert opinions using experience. These experts are normally key personnel towards project outcome (Chua *et al.*, 1999). Success factors are to increase efficiency, reduce costs, improve product quality and increase customer satisfaction and shareholder value. With this, the organisations have realized that success lies in the performance of their processes and not only the functional structures. Success factors should be focused on primary project objectives in order to achieve the most satisfying results (Ziemba and Oblak, 2013).

Other project critical success factors included communication, clear objectives and scope, decomposing project and project plans (Jugdev and Müller, 2005). In the 1990's a project success framework emerged which outlined a concept that was stakeholder dependent and also involved the interactions between the internal and recipient organisation (Jugdev and Müller, 2005; Kerzner, 1992),. A framework based

on major projects and grouped project success has been known as follows; project functionality, management, and contractor's commercial performance and project termination. The critical success factors which included attitudes, project definition, external factors, finance, organisation and contract strategy, schedule, communication and control, human qualities and resource management were developed (Morris and Hough, 1987).

With all these factors taken into consideration, failure in projects is being experienced in different phases of the project life cycle. In the cases where project management fails, it overshadows the stories of successful projects (Pinto and Mantel Jr, 1990).

Success or failure depends on the implementation process itself, the expected value of the project and client satisfaction with the delivered project (Pinto and Mantel Jr, 1990). The first analyses consider the internal efficiency of the processes while the last consider project external effectiveness. The internal measure takes into consideration Interface management between stakeholders. This is generally considered to be the link between different construction elements, stakeholders and project scope (Shokri *et al.*, 2012). Poor management of Interface management may lead to deficiencies in the project cost, time, and quality during execution or failure of project.

2.4 PROJECT IMPLEMENTATION PROFILE (PIP)

The PIP methodology was developed by Slevin and Pinto (1986, 1987) in an attempt to assist which aspects of a project determine its success or failure. The tool has ten measuring critical success factors (CSF). Through a literature review they identified ten general factors they found to be critical to project success. The ten factors are as follows (Pinto and Prescott, 1988);

- Project Mission
- Top Management Support
- Project Schedules
- Personnel
- Technical Tasks

- Client Consultation
- Client Acceptance
- Monitoring and Feedback
- Communication
- Trouble Shooting

The above CSFs are described in more detail below based on the studies by (Pinto and Slevin (1988) and Pinto (1990).

2.4.1 Project Mission

This factor outlines the initial clarity of goals, objective and directions of the project. Many authors have reiterated the importance of this factor to be clarified at inception. The aim of the development should be known, its benefits to the end user. This has to be understood by all stakeholders during the project lifecycle. The decision to develop and implement a new project often shows commitment by the organization of funds and resources required

2.4.2 Top Management Support

This refers to the nature and amount of support the project manager can expect as a leader and for the project. Top management is proven critical to project success and project management is dependent on it for authority, direction, and support as clients' representative drivers of the project. The support includes adequate allocation of resources thus financial, manpower, time during project lifecycle. The project manager should have top management support even in the event of crises.

2.4.3 Project Schedule

This refers to the critical importance of detailing the plan of the required stages or milestones of the implementation process. All necessary activities must be outlined and detailed to show when critical resources will be required. Finally a measurement tool should be in place to judge the actual progress against planned budget and time.

2.4.4 Client Consultation

This refers to the continuous interaction between the client and the project team during the implementation stage. This increases support to the project. The factor also expresses the need of taking into account the needs of the future stakeholders

of the project. The project manager needs to verify all stakeholders and their requirement needs.

2.4.5 Personnel

This refers to the recruitment, selection and training of the relevant skilled personnel to implement the project. The organization has to determine its skills base required for the project within or it has to recruit from outside. In most cases this is not done properly hence failure occurs. There has to be a right number of people for the project with required experience.

2.4.6 Technical Tasks

The implementation needs to be managed by people who fully understand the specific project scope. There has to be adequate technology to support the project. The personnel should possess the necessary technical skills and have adequate technology to perform the tasks.

2.4.7 Client Acceptance

At completion of the project, it is vital that the client accepts the project and approves it. During the implementation period, this should be taken into consideration; the client should approve all milestones as the project progresses though acceptance is done at the end of the project.

2.4.8 Monitoring and Feedback

This refers to the project control measures put in place to monitor progress against planned. A contingency allowance is incorporated to cater for the unknown and ensure that no deficiencies are overlooked during implementation. Constant feedback is critical with fine tuning of the implementation processes. This has to cater for all project stakeholders.

2.4.9 Communication

This refers to effective means of communication amongst stakeholders during implementation. The channels need to be established as they are extremely important to the success of the project. Necessary information is exchanged between stakeholders concerning project goals, objectives, changes in policies and procedures during project lifecycle.

2.4.10 Trouble Shooting

During the implementation stage, problems or deviations normally occur as it's impossible to predict the unknown at inception. Therefore it is critical to have a trouble shooting mechanism in place so that reacting to problems is easier, and also to foresee potential trouble areas in the implementation process.

The CSF's can be time sequenced and interdependent.

2.5 INTERFACE MANAGEMENT

Interface Management is the management and control of interrelationships or interactions among elements of complex project entities such as people, building components, subsystems and equipment. Interface Management is also known as the management of communication, coordination and responsibility across a common boundary between two organisations, phases, or physical entities which are interdependent (Chen *et al.*, 2007). It is also the proactive avoidance of any project issues, including design conflicts, installation clashes, new technology application, regulatory challenges and contract claims (Shokri *et al.*, 2012). Construction projects are complex in the sense that they may require bringing together different multi-disciplinary teams, materials, systems, budgets and schedule for a determinate amount of time (Daniels *et al.*, 2014). More complexity arises due to advances in technology and operations (Shokri *et al.*, 2012). These projects involve many stakeholders, with different working cultures, interacting with one another throughout the project life cycle (Shokri *et al.*, 2012). There are many uncontrolled variables that complicate the management process. In bringing together multi-organizational teams, several interfaces or interactions are temporarily created (Daniels *et al.*, 2014). The growing competition compels the construction industry organizations to reconsider their processes for improving productivity, quality and efficiency (Chen *et al.*, 2007). Interface management becomes a possible solution to help effectively manage complex projects. Interface Management provides a means to oversee numerous organizational interfaces that exist amongst projects participants. It is a means of improving efficiency in construction projects (Daniels *et al.*, 2014).

The three general types of interfaces in a project include physical, contractual and organizational. The first involve actual physical connections between two or more

building elements or components, the second includes work elements grouped into distinct work packages by contract normally associated with specialist contractors, while the last involves the interaction that occurs between the different people associated with the construction project (Daniels et al., 2014; Pavitt and Gibb, 2003).

The organizational project interface can exist either internally (within a single contract or scope of work) or externally (between contracts or scope of work) to the project. The interface can be analysed at three levels including: inter-project interface which is between different parties directly involved in project planning and execution, intra-project interface where it is within the organisation framework of each independent party and lastly extra-project where interfaces occur between the project parties and other organizations not directly involved in project execution (such as government permitting agencies or environmental organisations). Collaboration and dependence on others is critical during the project lifecycle for success to be achieved in a project, thus open communication and interfacing amongst each other is important (Daniels *et al.*, 2014; Shokri *et al.*, 2012).

Interface management is a continuous process which must be considered dynamic throughout the project life cycle with the aim of maintaining the balance between scope, time, cost, quality and resources. This is because as the system grows, its interfaces change; new contacts are established and generated. If interface management is implemented from the initial early stages of the project, higher performance might be realized (Shokri *et al.*, 2012).

Interface management includes the improvement of quality of physical connections between building components, the reduction of project conflict among stakeholders during project implementation, and the maximization of resources and environment (Chen *et al.*, 2007). Lack of interface management challenges are experienced which results in two sets of factors; they are, know-how and environmental (Huang *et al.*, 2008; Shokri *et al.*, 2012). The know-how factors include management, experience and coordination knowledge. The environmental factors include contract obligations, regulations and inclement weather. Other challenges includes poorly coordinated and controlled boundary conditions among project entities, design errors, mismatched parts, systems performance failures, coordination difficulties and construction

conflicts (Al-Hammad, 2000; Chen *et al.*, 2007). These issues affect and distract from smooth delivery of projects (Chen *et al.*, 2007).

Categories of problems include financial, inadequate contract and specifications, environmental, and common problems (Al-Hammad, 2000), technical, organizational, temporal, and geographical problems that need to be managed and resolved to avoid delays. Interface management becomes the idea of organizing a complex project into understandable interface themes, and handling all interactions, responsibilities and coordination associated with these interdependent parts (Chua and Godinot, 2006)

The benefits of Interface management can be outlined as below (Chua and Godinot, 2006; Daniels *et al.*, 2014). These would be discussed in relation to the

- *Build a deep understanding of project complexity for project participants*
- *Optimize design in terms of quality, compatibility, constructability, cost, risk, and function to meet customer needs*
- *Improve project planning by avoiding, minimizing, or eliminating potentials for interface issues in advance*
- *Improve work packaging and subcontracting to reduce project complexity and to avoid congenital interface issues*
- *Build and maintain desirable relationships and interaction channels among project participants to achieve timely communication, coordination, and cooperation*
- *Standardize the handling processes and work flows for various types of interfaces in construction projects and reduce uncertainties*
- *Enable a dynamic and well-coordinated construction project delivery system when responding to changes*
- *Identify and record good practices in dealing with project complexity and reapply them in future projects*

Despite the highlighted benefits of using interface management, the effective implementation can still be problematic. Early implementation of interface management within a project is more advantageous than attempting to do so later (Daniels *et al.*, 2014).

There are different stakeholders that interact at different levels within the KZN's Department of Health making decisions that contribute to the success of the project. As the benefits of interface management have been highlighted, the same can be experienced in the department projects. This paper proposes to use PIP tool concept to improve interface management at all levels and stages of a project.

The tool was developed to allow the project manager to assess the softer behavioral side of the project management process when determining the status of the project in relation to its human elements and also to give project managers a chance to concentrate on the strategic issues of the project development (Pinto, 1990).During the project life cycle, the PIP tool can be employed in different phases from inception to completion thus from obtaining clients requirements to acceptance of the project by the end users. The CSF's of the PIP tool have been detailed before.

Before the implementation of the PIP tool, the following need to be established about the interface management system; identification of the interface, documentation, issuing, communication, closing and stakeholders involved (Daniels *et al.*, 2014; Shokri *et al.*, 2012).

The next Chapter will focus on the methodology that will be implemented to ascertain the effectiveness of the PIP tool on interface management.

2.6 SUMMARY OF THE LITERATURE REVIEW

The Problem Statement of this Research is;

Public sector construction projects have complex interface requirements. These impede the successful completion of projects.

The interfaces and interface management challenges are highlighted under the introduction section of the research. These include interfaces within and outside the organisation leading to too many state holders that have an influence on the project implementation. Decisions turn around period delays the smooth flow of the project. This results in delays in completing the project causing increased costs which then reduce the success rate of projects implementation.

With these Interface management challenges highlighted; a proposed instrument that has been developed in past times by Pinto is proposed to be implemented on existing and proposed projects to establish its impact in improving project success rate in the organisation. The advantages of using the tool would be established and lessons learnt to advise the organisation on future projects implementation.

Studies of different literature in different times past have shown that no one has done the assessment as a tool except for this one instrument developed by Pinto. It has ten success factors as mentioned in section 2.4. These factors outline the critical aspects of project implementation with the view of increasing the success rate.

In this study research, the tool would be used to tackle interface challenges faced by the KZN Department of Health organisation in implementing its infrastructure projects.

3 METHODOLOGY

Chapter two has outlined the literature concerning project success criteria, success factors, and project implementation profile and interface management. This chapter will formulate the research method to determine the answer to the research questions outlined in section 1.4.

The primary research question is: can the PIP tool make a positive contribution to the process of interface management and what can be done to improve the success rate of projects in the department? This will explore the challenges experienced with interface management, the advantages and positive contribution of using the PIP tool for quality assurance and improve IM processes. This will further analyse the suitability of applying the PIP tool to improve the probability of project success in the KZN DOH.

It will be applied to completed KwaZulu Natal Department of Health projects by the project leader from Health, Treasury Department Public works, Principal agent, HOD and MEC offices. The respondents will reflect on the effectiveness of the tool.

The post-implementation analyses will be most beneficial if undertaken in an objective way by the respondents.

The first part of this chapter will review the questions and highlight the means through which they will be answered, followed by the research design in greater detail, and presents the research tool considered most appropriate to obtain data. The study sample is discussed and the instrument distribution method described. Finally the limitations of the methodology are highlighted.

3.1 THE RESEARCH REQUIREMENTS

The PIP tool is the subject of the research. The purpose of the study is to get an opinion from respondents on the effectiveness of using the tool in interface

management to ensure success of the projects. Hence the underlying research questions for this dissertation, as raised in section 1.4, are as follows:

- *What are the challenges with Interface management in KZN health facility projects?*
- *What are the advantages of using the PIP tool for interface management quality assurance?*
- *How does use of the PIP tool make a positive contribution to the processes of interface management?*

The above study questions will be answered in the following steps:

- Identification of the current challenges encountered with interface management in KZN health facility projects
- Highlight the effectiveness of using PIP tool in management of interactions that happen during implementation of projects
- Compare the current status of interface management challenges against outcome after application of the PIP tool on the project. Is there a positive impact in mitigation of challenges? What lessons can be drawn from the research for the department to improve on.

The first step was partially completed in Chapter 1 where the challenges encountered within department projects were highlighted. In chapter 2, the PIP tool and interface management were explained including its benefits.

For the second step, the respondents will make practical use of the PIP tool and reflect on the advantages of using it in a project from inception to close-out. The researcher will explain the PIP tool to respondents and, they would be taken through a project from inception and be given an opportunity to apply the tool. They would give feedback as how the tool would make a difference at each and every stage of the project.

Lastly the interface management challenges experienced currently will be weighed against the results of tool effects. This tool has never been used in the department hence there is no captured information about it. The next section goes into detail on the process that is used for this to be accomplished.

3.2 RESEARCH DESIGN

This section highlights the structure of the study intended to answer the research questions of this dissertation. The research instrument chosen to gather the necessary data for analysis is described in the following section. This is followed by an overview of the sample chosen for the research and the description of the distribution methodology implemented to distribute the research instrument to the given sample.

3.2.1 Research Instrument

The approach in answering the first question was different from the second and the third question. The list of challenges highlighted in the literature review was sent to respondents via email and they had to determine the relevance and impact of these challenges to the projects. Respondents were also provided with a field to list any additional interface challenges influential to project success that were not part of the list.

A questionnaire that uses a Likert scale was constructed, this is common to assess ordinal data and it was chosen as the primary instrument for this research due to wide effective documented use in literature (No *et al.*, 2013). It captures everyone's views by offering respondents a wide choice of options and thereby encouraging a greater rate of response.

The interface management challenges were categorized as follows;

- financial problems
- inadequate contract and specifications
- environmental problems
- other common problems

Under each category, a list of common problems was highlighted and respondents were required to state relevance to the projects.

The 5-point Likert scale to measure respondents' attitude with respect to 5 ordinal points is a commonly used variant of the Likert scale (Jamieson, 2004). The 5-point Likert scale was chosen for this first question. The respondents were asked to determine the relevance of these problems in their projects and suggest more if not identified on the list. The 5 ordinal points chosen were as follows;

- not influential at all
- somewhat influential
- influential
- very influential
- absolutely critical

The second and third questions were approached with open-ended subjective questions that had expandable boxes to allow respondents to give as much input as they chose.

The respondents applied the PIP tool to a project they were involved with. Action research was used. It is more of a holistic approach to problem solving, rather than a single method for collecting and analysing data. It is used in real situations since its primary focus is on solving real problems. It will be initiated to solve immediate IM challenges or be a reflective process of progressive problem solving.

My colleagues reviewed my questionnaire and advised on changes to be made for clarity. Respondents needed to reflect on the effectiveness of the tool in projects. These would list the advantages of using the tool for interface management and its positive contribution to the interface management.

3.2.2 Sample Framework

Selection criteria

This can be defined as a set of source materials from which the sample is drawn or selected (Turner, 2003). This includes the means of choosing particular members of the target population that will be interviewed in the survey. It must capture, in statistical sense, the target population (Turner, 2003). It is difficult to study the entire population because of feasibility and cost constraints, and hence a sample must be selected which is a representation of the population interest and be accessible (Bhattacherjee, 2012).

The sampling frames may not entirely be representative of the population at large and hence the conclusions derived may not be generalizable to the population (Bhattacherjee, 2012). Non-probability sampling technique was used as opposed to

probability sampling because some units of the population had a no chance of being selected because of convenience and lack of accuracy in determining the selection. Convenience and expert sampling techniques were appropriate for this research because the selected population were close to hand and available with necessary expertise on the phenomenon being studied. This gave the benefit of expert's views which are more credible to study.

In the distribution of the research instrument, respondents were chosen based on their total involvement in the implementation of projects from inception to completion. The sample population includes three top DOH management officials that head the three main arms of infrastructure delivery i.e. planning, delivery and maintenance. Decisions that constitute the list of projects to be implemented in a particular financial year are made at this level upwards.

The sample also included two DOH project managers who implement the finalised Annual Implementation Plan of the department with the Implementing Agent (DoPW). Most projects are executed through the DoPW the Implementing Agent which assembles a team of consultants depending on the project scope. In this research two Principal Agents were selected as they have the authority to instruct and lead the implementation of the project on behalf of DoPW. Final two contractors were nominated to complete the diversity of the respondents.

The decision to focus on these stakeholders is because that is where a lot of interaction and decisions happen during project implementation. This is vital as the research questions can be adequately answered. The respective roles of the individuals completing the questionnaire were requested as this allowed for additional observations to be made from the data received.

A case study (KZN Health facilities) was used as a major contributor of the research to understand the challenges of interface management and how the application of the PIP tool will bring about success in the project. This enabled an up-close, in-depth, and detailed examination of challenges of interface management as well as monitors the practical implementation of the PIP tool. This also enabled examination of real-life situations.

A number of projects were considered so as to make the case study stronger than in a single project. The respondents implemented the PIP tool in different projects at different phases.

3.2.3 Data Collection

Qualitative method analysis was used for the research as opposed to quantitative analysis which is statistics driven and largely independent of the researcher (Bhattacherjee, 2012). Qualitative approach is heavily dependent on the researchers' analytic and integrative skills and personal knowledge of the research topic. It is based on opinions of the sample population and not hard facts. It requires 'sense making' or understanding of a phenomenon (Bhattacherjee, 2012).

This approach helps broaden and deepens the understanding of current IM challenges within the department as respondents explore their views and experience in implementing DOH projects. It focuses on description, interpretation and may lead to development of new concepts or to an evaluation of DOH processes.

The chosen method of data collection was a web-based survey for the distribution of the questionnaire. This was a preferred instrument in collecting respondents' opinions and perceptions (Thomas, 2003). Its advantages are; it is time and cost saving in implementation and there is greater anonymity.

The items on the questionnaire were designed to answer the research questions highlighted in section 1.4 of the first chapter. This also assisted in getting relevant responses to the study. The questions were open ended as the respondents needed to give their opinion on the effectiveness or positive impact of the PIP tool in addressing interface challenges.

In choosing the sample size, a sample of ten responses was desired for the instrument completion as explained in the previous section. The respondents were taken through the PIP tool to fully understand it before they use it on a project.

After respondents identified the interface challenges in project implementation, and having understood the PIP tool, they were assisted in applying the tool in different project phases. The same procedure was applied in different projects several times. This ensured relevant responses and improves quality assurance on the research.

The research results were reviewed for each project with respondents to determine if they understood the objective of the research. The data collected was based on respondents experience in application of the PIP tool to mitigate interface challenges and ensure project success.

The data obtained was analysed using the inductive approach as there is no predetermined theory, structure or framework. The actual data collected was used to derive the structure of analysis. The data was analysed immediately after the first data was collected and this continued throughout the study.

The data was analysed manually. Each response was read through and notes made from each. Common themes that emerge from the data were identified and categorized. This is also known as open coding. The aim was to offer a summary for each element discussed in the questionnaire. Any deviations were left uncoded.

In the second stage, all emerging themes were grouped together to eliminate repetitions and reduce number of categories. These categories were further refined to eliminate/reduce overlaps and similarities. The categories were separated and the data from research grouped accordingly. Once the data was organized in this format a report on the findings was produced. The same principle applied in all responses to research question answers.

3.2.4 Research Process Diagram (summary)

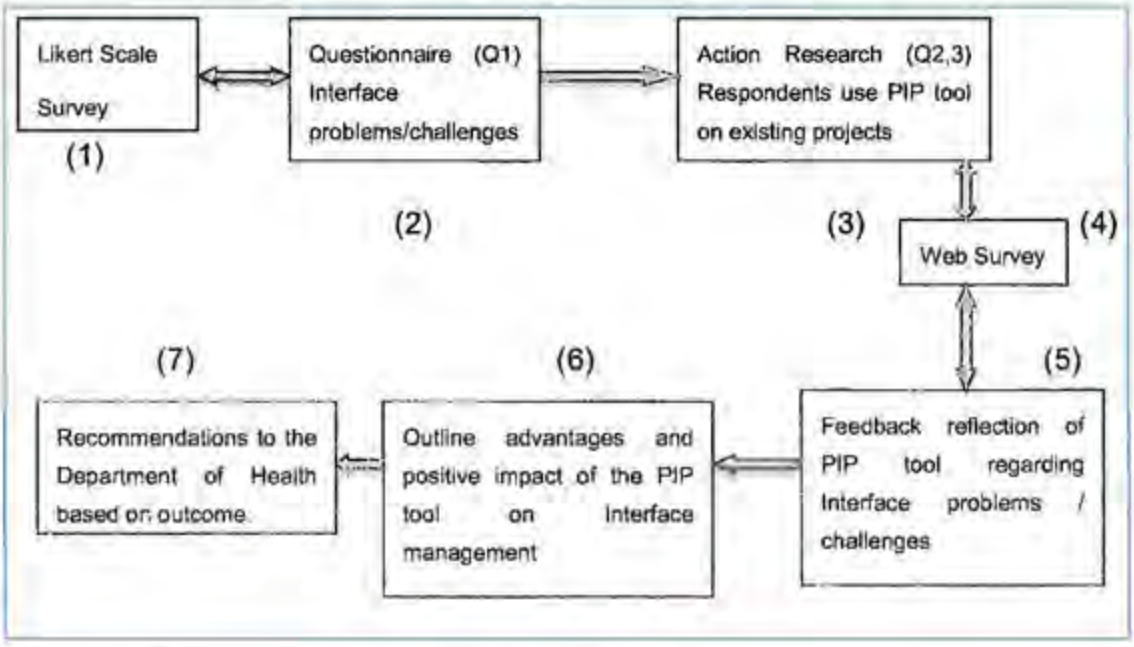


Figure 3.1: Summary of the research process

3.3 CONTRAINTS OF THE RESEARCH

The following are the key limitations to the research;

- Information obtained would be subjective as stakeholders would be giving their opinions.
- The time available to collect data was limited as it was going to be more effective to practically monitor the implementation of the PIP tool throughout the project life cycle. This will avoid the gathering of subjective information as the monitoring of the tool would be done with respondents as opposed to them giving their opinions.
- Only the project manager and team may have sufficient information to complete the questionnaire.
- Some respondents might be sceptical to release information especially the treasury department, HOD and MEC offices.
- Non availability of some respondents. The quality and relevance of data obtained from some respondents might not be helpful to the study.

3.4 ETHICAL CONSIDERATION TAKEN DURING THE STUDY

The following were the issues encountered and assurance was given to respondents of anonymity of their responses and they were not required to identify themselves.

- Sensitive financial documents from Treasury department detailing the financial expenditure trends by different stakeholders. Only the data interpretation of the expenditure trends was used as opposed to actual figures to avoid information leakage.
- Consultants were hesitant in pointing out the short-comings of DOH and DoPW. This was because of fear of being victimised in future projects. Information obtained from them was generalized in the presentation to avoid any traces made back to them.

4 RESULTS

This chapter presents the results obtained from the research study conducted as outlined under Research Design. The research study results outline individual respondent's role, number of projects involved, interface challenges experienced during project implementation, their relevance, advantages of using the PIP tool to mitigate interface challenges and the positive impact of the PIP tool to the organisation.

The next section provides an overview of the respondents as described in sample selection. This would be followed by the primary research results separated according to research questions.

4.1 PARTICIPANT DEMOGRAPHICS

The research study returned nine of the questionnaires from the ten target respondents. Respondents included the Department of Health top management, project team, implementation agent, principal agents, and contractors. One respondent who did not return the questionnaire was out of the country during the time of data collection and follow-up was difficult.

All the critical stakeholders who form part of the decision making process were selected, thereby providing an adequate representation of data in general. Below is a table showing the respondents distribution and their organisations.

Table 4.1: *Respondents*

DOH Top Management	DOH project team	Implementing agent	Principal Agent	Contractors	TOTAL
3	2	1	2	1	9

4.2 PRIMARY RESEARCH FINDINGS

The respondents highlighted the relevance of the interface management challenges they experience in project implementation from inception to completion. Table 4.2 below shows the responses. The responses in the table below can be categorized as i) financial, ii) Inadequate contract & specification iii) environmental and iv) common problems.

Additional interface challenges have been highlighted in Table 4.3. As stated in chapter 3, these were coded and grouped.

Table 4.2: *Interface Management Challenges Relevance*

		Not Influential at all %	Somewhat Influential %	Influential %	Very Influential %	Absolutely Critical %	Total No. of Respondents
Financial	Delays In Progress Payment	0	11	22	11	56	9
	Accuracy of Project Estimate	0	0	0	56	44	9
	Client's Low Budget	0	0	11	33	56	9
	Prices Changes of Materials & Labour	11	33	11	33	11	9
Contract and Specification	Insufficient working Drawings details	0	0	33	33	33	9
	Insufficient Specification	0	0	11	56	33	9
	Violating Conditions of Contract	0	11	44	11	33	9
	Change Order	0	0	44	44	11	9
Environmental	Weather	11	22	44	11	11	9
	Geological Problems on Site	0	44	33	0	22	9
Other Common Problems	Communication Between Stakeholders	0	0	11	44	44	9
	Slowness of Client in Decision Making	0	0	11	33	56	9
	Delay in Finish of project	0	11	11	56	22	9
	Unavailability of Professional Construction Management	0	11	22	56	11	9
	Skills and Productivity of Labourers	0	11	44	22	22	9
	Poor Quality of Work	0	0	33	33	33	9
	Poorly done Planning and Scheduling	0	0	22	33	44	9
	Unfamiliarity with local laws	11	22	22	22	22	9

Table 4.3: *Additional Interface Management Challenges as Indicated by Respondents*

INTERFACE MANAGEMENT CHALLENGES	CODING
Conflicting stakeholder performance measures e.g DOH is more concerned about monthly expenditure while project team looks at the physical progress.	Conflict of Interest among stakeholders
DOH internal policies constantly change e.g psychiatric building norms and standards, and Infection Prevention control norms.	Frequent policy changes
DOH high staff turnover affecting continuity.	High staff turnover
DOH project leaders lack authority to make immediate decisions.	Project leaders not empowered to make decisions
Delays by end user in decanting (relocation of end users during project implementation).	Delays in decanting
Delays by end user to address issues that may impact on construction.	
Lack of experience by consultants in health projects (they are appointed using a KZN roster).	Lack of competence by service providers
Poor contractor performance due to lack of experience (lowest bidder considered first as opposed to reputation and experience).	
DOH project leaders overloaded with projects affecting their effectiveness in project implementation participation.	Reduced site attendance by DOH project leaders
DOH engineering services advisers overloaded with projects as they need to cover the whole of KZN province.	
Political interference in overall planning.	Political interference
Bureaucracy in relation to site acquisition processes.	Bureaucracy in decision making
Delays in Planning and Development Application.	
Lack of Top level management support though all phases.	Lack of Top management support
End user neglect maintaining end product.	Lack of maintenance of end product
Structures are not equipped on time leading to vandalism of end product.	Lack of timeous equipping building

Table 4.2 and Table 4.3 show the overall respondents ranking of the relevance of interface management challenges and additional challenges.

Table 4.4: *Additional Interface Challenges categorised*

		Not Influential at all %	Somewhat Influential %	Influential %	Very Influential %	Absolutely Critical %	Total No. of Respondents who mentioned the problem
Other Common Problems	Conflict of interest among Stakeholders	0	0	16	16	67	6
	Frequent Policy Changes	0	0	0	0	100	9
	High Staff Turnover	0	0	0	50	50	4
	Project leaders not Empowered to Make Decisions	0	0	0	44	56	9
	Delays in Decanting	0	0	0	0	100	9
	Lack of Competence by Service Providers	0	0	0	50	50	4
	Reduced site attendance by DOH project leaders	0	20	20	40	20	5
	Political Interference	0	0	14	43	43	7
	Bureaucracy in Decision Making	0	0	0	0	100	9
	Lack of Top Management Support	0	0	0	0	100	9
	Lack of Maintenance of End Product	0	0	33	33	33	3
	Lack of Timeous Equipping Buildings	0	0	0	40	60	5

Table 4.4 shows different total numbers of respondents because not all respondents highlighted the same additional problems.

In answering Question 1 as highlighted in section 1.4, the following results can be observed from the previous Table (see table 4.2). The additional Interface Management Challenges can be taken as they are from Table 4.3.

In response to Question 2 from section 1.4, the following can be observed from the research as shown from the Table 4.5

Tables 4.2, 4.3 and 4.4 were generated from the information obtained from research questionnaire. Table 4.2 categorized IM challenges to four groups of which all the respondents had to highlight the challenges' relevance according to their experience in different projects. This was a section with structured questions on the questionnaire which respondents had to rate the relevance accordingly.

In addition to structured questions, respondents had to add more IM challenges that did not form part of the structured questions. The additions were grouped according to similarities and coded as shown in Table 4.3.

To establish the relevance of additional IM challenges that are highlighted in Table 3, Table 4 was generated. The number of respondents varies per each IM challenge because not all respondents stated similar IM challenges. Out of the number of respondents that stated a similar challenge, a percentage was calculated in relation relevance.

Table 4.5 highlights the advantages of using the PIP tool to mitigate interface management challenges during project implementation. In summary the improvements are to do with planning, monitoring and efficiency amongst the stakeholders involved in the project implementation.

Table 4.5: *Advantages of Using the Project Implementation Profile (PIP) Tool for Interface Management Quality Assurance*

ADVANTAGES OF USING PIP TOOL	CODING
Project can be monitored from inception to completion.	Improved project monitoring and evaluation
It act as a checklist to ensure that all necessary steps are adequately covered at the right time and therefore a quality assessment tool.	
Delivery aspects are addressed on an ongoing basis.	
Facilitate monitoring evaluation process.	
Allows for closer working relationship between stakeholders.	Improves stakeholders relationships
It will ensure the product is delivered on time and within budget.	Improves project delivery efficiency
Project delivery is improved in terms of reduced delays, quality issues and cost variances.	
All stakeholders address the interface management challenges at an early stage.	Early intervention to solves project challenges
The scope is clearly defined making it easy to audit the project.	Scope is clearly defined and understood
Stakeholders understand their roles and responsibilities and the impact of non-performance during project implementation.	Stakeholders become efficient
Assist with proper planning and risk management.	Proper planning and risk management
Facilitation of goal alignment for the organisation.	Goal alignment
Results in measurable outcomes.	Outcome can be measured
Better management of project resources e.g human resources, plant and materials.	Experienced personnel
Improves client consultation and facilitate efficiency.	Improves client consultation
Stakeholders are kept informed at all phases which facilitate chances of project success.	Improves client consultation resulting in project success.
Eliminates unnecessary scope and cost overruns due to proper detailing of scope.	Unnecessary scope and cost overruns are reduced.
Constant communication eliminates uncertainties and delays in decision making.	Uncertainties are eliminated and decision making improved

In response to Question 3 from section 1.4, the following was obtained from the research study;

Table 4.6: *Project Implementation Profile (PIP) Tool Positive Impact to the Process of Interface Management*

PIP TOOL POSITIVE IMPACT	CODING
Most projects are complex in nature with high risk and complications.	It mitigate risks involved
More successful outcomes of projects as stakeholders address issues immediately before escalating and disrupting work progress.	Project success is achieved
An accurate scope of work will mitigate the risk of variation orders to within acceptable norms.	Clearly defined scope at inception
There is synergy of the project team.	Teamwork
Adequate front end loading.	Improves planning
It allows realistic forward planning based on realistic timelines and achievable expectations.	
It helps to streamline and improve the speed and quality in which KZN Health Projects are implemented as challenges are clarified early.	Improves efficiency in project implementation.
Improves planning and monitoring.	Improves planning and monitoring
Reduce cost overruns – Budget will be managed relative to scope.	Reduce cost overruns
Budget will be realistic at project initiation.	
Reduce scope creeps – Initial project brief will be thrashed out before design works starts.	Reduce scope creeps
Improve quality of processes.	Quality improved
Increase chances of project overall success.	Project success
Improve timely completion of projects.	Manage time frames
Assist in mitigating risks.	It mitigate risks involved
Ensure top management buy-in	Top management support
Ensure client decisions are timeous.	

Table 4.6 highlights the positive impact of the PIP tool to the process of interface management during project implementation. The tool improves the process as most of the challenges highlighted in Tables 4.2 and 4.3 are mitigated.

5 DISCUSSION OF FINDINGS

This chapter discusses in detail the results outlined in the previous chapter. Both the primary and additional study findings were highlighted. The discussion will analyse the findings that answer the research questions stated in section 1.4.

As outlined in the previous chapter, nine of the ten target population responded thereby providing an adequate (90%) balanced representation of data in general. These constitutes mostly of the stakeholders who are critical in decision making and in driving projects implementation.

5.1 DISCUSSION OF FINDINGS

As highlighted in Table 4.2, the interface management challenges were grouped in four categories namely;

i) financial,

ii) contract and specification,

iii) environmental and lastly

iv) other common problems

Under the financial category, 11% of respondents highlighted that *Prices Changes of Materials and Labour,* do not form part of the influential challenges. *Client's low Budget and Delays in Progress Payment*, proved to be very critical as they had 56% of respondents highlighting that it's absolutely critical.

Under the contract and specification category, all challenges highlighted seemed to range from somewhat influential to absolutely critical. These challenges can stop implementation on site until there are resolved. The cost implications are high.

With environmental challenges, only 11% indicated weather was *not influential at all* as some projects are upgrades and renovations which happen inside covered areas.

In general these factors are taken into consideration at the planning stage hence there are influential but not absolutely critical. Under *Other common problems* category, 11% of *unfamiliarity with local laws* factor indicated it is *not influential at all*. The other challenges are somewhat influential to absolutely critical.

Communication between stakeholders and *slowness of client in making decisions* had the high percentages of 44% and 56% respectively indicating that these are very influential and absolutely critical. These challenges can be mitigated by proper and constant communication channels between stakeholders and having top management support in making immediate decisions required.

Figure 5.1 is a graphical representation of the Interface Management Challenges Relevance,

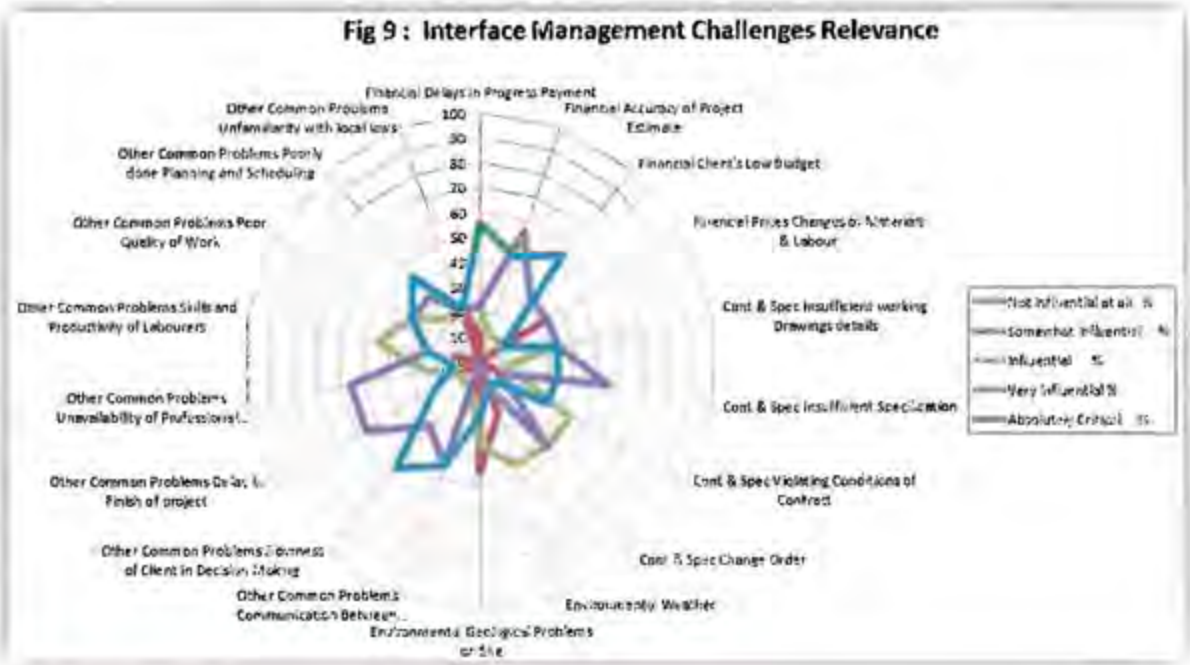


Figure 5.1: Interface Management Challenges Relevance

From the graph, it can be observed that all challenges have an element of being very influential or absolutely critical depending on different stakeholders. For individual display of each level of response, refer to Appendix C.

The interface management challenges highlighted were mitigated using the PIP tool as outlined under the advantages of using the tool in Table 4.4.

Table 4.3 highlighted the additional influential interface management challenges that the respondents had to add to those in Table 4.2. Most of the additional challenges were noted as being caused by the client department. These include:

- Frequent policy changes within DOH: the norms and standards constantly change especially for Infection Prevention Control (IPC). These cause change orders which normally have cost and time implications to the project.
- Conflict of interest among stakeholders: DOH measure progress through expenditure while the project team looks at the physical progress. Different contradicting analyses can be drawn from the same project. Low expenditure might mean poor performance on site meanwhile the project team might be progressing well.
- Empowering of DOH project leaders to make decisions: Most of the decisions are made by the top management, the turnaround time is too long and progress on site is greatly affected. If project leaders are granted the authority to make immediate decisions, delays would be reduced.
- Lack of competence by service providers: These include consultants, contractors and sub-contractors. The government policy favours the lowest bidder and in most cases these contractors do not retain experienced labour force nor do they have enough capacity to handle projects. Most of these contractors are terminated which becomes costly to the department.

  Consultants are appointed on a rotation bases, a less experienced consultant can be appointed on a project. When they underperform, they are terminated as well. This becomes costly to the department.
- Political interference: The appointment of some service providers, and approval of some projects are political motivated. Less experienced service providers have been appointed who in most cases underperform resulting in termination of contracts.
- Reduced site attendance by DOH project leaders: There are few project leaders to manage a large number of projects. This then renders them less effective during implementation. Some decisions cannot be taken in their absence causing delays on the programme.
- High staff turnover: This hinders effective continuity in management of the project

- Delays in decanting: This causes the relocation of end users during project implementation, this normally results in cost and time implications
- Delays in Planning and Development application: This is caused by bureaucracy in decision making before a project in approved to proceed to planning.
- Lack of top level management support in all phases of the project
- Failure to equip buildings soon after handover: This normally lead to vandalism of structures as they won't be occupied yet and also guarantees on installed equipments is lost.
- End users do not properly maintain the end product especially equipment and hence long term maintenance plans should be included as part of the project scope.

Interface management challenges are experienced in different phases of the project so the PIP tool can be applied in different phases of the project. The PIP tool is the project management tracking tool. When it was applied in different projects by respondents to mitigate the interface challenges, the following were highlighted as the advantages;

- Scope is clearly defined and understood: "*Clearly defined and detailed scope of work makes it easier to audit the project*". Project mission outlines the objectives and goals of the project from inception. Project schedule will help breakdown the scope and highlight all milestones involved. This makes the auditing of the project much easier. It also facilitates goal alignment for the organisation.
- Outcome can be measured because results are measurable: "*Results in measurable outcomes*".
- The tool brings improved project planning, monitoring and evaluation: "*It provides an appropriate checklist for ensuring all aspects related to delivery are addressed on an ongoing basis*". The project can be monitored from inception to completion. The tool acts as a checklist to ensure that all necessary steps are adequately covered at the right time making it a quality assessment tool. Deliverables are checked and assessed easily in all gates.
- The tool assists with proper planning and risk management: "*It improves proper planning and very critical as well as risk management tool*". When competent personnel and service providers are appointed, the high risk of project termination

is reduced and poor quality product is greatly minimized. Efficiency is improved in project implementation.

- Project scheduling reduces the amount of variation orders (change order): "*Eliminates unnecessary scope and costs overrun due to the proper detailing of scope*". This minimizes disruptions during project implementation and delays that are normally experienced in getting financial and time approvals
- Improves stakeholder relationships and commitment to the project: "*Improves client consultation and facilitate efficiency*". Communication and constant client consultation keeps all stakeholders informed and decisions are made timeously. When client consultation is improved, it facilitates efficiency.
- Most projects are renovations and upgrades and hence contingency amount will cater for the uncertainties that normally arise during implementation causing delays to the whole programme.
- Improves project delivery time: "*Will ensure the product is delivered on time and within budget*". The product is delivered on time and within budget. Cost overruns are reduced.
- The tool allows for early intervention by stakeholders to solve project challenges: "*DOH will have a better understanding of all constraints experienced*".

The PIP tool can mitigate all the interface management challenges except for external factors like environmental challenges which are considered to be beyond human control.

In the implementation of projects within the department of health, the PIP tool has a positive impact to the processes of interface management in the following ways;

- "*Detailed scope of work. An accurate scope of work will mitigate the risk of variation orders to within acceptable industry*": An accurate scope of work will mitigate the risk of variation orders to within acceptable norms as scope is clearly defined at inception:
- "*It would allow realistic forward planning based on realistic timelines and achievable expectations*": Improves project planning as it allows for realistic forward planning based on realistic timelines and achievable expectations.

- "*Manage time frames*": The tool assists in streamlining and improving the speed and quality in which KZN health projects are implemented as challenges are clarified early. This improves efficiency.
- "*Budget will be managed relative to scope*": Budget is managed relative to scope thereby reducing cost overruns and scope creep. The project brief is reviewed in detail before design stage commences. Accuracy of budget estimate is improved helping the client to make informed decision in terms of committing financial resources.

  In summary, the probability of achieving project success increased as top management commitment is achieved early, equipping the project team with all required resources. There were no uncoded concepts from the responses of the research questions. This was because the respondents were directly involved with project implementation and hence they gave relevant responses.

6 CONCLUSION AND RECOMMENDATIONS

This chapter concludes and summarizes the study research that was undertaken. The study used the PIP tool to mitigate interface management challenges experienced by the KZN Department of Health during project implementation. The chapter highlights the constraints faced in undertaking the study, the findings that were made and limitations of the findings. It will conclude by outlining recommendations to improve future research that would be usefully undertaken.

6.1 RESEARCH BACKGROUND AND APPROACH

As highlighted in the first chapter, KZN Department of Health implements projects that range from minor upgrades to complex hospital structures. In the process of implementation there are interactions between stakeholders that are within the organisation and also external to it. Due to large numbers of stakeholders and processes involved, interface management challenges have been experienced. These challenges have affected the successful completion of projects.

This study was guided by the research questions from section 1.4. The objectives of the study were to identify the interface management challenges experienced by the KZN Department of Health. Identify the advantages of using PIP tool in mitigating interface challenges and finally establish how the PIP tool could improve project success by improving interface management between stakeholders.

The aim of the research study was as follows;

- *The aim of this research is to find out if the PIP tool can be applied to Interface management and improve the probability of project success in the context of KZN Health Department.*

6.2 RESEARCH FINDINGS

Chapter 4 presented research study results and chapter 5 analysed and discussed the findings. The findings from the questionnaire represented the stakeholders that make influential decisions during project lifecycle. The respondents concurred to highlighted interface challenges which were categorized under financial challenges, contract and specification, environmental and other common problems. In addition to these, the following challenges were highlighted which are mostly instigated by the end user client; thus conflict of interest among stakeholders, frequent policy changes, bureaucracy in decision making, project leaders not empowered to make decisions, lack of competence by service providers, high staff turnover and reduced site attendance by DOH project leaders due to overload in terms of projects they manage.

Other challenges identified also included political interference, lack of top management support in all project phases and lack of maintenance of the end product by the end user.

Upon application of the PIP tool in mitigation of the interface management challenges, there were advantages that resulted which can be summarized as below:

- The tool improved project monitoring, planning and evaluation;
- It improved stakeholder relationships due to constant communication throughout the project life cycle and also improved efficiency;
- Goals of the organisation are aligned and there is early intervention in solving project challenges;
- Scope and cost overruns are reduced and so are risks; and
- The turnover in decision making is improved.

From the study it was also noted the positive impact that the PIP tool can bring to the implementation of KZN DOH projects. These can be summarized as below:

- Project success is achieved and risks are mitigated as planning is improved;
- Efficiency, quality in project implementation is improved and monitoring;

- Scope is clearly defined at inception, reducing cost and time overruns. This also reduces scope creep which is always a problem; and
- Finally teamwork is improved due to constant engagements and early top management involvement.

On the basis of the above findings, the research study concludes that the PIP tool is a useful tool in mitigating interface management challenges experienced by KZN department of health. It also has a positive impact in project implementation. This substantiates the research proposition stated in section 1.5 as follows;

- *The PIP tool can contribute to project success by improving Interface management.*

The PIP tool could not impact positively on environmental interface challenges as these are beyond human control.

6.3 RIPOSTES TO RESEARCH QUESTIONS

Section 1.4 outlined the research questions for the study, and the following responses can be summarized to answer each question.

- *What are the challenges with Interface management in KZN health facility projects?*

As outlined in chapter 4 and discussed further in chapter 5, the interface management challenges faced by the department can be categorized as financial, contract and specification, environmental and other common problems. In addition, the following were highlighted; frequent policy changes, conflict of interest among the stakeholders, political interference, lack of competence by service providers, delays in planning and development application, lack of top level management support during project life cycle.

Other challenges also include high staff turnover which hinders continuity, delays in decanting, poor maintenance of end product by end users.

These challenges affect the success rate of projects implemented by the department of health.

- *What are the advantages of using the PIP tool for interface management quality assurance?*

After the application of the PIP tool in different projects, the following were noted as advantages: scope is clearly defined and understood, results are measurable. There is improvement in terms of planning, monitoring, evaluation and risk management. This also reduces variation orders (change order) as project scheduling is implemented. Stakeholder relationships and commitment are improved which is vital to project success, as early intervention is guaranteed.

Project delivery time is improved and cost overruns are reduced. Lastly contingency amount caters for the uncertainties that normally arise as most projects are upgrades and renovations.

- *How does use of the PIP tool make a positive contribution to the processes of interface management?*

When the tool was implemented, the following were the positive impacts to the process of interface management; forward planning based on realistic timelines is achievable, budget is managed relative to scope thereby reducing scope creeps.

Projects can be streamlined thereby improving the speed and quality of delivery and implementation. Scope is clarified at inception reducing risk of variation orders to acceptable norms. Finally teamwork is improved and the probability of success is increased.

Table 6.1: *Summarising Links between the Problem and Research Design*

Problem Statement	***Research Question***	***Research Instrument***
Public sector construction projects have complex interface requirements. These impede the successful completion of projects. What can be done to improve the success rate of projects in the department?	Can the PIP tool be applied to Interface management to improve the probability of project success in KZN Health Department?	
Objective 1 Identify Interface management challenges encountered by health facility projects	***Sub Question 1*** What are the challenges with Interface management in KZN health facility projects?	Likert Scale Questionnaire
Objective 2 Identify the advantages that can be realized in using the PIP tool	***Sub Question 2*** What are the advantages of using the PIP tool for interface management quality assurance?	Action Research
Objective 3 Outline how the PIP tool can bring about project success by improving Interface management between stakeholders	***Sub Question 3*** How does use of the PIP tool make a positive contribution to the processes of interface management?	Action Research
Aim The aim of this research is to find out if the PIP tool can be applied to Interface management and improve the probability of project success in the context of KZN Health Department.		

6.4 RESEARCH LIMITATIONS

There was a balanced representation of stakeholders as 90% responded. This could have been more had all the stakeholders given enough time to respond at their convenient time. This has an implication on the generalizability of the data received.

The PIP tool excludes external factors in the list of success factors, and this will be reduced by allowing respondents space to add any other factors responsible in

making a positive contribution to the process of interface management and also highlight challenges experienced.

A case study approach will limit scope for generalizing the findings. Though there are limitations, the findings can be useful in informing stakeholders and similar future projects, and establish in principle if the tool is suited to the task.

6.5 BEYOND THIS RESEARCH

As highlighted under research limitations, these could be minimized with the following recommendations;

- For future research the sample size should be larger to include all stakeholders involved in project implementation. The results can be generalizable because of a much better representation.
- The PIP tool needs to be workshopped to all stakeholders before they use it as this will position them to give better informed responses.
- The time for monitoring the tool should be from inception of the project to completion as results can be captured more accurately and avoid subjective responses.
- The application of the PIP tool needs to be repeated in more projects to establish if the same results can be obtained.

6.6 PIP IMPACT TO THE ORGANISATION

As outlined in section 6.2 previously, if the KZN Department of Health organisation adopted the PIP tool, positive impact would be realised in implementation and monitoring of projects. The probability of project success would be increased as project risks are mitigated early during planning stage.

Stakeholder participation during the project life cycle would be greatly improved thereby improving the planning process and aligning the scope of the project to the vision of the organisation. This will reduce scope creeps which normally results in increased project costs and project completion periods.

The quality of end products will be improved which meets the norms and standards of DOH and efficiency in implementation and execution of projects. Teamwork between DOH stakeholders and the project team will be greatly improved thereby increasing the probability of success in projects.

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8 APPENDICES

8.1 APPENDIX A - SURVEY

EVALUATING THE IMPACT OF THE PROJECT IMPLEMENTATION PROFILE (PIP) TOOL ON INTERFACE MANAGEMENT IN PUBLIC SECTOR PROJECTS: CASE STUDY KZN DEPARTMENT OF HEALTH FACILITIES

USE OF PROJECT IMPLEMENTATION PROFILE (PIP) TOOL ON INTERFACE MANAGEMENT CHALLENGES IN A PROJECT

Goodday, my name is Ndabezinhle Dube and I am conducting research as part of my Master's degree, into the impact of the Project Implementation Profile (PIP) tool on interface management in public sector projects. You are invited to take part in this survey and assist me with my research.

This survey investigates the impact of the PIP tool on interface management during project implementation, and will only be applicable to you if you have had involvement with public sector projects.

Interface Management is the managing and controlling of interrelationships or interactions among elements of complex project entities such as people, building components, subsystems and equipment. Interface Management is also known as the management of communication, coordination and responsibility across a common boundary between two organisations, phases, or physical entities which are interdependent , proactive avoidance of any project issues, including design conflicts, installation clashes, new technology application, regulatory challenges and contract claims.

Construction projects are complex in the sense that they may require bringing together different multi-disciplinary teams, materials, systems, budgets and schedule for a determinate amount of time (summary).

Please be advised that the information shared in this survey is completely anonymous. Your participation is voluntary and if you wish to withdraw at any time you will be able to do so at no detriment to you whatsoever.

Should you wish to find out more about this research then please do not hesitate to contact me (ndabez2001@gmail.com) and I will gladly share my findings with you.

Please click 'Next' to proceed

Figure 8.1: Web survey page 1

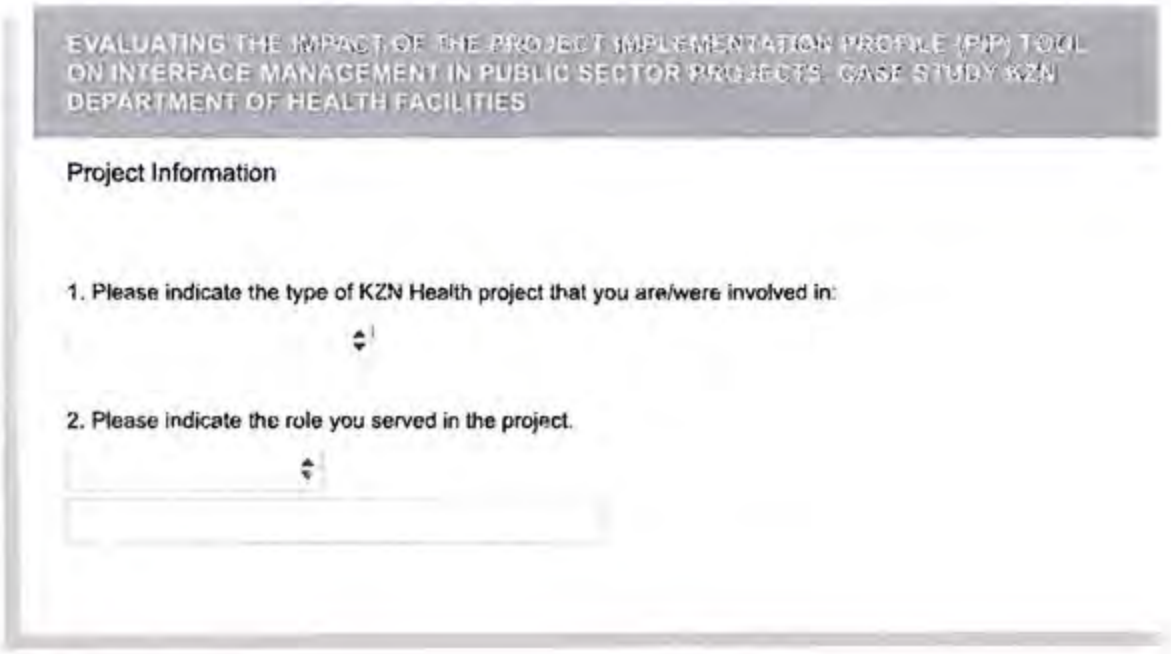


Figure 8.2: Web survey page 2

Information of Success Factors

Critical success factors are key aspect of project success. If addressed properly, they lead to success criteria being achieved. During project implementation there are interactions that happen between stakeholders. Interface management has challenges that need to be mitigated to avoid affecting project success. A Project Implementation Profile tool is proposed to bring about positive impact in interface management.

If Top Management Support is addressed, all required resources would be made available to the project team from inception to completion of the project.

3. Please rate the relevance of the following Interface Management challenges as experienced in your project

	not influential at all	somewhat influential	influential	very influential	absolutely critical
Delay in progress payment by client					
Accuracy of project cost estimate					
Client's low budget for construction relative to requirement					
Prices change of materials and labour during construction					
Insufficient working drawings details					
Insufficient specification					
Violating conditions of contract					
Change order (Variation order)					
Weather					
Geological problems on site					

Figure 8.3: Web survey page 3 (1 of 2)

	not influential at all	somewhat influential	influential	very influential	absolutely critica
Lack of communication between stakeholders					
Slowness of client in decision making					
Delay in finish of project					
Unavailability of professional construction management					
Skills and productivity of labourers					
Poor quality of work					
Poorly done planning and scheduling					
Unfamiliarity with local laws of related governmental agencies					

Please note any additional interface management challenges not included in the list, that you deem necessary to be highlighted.

Figure 8.4: Web survey page 4 (2 of 2)

Description of Project Implementation Profile critical success factors (Ten success factors)

1. **Project Mission** - Outlining and understanding project goals and objectives from inception (justification of project)

2. **Top Management Support** - Senior management commitment and ability to provide resources, authority and influence on the project to succeed.

3. **Project Schedule** - Detailing of plan of action for the implementation process. This includes the action steps and resources required and the project milestones.

4. **Client Consultation** - Continuous interaction between client and project team during implementation stage

5. **Personnel** - Availability of skilled and capable employees and the accessibility to training facilities for them.

6. **Technical Tasks** - Accessibility to adequate technology to support the project. The personnel should possess the technical skills.

7. **Client Acceptance** - The project end user's agreement and approval of the final product. The client should approve all milestones as the project progresses.

8. **Monitoring and Feedback** - Project control measures put in place to measure project progress against planned.

9. **Communication** - Effective means of exchanging relevant information amongst stakeholders during project implementation.

10. **Trouble Shooting** - Ability to manage and resolve any deviations from the original approved scope.

Figure 8.5: Web survey page 5

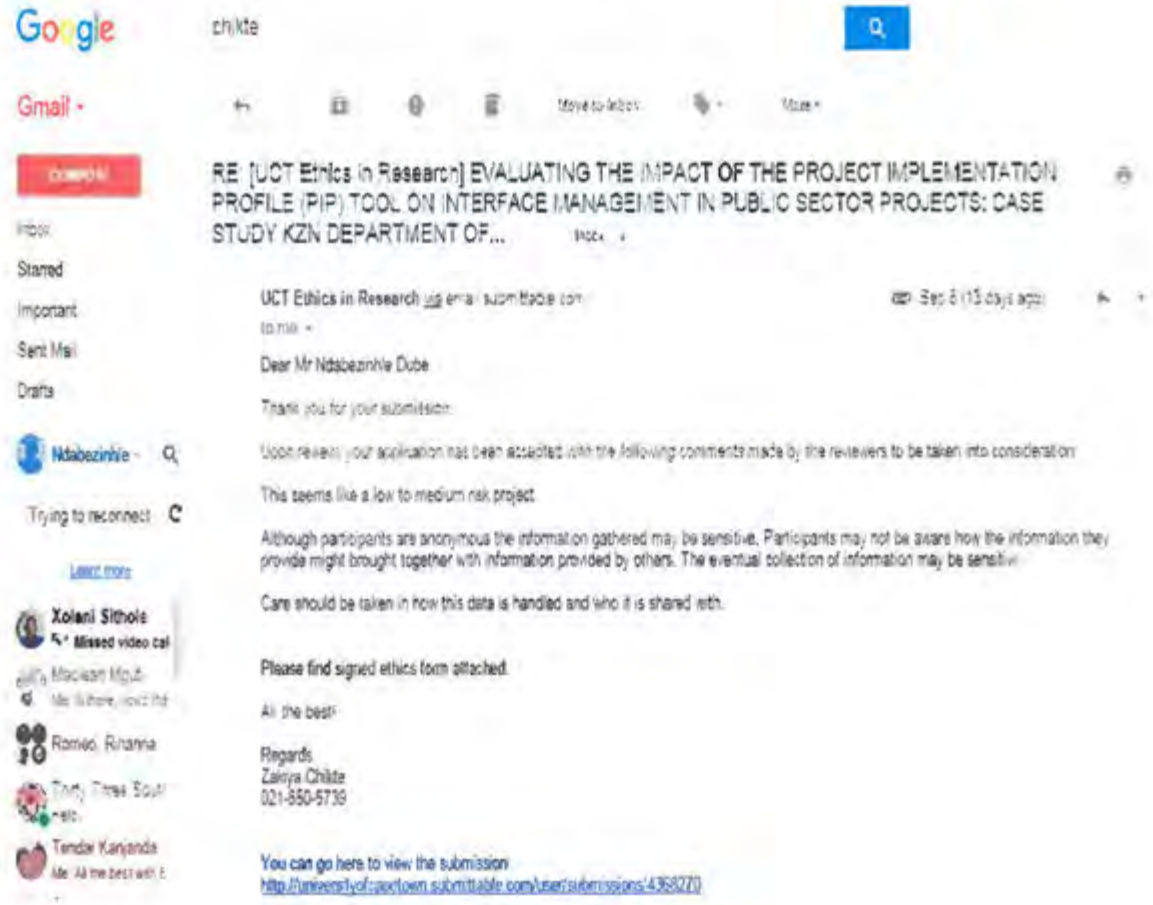
4. In your opinion, what are the advantages of using the PIP tool in interface management quality assurance?

5. In your opinion, what are the positive contributions will the PIP tool make in implementation of KZN Health infrastructure projects?

Figure 8.6: Web survey page 6

Figure 8.7: Web survey page 7

8.2 APPENDIX B – ETHICS CLEARANCE



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Gmail

RE: [UCT Ethics in Research] EVALUATING THE IMPACT OF THE PROJECT IMPLEMENTATION PROFILE (PIP) TOOL ON INTERFACE MANAGEMENT IN PUBLIC SECTOR PROJECTS: CASE STUDY KZN DEPARTMENT OF...

Inbox
Starred
Important
Sent Mail
Drafts

Ndabezinhle

Trying to reconnect

Learn more

Xolani Sithole
Missed video call

Romeo, Rihanna

Tendai Kanyanda
Me: All the best with it

UCT Ethics in Research via email.submittable.com
to me

Dear Mr Ndabezinhle Dube

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:

This seems like a low to medium risk project.

Although participants are anonymous the information gathered may be sensitive. Participants may not be aware how the information they provide might brought together with information provided by others. The eventual collection of information may be sensitive.

Care should be taken in how this data is handled and who it is shared with.

Please find signed ethics form attached.

All the best!

Regards
Zaiyra Chikte
021-650-5739

You can go here to view the submission
http://universityofcapetown.submittable.com/user/submissions/4368270

8.3 APPENDIX C – LEVELS OF RESPONSES SHOWN SEPARATELY

Figure 8.8: Not Influential at all

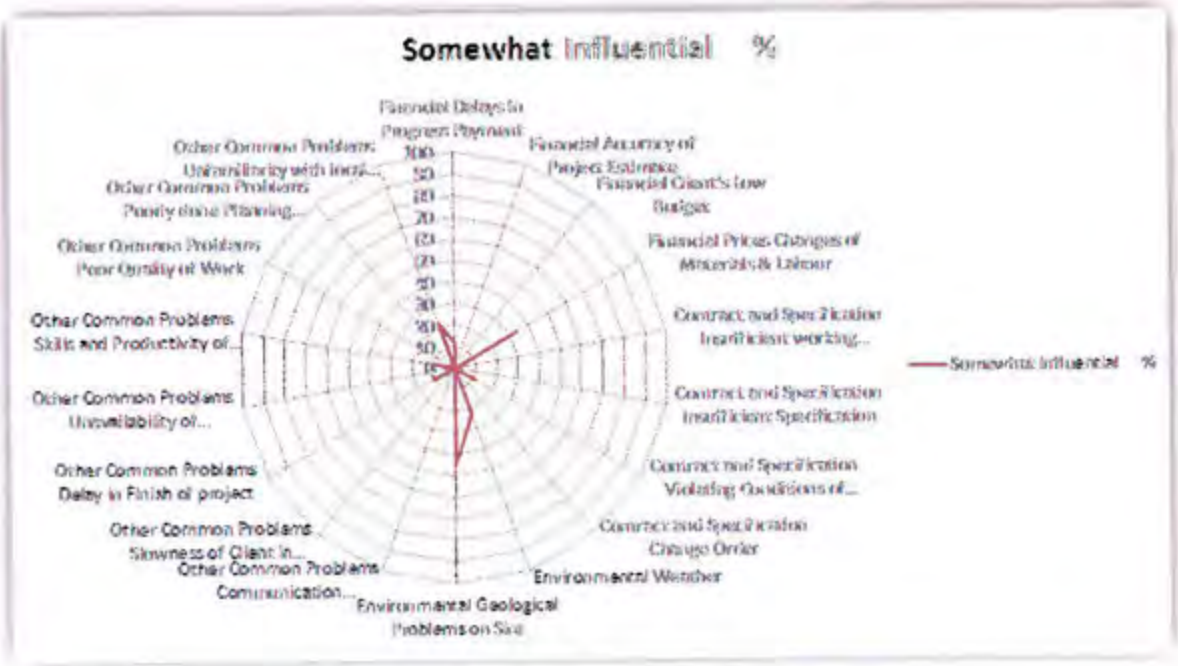

Figure 8.9: Somewhat Influential

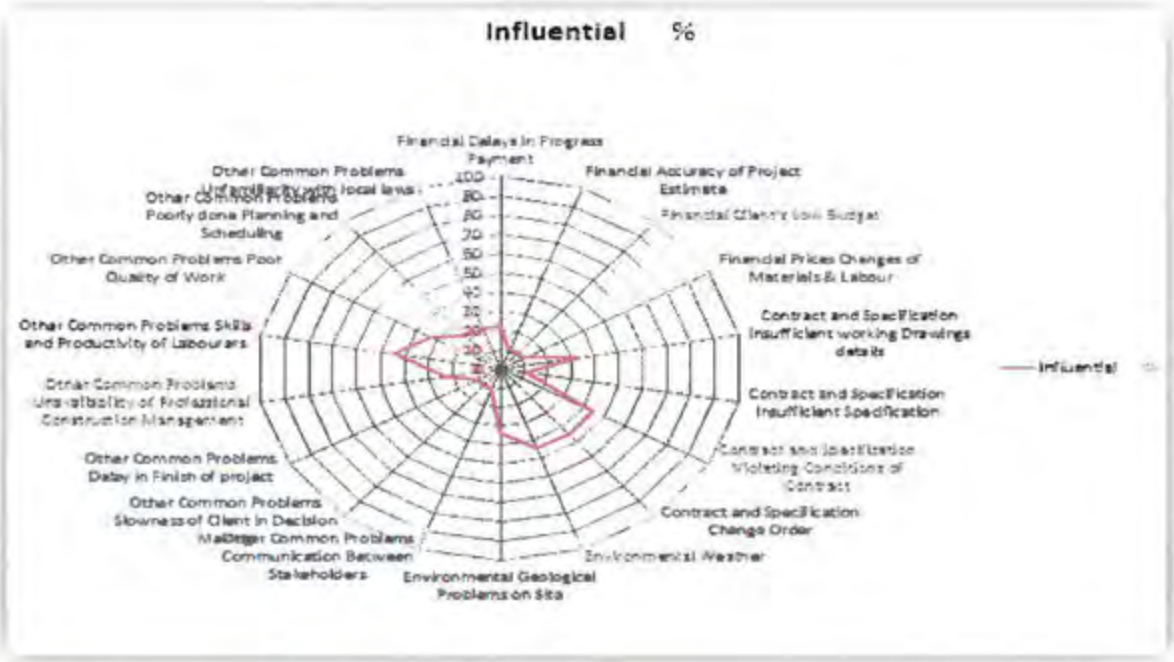

Figure 8.10: Influential

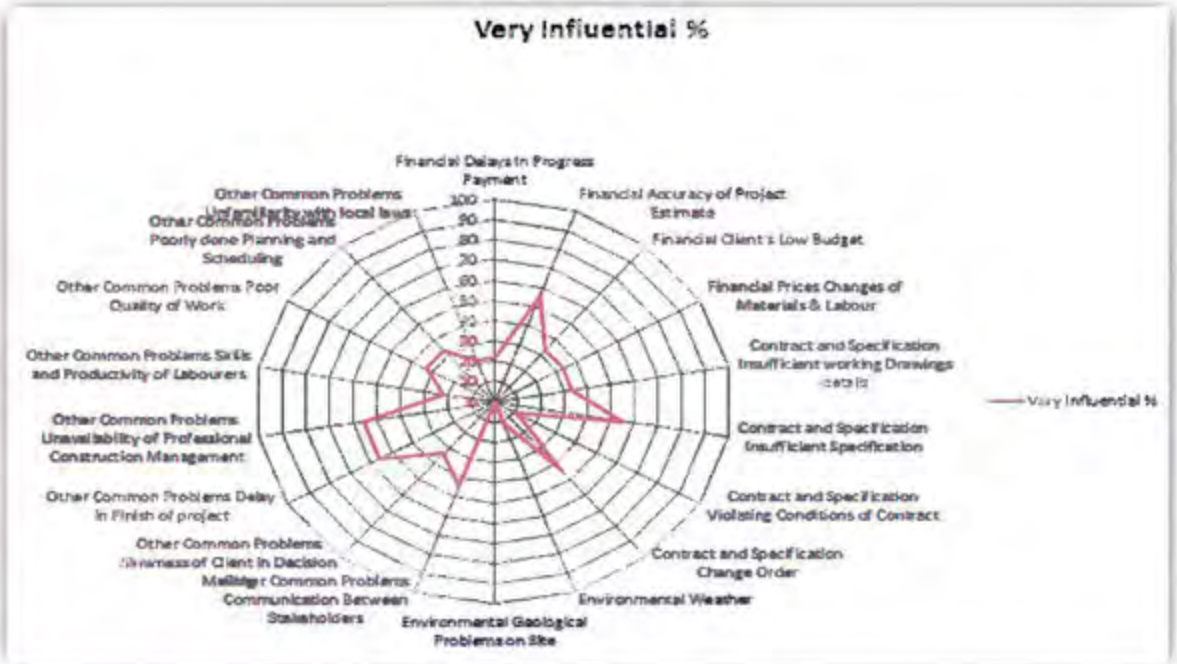

Figure 8.11: Very Influential

Figure 8.12: Absolutely Critical