

THE EFFECTIVENESS OF CONSTRUCTION  
PROJECT MANAGEMENT SERVICES

TOWARDS CLIENT'S  
OBJECTIVES IN THE BUILDING INDUSTRY

LITEBOHO NKHABU

**THE EFFECTIVENESS OF CONSTRUCTION PROJECT MANAGEMENT SERVICES TOWARDS CLIENT'S  
OBJECTIVES IN THE BUILDING INDUSTRY**

By: Liteboho Nkhabu  
24158641

Submitted in fulfillment of part of the requirements for the

Degree of Bsc (Hons) (Quantity Surveying)

In the faculty of Engineering, Built Environment of Information Technology



**UNIVERSITEIT VAN PRETORIA  
UNIVERSITY OF PRETORIA  
YUNIBESITHI YA PRETORIA**

Study Leader:  
Mr J.H. Cruywagen

October 2010

## **DECLARATION**

I, Liteboho Evelyn Nkhabu, do hereby declare that this treatise is entirely my own work, except where otherwise stated and not been produced in any manner or form before.

Signed:

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Liteboho Evelyn Nkhabu

Pretoria: October 2010

## ABSTRACT

Title of treatise : The Effectiveness of Construction Project Management  
Service Towards Client's Objectives

Name of author : Liteboho Evelyn Nkhabu

Name of study leader : Mr Cruywagen

Institution : Department of Construction Economics  
Faculty of Engineering, Built Environment and Information  
Technology  
University of Pretoria

Date: October 2010

The major objectives of a construction project management are still time, cost and quality but the management processes and procedures are different because of today's economy and technology. With that, the construction industry is keeping up with times by improving construction project services, to make everyone's life easier and improve the procurement systems in such a way that it suites; client's objective, construction constraints and the shortfall of old systems.

Most people have raised compliant about the new modern procurement systems. The most criticism of these being that, projects are failing even before the implementation of the current construction procurement systems, so, why waste resources by absorbing these kind of systems in projects which seem to be expensive and worsening the current situation of delays and cost overruns. Because of these

issues that are raised, all the emerging procurement systems are notoriously known as money making schemes that are digging deep in client's pockets.

With this being the case, the research proposes to research on whether construction project management as a modern procurement system is working towards achieving the client's objectives, if not what are the issues refraining it from achieving these objectives and how can it be addressed. Based on the question in mind the following hypotheses were raised:

- Construction Project Management is the most preferred procurement method in today's construction, therefore it is a better system than the traditional systems.
- If corporate businesses are increasing profitability through risk management techniques, risk management should be an improvement of client's objectives in the construction industry.
- Construction Project Management is an improvement of the traditional system, meaning it does address traditional management setbacks.
- There should be a linkage because the techniques and strategies of management for effective mitigation.

The hypothesis was answered through literature reviews and empirical surveys. The literature review was mostly from construction project management books and journals. Interviews were conducted but did not contribute much to the bigger picture. The empirical survey contributed a lot to most unanswered questions and overall the response was positive on the success of construction project management and on its achievement of the client's objectives.

## **ACKNOWLEDGEMENTS**

I wish to thank the following people for their involvement and assistance in the preparation of this treatise:

1. My supervisor, Mr Cruywagen, who provided me with valuable guidance during the preparation of this treatise.
2. My family (Nkhabu family) and friends for their support and understanding
3. My supervisor from work, Mr Tsita, for granting me time to complete the treatise.
4. The participants in the survey, for all valuable information input that made this treatise a success.

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## CHAPTER 1

### INTRODUCTORY CHAPTER

#### 1.1 Background

In today's world of transformation, things change for the better and at the same time they change for the worse. In the construction world this theory seems to be true. In the past we have seen a shift from principal agency to project management being the sole driver of construction projects with the objective of improving performance in a project. Project management and other functional tools of a project are used in most construction projects with the aim of improving project performance, but often the opposite is achieved. Project management has been rated to be one of the most fast growing services in the industry aiming to fast track all angles of a project. If this is the case how come we see projects being late, project losing resources and chaotic management of projects? Because of this, it will be important to try and attest its effectiveness on construction objectives; analysis it's key success factors and show whether they are functional or not, and lastly, analysis the issues hindering its performance. The approach to this problem will try and analyze the objectives of these services in relation to the general objectives of a project, through varies research methods and assumptions.

A project is set to be a unique temporary endeavor, this means a project can be the same but the risks and uncertainty could be different; an example of this would be of a construction of a an L-shaped 3 bed room house in location 1 and the other in location 2 using the same material. Both are the same but because of the location the objectives can differ therefore the challenges will also differ. Regardless of the different challenges that a project may show, the procurement system chosen for the particular project, should be able to resolve the constraints, if not, it should be rated a failure. The will be no exception to a project failure because of the risk and uncertainty of a project, unless the rest was beyond the control of the project, which is the responsibility of a project manager.

In the past the responsibility of a project manager was of an experienced foreman or Quantity Surveyor, but now because of the complexity of projects and rapid development someone with appropriate academic skills has replaced the role. The project manager has the responsibility of biting the project constraints with the aim of achieving time, budget and quality, but often if not always the project manger fails to meet either of the set objectives, this raising questions of the effectiveness and

competence of project management strategy on projects objectives, or is it the incompetence of the individuals running the project; or are the client's objectives are unachievable? A good example of a project that turned out to be catastrophe from a project manager's point of view is the Sydney Opera House. In the 1950s it was observed that there is a need to built this type of construction, it was estimated that the construction will cost 7 million Australian Dollars (\$A) and it will be completed in January 1963. At the end of the project, the project's original scope had to change to prevent further cost increase and delays, according to (Steyn et al 2008).

### **Construction challenges of (according to Fewings : 2005)**

- Economic factors, which affects funding and the market prices
- Ethical and environmental choice
- Resource availability, the more the resources the risk of completing
- Time constraints
- Technical and design issues, "a good estimate is as good as the drawings"
- Planning constraints which exist to the type of development noted making some locations easier than other to gain permission or apply
- Physical site constraints, the site might not be easily accessible

### **1.2 Project Overview**

This research proposes to measure the effectiveness of construction project management as an improvement of project objectives; the project objective being time, cost, and quality; it also measures the success of construction project management in the current South African industry.

### **1.3 Sub problems**

- Is construction project management a better procurement method than the other procurement systems?
- Does risk management service contribute towards the effectiveness of construction project management?
- Is construction project management effectively addressing traditional management seatbacks?

- Is there a link between construction project management skills and project constraints?

#### **1.4 Hypothesis**

- 1.4.1 Construction Project Management is the most preferred procurement method in today's construction, therefore it is a better system than the traditional systems.
- 1.4.2 If corporate businesses are increasing profitability through risk management techniques, risk management should be an improvement of client's objectives in the construction industry.
- 1.4.3 Construction Project Management is an improvement of the traditional system, meaning it does address TPM setbacks.
- 1.4.4 There should be a linkage because the techniques and strategies of management for effective mitigation.

#### **1.5 Scope and limitations of Study**

The scope of this research covers project management in the building industry only and the approach will cover the managerial aspect of the construction industry and less of technical aspects. The technical aspects will be used for example purposes. The research will be conducted in Gauteng Province in South Africa, mainly in Pretoria and Johannesburg cities.

#### **1.6 Definitions and terms**

- 1.6.1 **Capital Improvement Plans Process** - it's a list of prioritized list of projects to meet Agency's capital assets needs.
- 1.6.2 **Construction Management** - organizing, scheduling, mobilizing and directing of equipment, material and personnel in performance for construction contracts.
- 1.6.3 **Stakeholders** - anyone who has an interest in the proposed work or is affected by the project, e.g. Client, professional team, local municipality.

- 1.6.4 **Deliverables** - the end product or service that must delivered.
- 1.6.5 **Resources** - all the resources needed to accomplish the project, e.g. Funds, equipment and the professional team etc.
- 1.6.6 **Scope of works** - work to be done to deliver the products or services
- 1.6.7 **Cost estimate** - the estimated financial cost that will fund the work to be done.
- 1.6.8 **Risk** – Environmental, economical and project constraints Factors that could hinder the outcome and performance of the proposed work.
- 1.6.9 **Main Contractor** - The client’s agent responsible for the construction of the project
- 1.6.10 **Subcontractor** - A specialist contractor working under the main contractor to provide specialist work like air-condition systems and lift installation
- 1.6.11 **Prototype** - Building design that is identical

## 1.7 List of Abbreviations

- 1.7.1 CIC: Construction Industry Council
- 1.7.2 CM: Construction Manager
- 1.7.3 CPM: Construction Project Manger
- 1.7.4 CIP: Capital Improvement Plans Process
- 1.7.5 D+C: Design and Construct method
- 1.7.6 PMBOK: Project Management Body Of Knowledge
- 1.7.7 PM: Project Manager / Project Management
- 1.7.8 MC: Management contract
- 1.7.9 RM: Risk Management
- 1.7.10 TPM: Traditional project manager/ management
- 1.7.11 QS: Quantity Surveyor

## **1.8 Assumptions**

- 1.8.1 It is assumed that, the employment of a construction project manager in a project has a great and positive influence on the project objectives being, time, cost and quality.
- 1.8.2 It is assumed that construction project management has been implemented to compete with other existing construction procurement systems.
- 1.8.3 It is assumed that, construction project management is currently the most preferred and fastest growing procurement system in South Africa.

## **1.9 Importance and needs of the study**

Firstly, project management services are used by developer and corporate companies; and in both circumstances it proposes to grant improved management services as compared to the ancient management systems. The study will be important in clarifying and influencing the client's and companies decision on which management system to use before the project commences. It will also assist interested parties of the construction industry in understanding the core call for construction project management and how it operates.

Secondly, the construction industry in South Africa is fragmented with inexperienced use of the service and the research will be a good indicator of real pros and cons of the system and where improvement will have take effect.

## **1.10 Research Methodology**

- 1.10.1 **Literature Review** - Information should have both theoretical and practical framework, but the framework of the research will be formulated from a theoretical analysis. The information will be gathered from books, journal and magazines mainly from South Africa but also from international countries.
- 1.10.2 **Questionnaire Design** - The theory formulates processes and procedures, but does not always represents the true facts; a questionnaire analysis will express an indication of



the facts. The questionnaire participation will involve: contractors, practicing project managers, architects, quantity surveyors and clients that have been using the services.

1.10.3 **Research Interview** - It will be important to information on experienced personnel in the industry to lay down their actual experiences on the problem.

1.10.4 **Case study** - Past experience and numerous studies will be significant in trying to obtain the truth in the problem, though construction and business related case studies.

## CHAPTER 2

### PROCUREMENT SYSTEMS AND CLIENT'S OBJECTIVES

#### 2.1 Introduction

Time, cost and quality have been identified as client's objective and are always competing with each other; a project with a lesser construction period could result with a high cost, a project with limited resources could compromise the quality of the work. With that, procurement strategies structure tries to reduce the competitive effect of the parameters. Every project differs and client's objectives differ, but the choice of a procurement strategy should be weighed to the demands of a particular project. To address this it will be ideal to try and make the reader understand a project in construction terms. This is illustrated by explaining in depth and through examples the meaning of a project and its main objectives. This chapter illustrates the different types of procurement strategies, their characteristics, advantages and disadvantages towards the project objectives; it also compares this to that of project management in trying to find the most appropriate strategy while addressing the clients objectives. The aim is to try and depict whether construction project management is dissolving other traditional systems or whether it's only an improved management system. The analysis will include CPM, D+C, MC and CM as the basic procurement strategies used in the construction industry.

#### 2.2 Project characteristics and procurement requirements

##### 2.2.1 Project characteristics

According to (PMBOK, 1996) a project is a temporary and unique product or service, (Steyn et al 2008) adds on to say, it is planned, performed and controlled by people to satisfy pre-determined needs of stakeholders. The objective is to create a unique product, service or complete and definite outcome.

- **Temporary:** Implies that a project has a beginning and an end. The end of a project is reached when the project objectives have been reached or when the project is terminated for some other reason. What should be understood is that, the word temporary does not refer to a shorter duration; this only indicates that the project will at some point cease. To add to this, temporary does not apply to the product or services created by the project and it only cease when its objectives are reached; which makes it different from other projects.

- **Unique:** implies that each project differs from other similar endeavors and has a single, definable purpose, (Steyn et al 2008), a good example will be of a school, most schools in South Africa are prototypes whether the school is in Free State or Gauteng the design will be similar; but the challenges and objectives may differ. According to (PMBOK, 1996), the uniqueness of a project means that the characteristic of a project that distinguishes the product or service must be progressively elaborated. Progressively meaning, proceeding in steps continuing steadily in by increments, while elaborated means work out with care and detail, developed thoroughly. This means the progressive elaboration must be carefully coordinated with proper project scope and definition.
- **Planned:** A project is planned, performed and controlled a group of people or team members to a pre-determined needs of stakeholders
- **Complete and definite:** The outcome implies that every project leads to something; this is referred a deliverable. Deliverable means a tangible object; a product will be to the benefits of client. This deliverable should satisfy or exceed the need and expectation of the stakeholders.

#### 2.2.2 Factors to be considered in selecting procurement strategy, according to(Morledge et al 2006)

The choice of a procurement strategy will depend on the nature of the business case and the client's considerations when evaluating the most appropriate strategies. The following form part of the client's requirements:

- **Client's resources**

This involves the clients knowledge, the experience of the client's company's organization and the environment in which is operates are vital in assessing the appropriate procurement strategy.

- **Project Characteristic**

The characteristic differs from project to project but mostly the size, complexity and location of the project should be carefully considered and particular attention given to a project that show to be

complex, for example, a project of over one hundred million rands means there is a great risk on cost and time overruns therefore the higher the risk failure of client's objective.

- **Ability to make changes**

Changes are the most difficult aspect that has to be managed, changes can be assessed for mitigation process but because the future is uncertain changes will always be there. While choosing a management strategy; the strategy should be able adapt to changes at a later stage of a project.

- **Cost management**

A change in the design calls for increase in cost; therefore depending on the objectives, design changes during the construction period should be avoided as much as possible. Changes will also affect the cost where the contract clauses allow for changes to be made and the contractor is allowed compensate for making the changes. Some procurement strategies do not allow for design changes after the construction commences the changes allowed are changes inherited by the project.

- **Project timing**

The South African industry has a reputation for delivering projects late even under the new construction procurement system. Complex project will require more time to design and prepare the overall project documentation. Project progress may be at the initial stages of the project operation may be influenced by compulsory purchase order, and purchase or non specific but critical factor, which will later influence the overall construction project. In this case the choice of the procurement strategy is important; some procurement strategies will allow concurrent design and actual construction for early construction commencement.

### 2.2.3 Components of the procurement process, according to (Morledge et al 2006)

- A functional need analysis
- Selection and development of overall procurement philosophy, which will normally be based on either a design led, construction led or management led approach
- Analysis of the most suitable form of relationship between the demand and supply sides of the procurement equation

- A detailed design of the specific procurement approach to be used

## **2.3 Procurement strategies**

### **2.3.1 Traditional System**

Traditional approach involves discrete design development, tender contract award and construction delivery phases. The process begins with a client approaching the principal design consultant; this could either be an architect in a building contract, an engineer in an engineering contract. The architect has a direct relationship with the client and continues to serve as the agent of the client in administering the main contractor; the architect provides advice on the most appropriate contract form, on specific contract conditions and tendering method. In addition to this, the architect coordinates the tendering process and evaluation of the tender on submissions, (Best and De Valence: 1999). Under the traditional procurement strategy, the design should be completed before competitive tenders are invited and before the main contractor is let and the advantage is, cost can also be determined with reasonable certainty before construction commences, giving the client an indication of the budget for fund raising.

The main advantages of traditional strategy

- Competitive fairness, since all tendering contractors are bidding on the same basis.
- Design-led, with the client being able to have direct influence therefore facilitating a high level of functionality and bespoke quality in the design.
- Reasonable price certainty at contract award based upon market forces.
- Where public expenditure or audit demands are rigid the strategy is satisfactory in terms of public accountability since it is transparent.
- The procedures are well known, enabling confidence to be assured in those involved throughout the supply chain.

The main disadvantage is:

- It is possible to attempt to speed up the process by producing tender documents from an incomplete design, but this will usually result in less cost and time certainty and can be the cause of expensive dispute.

- The overall project duration may be longer than other strategies as the strategy is sequential and construction cannot commence prior to the completion of design with no parallel working.
- There is no input into the design or planning of the project by the contractor who will not be appointed at the design stage.
- The strategy is based upon price competition results in adversarial relationships developing.

### **2.3.2 Management Contracts**

(Masterman: 2002) explains management as a method where the contractor agrees to carry out building works at a cost while at the same time providing some limited management expertise to the client and the clients design team at an agreed fee. The contractor is appointed on a professional basis as an equal member of design team providing construction expertise, the actual construction is carried out by work package contractor who are employed to be co-ordinated and administered by the management contractor, the management contractor co-ordinates the releases of information from the design team to the main contractors. The design are completed at hand, then subsequent packages of work are tendered and let, cost certainty is thus not achieved until all the works contractors have been appointed. A high level of cost management is therefore, required. With the agreement of the client, the management contractor selects works contractors by competitive tender to undertake sections of construction work. The client reimburses the cost of these work packages to the management contractor who, in turn, pays the main contractors.

Main advantages (Morledge et al 2006)

- There is a relatively good time saving potential from the overall project due to the overlapping of the design and construction process.
- The strategy enables contractor contribution of the design and project planning.
- Change can be accommodated provided packages affected have not been let.
- Work packages are let competitively at a price that is current at the time the work is let.

### Main disadvantages

- The client must provide a good quality brief to the design team as design will not be complete until the client has committed significant resources to the project.
- Poor certainty of price is offered at early stage and potential cost commitment depends upon design team estimates
- The strategy relies on good quality committed team or it may become more than a post box system in certain circumstances.
- It reduces resistance to work contractor's claims where such demands are passed on to the client by the management contractor.

### **2.3.3 Design and Built**

Under the design and built strategy, a single contractor assumes the risk and responsibility for designing and building the project, in return for a fixed-priced lump-sum. The client appoints a designer to prepare the concept design before the contractor assumes responsibility for completing the detailed design and constructing the work. The advantage is that, the risk is transferred to the contractor but the disadvantage is the client loses control over the project; and the contractor puts their own interest before the client's, for example, the contractor might compromise the specification or quality of work to gain more profit. The client must provide all necessary information completed to the contractor therefore ambiguity should be avoided in this type of strategy because the client will have little to influence during the construction of the work. Ambiguous information will inherit changes over the normal project changes but it is worse if they are inflicted. In the design and built, because of the fact that projects have a nature of being fast-tracked, it is important that when using it, performance and project brief are fully and clearly defined before entering into the contract, (Morledge et al 2006).

### Advantages (Morledge et al 2006)

- Reduces total project time due to early completion and the overlapping activity nature of the strategy.
- Price certainty nature.

- Price certainty is obtained before construction starts provided that the client's requirements are adequately specified and changes are not introduced.
- The client has with one firm, reducing time to contracting with design and contractor separately.

#### Disadvantages

- Difficulty is experienced by the client when preparing an adequate and sufficient comprehensive brief.
- The client is required to commit to a concept design at an early stage and before the detailed design is completed.
- There is no design overview unless separate consultants are appointed by the client; which increases the cost of the project.
- The bid processes are difficult to compare since each design will be different, the project programme will vary between bidders and prices for the project will be different for each different design.

#### **2.3.4 Construction Management**

Under the construction management, the client does not allocate risk and responsibilities to a single main contractor, but employs the design team and a construction manager who is engaged as a fee-earning professional to manage the programme and co-ordinate the design and construction activities and facilitates collaboration in order to improve the buildability of design, (Morledge et al 2002)

(Walker and Hampson: 2002) identifies two types of approaches of CM, which are direct and agency approach. With the direct approach CM undertake work for a guaranteed maximum fee or negotiated price usually when the design is sufficiently advanced to address issues of risk adequately. The CM works with the rest of the design team to obtain cost information and preliminary information at pre-construction stage. CM uses this information to draw up a detailed programme for the pre-construction activities. With agency the CM undertakes the work as consultant for a fee providing constructability advice and coordination of the construction work. The design responsibility not only lies on the design team but on the design team and CM,



this improves build ability and construction of the project. The aim of this particular strategy is time reduction but compromising the cost of the project, (Best and De Valence: 1999)

#### Advantages (Morledge et al 2006)

- It allows early involvement of the contractor which avails the contractor to the design team
- Client must always be close to the project; therefore it makes it suitable for inexperienced clients.
- Enables contractor contribution on the design and project planning.
- Changes in design can be accommodated late without paying premiums.

#### Disadvantages

- Close time information control is required
- The strategies relies upon the client selecting a good quality and committed team
- The client must provide a good quality brief team as the design will not be completed until the client has committed significant resources to the project
- Price certainty is not achieved until the last trade packages have been let. The budgeting depends heavily upon team estimate

### **2.3.5 Project Management**

The PM takes the responsibility for the design coordination and supervision of those responsible for undertaking the work packages. The contractor is only given the opportunity to determine the price, but the project manager determines and manages the profits. This is achieved by the ability of PM to influence construction changes as they occur. Project requirements are always uncertain and resulting into changes, this impacts the cost and budget and quality. CPM ensures that there is a widespread of unity of view as the client's objectives though project phases, the phases being: project initiation, feasibility studies, design and development, construction and project closeout. It also involves the preparation of tender documentation and administers the contracts as the superintendent; coordinate all members of the team throughout the project; administrate the project budget and programme: report to

the principals on the status of the project's time, cost quality progress; lease areas of the building where appropriate; and to commission the finished facility. These phases succeed on another; this means the proceedings phase is completed first before the succeeding phase takes place, the stakeholders assess the phase first and approve it upon satisfactory. Should the client be unhappy with certain items, the work can easily be redone; therefore it has an element of fast-track strategy and easy change management. Regardless the project will demand for changes during the construction period and CM introduces report on changes so that action can be taken to respond to the changes. Monitoring techniques are established to measure the actual cost and progress with established plans done at the beginning of the project. CPM is also concerned with the management of the job resources with project financial control. The project resources are material, labour, construction of equipment and subcontractor work. Resource management involves the advanced recognition of project need, scheduling and expending the resource required and demands where necessary.

#### Advantages

- Single point of responsibility in the project manager, the client's risk to various aspects of the project is reduced.
- Because the project manager is responsible for the delivery of the project, it enables the client to focus on his or her usual business operation rather than expend time and effort on the procurement of the facility.
- This strategy lends itself to large and complex projects that require greater overall management skill than offered by the traditional method.

#### Disadvantages

- The nature of the contractual arrangement can lead to high adversarial state that is more likely to lead to lengthy and expensive litigation.

(Holtzhasen, Siyabonga : 2003), stated that, no single building procurement system can be applied universally on all construction projects. To attest this statement a table indicating the suitability of various building procurement system of different types of cases is depicted in table 1 below (1 indicates low performance and 5 indicates high performance).

**Table 1 Rating for different procurement model ( Holtzhausen: 1998)**

|          | <b>Client's performance requirements<br/>or expectations</b>            | <b>Conventional</b> | <b>Design and Built</b> | <b>Management</b> |
|----------|---|---------------------|-------------------------|-------------------|
| <b>1</b> | <b>Technical complexity</b>   | <b>4</b>            | <b>4</b>                | <b>5</b>          |
| <b>2</b> | <b>High aesthetics or prestige<br/>requirements</b>                     | <b>5</b>            | <b>3</b>                | <b>3</b>          |
| <b>3</b> | <b>Economy / minimum cost</b>   | <b>3</b>            | <b>4</b>                | <b>4</b>          |
| <b>4</b> | <b>Time is of essence</b>   | <b>2</b>            | <b>5</b>                | <b>4</b>          |
| <b>5</b> | <b>Exceptional size and /<br/>administration complexity</b>             | <b>2</b>            | <b>4</b>                | <b>4</b>          |
| <b>6</b> | <b>Price certainty required as soon as<br/>possible</b>                 | <b>4</b>            | <b>4</b>                | <b>2</b>          |
| <b>7</b> | <b>Facility for variation control by the<br/>client during progress</b> | <b>5</b>            | <b>1</b>                | <b>5</b>          |

## **2.4 Hypotheses test**

Construction Project Management is the most preferred procurement method in today's construction, therefore it is a better system than the traditional systems; no, from the table 1, construction project management is not a superior procurement system than traditional systems but an improved management system of the traditional systems; what might be an advantage to one procurement system might be a disadvantage to another system.

## **2.5 Conclusion**

The chapter has highlighted that the choice of a procurement strategy depends on the complexity of a project and the demands of the client. The characteristic of a construction project are; temporary,

unique planned, complete and definite. A procurement strategy should be able to resolve; performance, cost and time constraints otherwise it will fail the client's objectives.

**CHAPTER 3**

**CONSTRUCTION PROJECT MANAGEMENT AND**

**RISK MANAGEMENT SERVICES**

**3.1 Introduction**

Changes are an inherent part of a construction project, many construction companies have a poor reputation of not completing within the estimated cost, delivering projects late and having many changes during the construction period. Changes and project constraints cannot be eliminated from any project but in to construction project management, by applying the principles of risk management the project manager can be able to improve the effectiveness of management with the objective of eliminating cost overruns and project delays and improving the cost, time quality of the project. According to (SACPCMP) management professions, the recommended scope of services and tariff of fees for a person registered in terms of the construction project management and construction management professions Act 2001 (Act NO. 48 of 2000) includes the risk management as one of the services paid to a project manager, therefore risk management is not an ordinary activity that can be ignored or taken lightly. The client invests so much money in employing a construction project manager and the best should be achieved. Risk management technique is seen as one the tools that enhance the services of construction project management and make is an effective procurement system; therefore this sub problem proposes to measure the effectiveness of risk management to towards time, cost and quality. Case study reviews will be used as a test to this particular sub problem, the literature review will indicate the key area that determines the success of risk management. Other services include scope management, time management, cost management, quality management, human resource management, communication management and procurement management as mentioned from the previous chapter.

**3.2 Definition to Risk**

The word "risk" originated from two sources, for example the French word "risqué" which means "danger" in which there is an element of "chance", and Italian word "risicare" which means "to dare". It is clear from its origin that risk is applicable to opportunities as it is to negative outcomes, such as damage, death or loss of money, (Steyn et al 2008). In construction, risk is identifies as an uncertain event or condition that if it occurs it can have a positive or negative effects on project outcomes.

Risk can be classified into external and internal risk (Loosemore and Uher: 2006); external risk being those that are outside the control of the project, for example national strikes, availability of resources and project location. Internal risk refers to events that are generated by the project itself, for example changes in scope and design errors in tender documentation, the use of difficult contract conditions and bid shopping and lack of coordination of subcontractor. The job of a project manager is to detect the cause of these constraints, the following method helps in identifying these constraints:

- Brainstorming
- Structured interviews
- Delphi techniques
- Documentation reviews
- Risks checklists
- Assumptions analysis

### **3.3 The Role of a Project Manager in Risk Management**

CPM has a role of dealing with uncertainty, identifying source of uncertainty and the risk associated with them. The CPM manages the risk such that the negative outcomes are minimized and positive outcomes are being capitalized on. In looking at risk management and the role of the project manager it should be noted that risk management cannot be owned by one individual on a project and that all team members must be 'risk ware' and participate in activities to improve a project's position, through action plans, which are part of the main project plan.

The two objectives for the deployment of the discipline of risk management are, (Simon and Burtonshaw - Gunn: 2009)

- To plan and take management action to achieve the aims of removing or reducing the likelihood and effects of risk before they occur and dealing with actual problems when it occurs and
- To continuously monitor potential impact of risks review, manage the associated action plans, provide and manage adequate financial and schedule contingencies to eliminate risk. Management of project includes assessment risk and activity management, these should be viewed as an indication of good project management and not an admission of failure. By looking ahead at the potential events that may impact the project and putting actions measures in place

to address failure issues, project teams can proactively manage risk and increase the chances of successfully delivering the project within time cost and quality project requirements.

### **3.4 Where to Start With Risk Management**

Risk management starts with the planning the phase, there should be plan put in place to manage any amendments caused by constraints, e.g. risk processes will form part of a risk management plan. (Simon and Burtonshaw- Gunn: 2009), has identifies some elements of RM plan as inputs and outputs.

(i) Considerations will be the first step in RM, the main input being planned meetings.

(ii) The inputs include:

- Organization's RM policies
- Defines roles and responsibilities
- Stakeholders risk tolerance
- Template for the organization's RM plan
- Work breakdown structure

(iii) Outputs of RM will include planning meeting, at which the project team develops a risk management plan. Attendees usually include the project manager, the project team leader, anyone in the organization with the responsibility to manage the risk planning and execution activities. These meetings can make use of organization's risk management templates and other inputs that are appropriate in order to achieve the best results. The primary output from the meeting should be an agreed management approach to risk that the project will face and formal risk management plan which will detail with how risk identification, assessment, response planning, monitoring and control will be undertaken during the project's lifecycle. Importantly, the RM plan does not address responses to individual risks as this is accomplished in the risk response plan.

### **3.5 The Benefits of Risk Management in Construction, (Smith et al 2006)**

Some objectives may be too unrealistic and some maybe under estimated; for example; the client may demand a completion date that is unachievable as compared to load of work or the budget estimate may not be realistic to the content of the work. With risk analysis, the problem can be solved by applying measured of risk analysis before the construction commences. From the initial go the client is

in a good position to either increase the cost or the time than solving the problem long after the project has commenced; this saves the project from undergoing unforeseen expenditure

#### Benefits

- Increase understanding of the project, which leads to more realistic plans in terms of cost estimates and construction periods
- It gives increased understanding of the risk in a project and their possible impact, which minimize risk for a party in handling the problem
- Decisions are supported thorough analysis
- Prompt management and efficient and effective management
- It minimize the liability of exposure
- Understanding the limitations of work measurement
- Understanding the variations in technical skill in how those variations can impact estimates

### **3.6 General Risk Management Processes**

#### **3.6.1 Risk Identification**

Risk identification involves the identification of risk that threatens the outcomes of the project; the aim of risk identification is to ensure nothing significant is over looked, failure to think through the needs and risk associated with a project may cause problems like; contract strategies not suitable to meet the needs of the project, demands that a project will inherit that may not be recognizable at the beginning and many more risk that the particular project faces. There will be project plan or alternative method used to redeem the risk associated with a project. The project manager makes use of other project team members in improving the set objectives, and (Steyn et al 2008) has identified other useful data like the list below as inputs in this process.

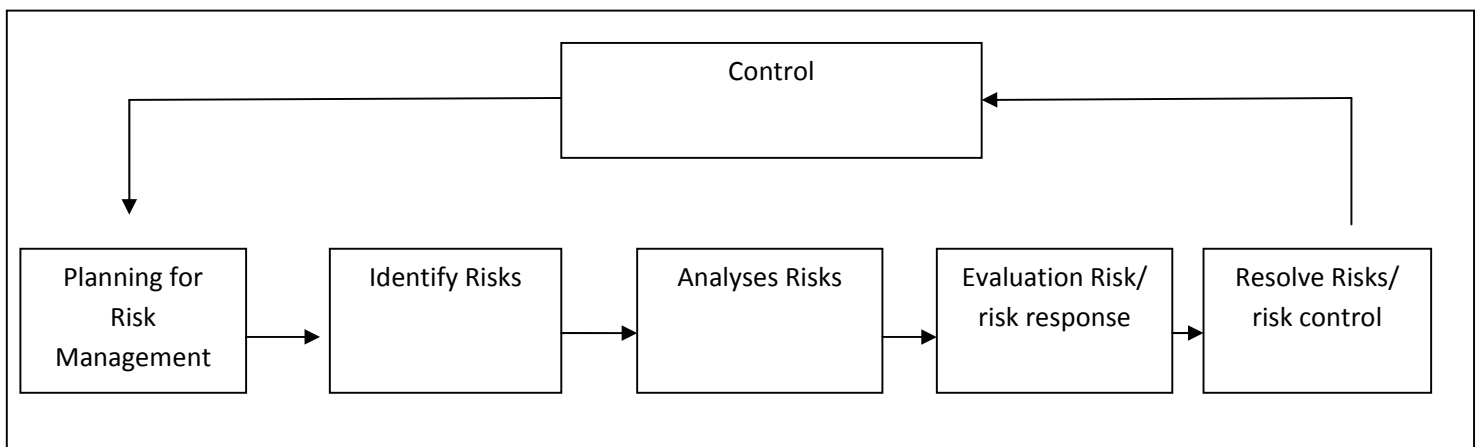
- Historical information and “lessons learnt” from similar projects
- Risk checklists that have been compiled in company for different types of projects
- Project management plan
- Work breakdown structure
- Project schedule
- Cost breakdown structure and project budget
- Technical performance goals for the project



- Risk categories
- System engineering documentation

The success of this process will depend on how the risk management team have been selected and brought together, (Burke: 2001) involving the stakeholders in team work determines the success of a project. Work break down structures (WBS) is being identified as an effective tool of reducing the risk because it can recognize the missed events, (Gray and Larson: 2006). Another effective means of risk identification is the use of a risk checklist or profile; this is a list of questions that addresses traditional areas of uncertainty on a project; these questions have been formulated and refined from previous, similar projects. The Delphi is another the risk identification technique used; this method is an established technique for obtaining consensus estimates from several experts. The method should not be used on projects that have tight budget but should be used on projects that has little information available or where the professional team has little experience from previous similar projects, this is because the method is too subjective and can bring out false predictions.

**Figure 1 The General Risk Management Process, (Steyn et al 2008)**



### 3.6.2 Risk Management Analysis

Not all the risk in a project will be managed, as this will be very time consuming and endless, therefore the main objectives of risk analysis is to help the project team or CPM to identify those risks that should be managed more. RM is divided into qualitative and quantitative analysis; qualitative risk analysis a process of assessing the impact and like hood on the identified risk, it prioritizes the risk according to

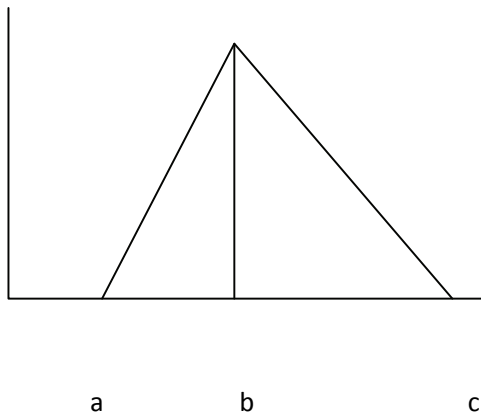
their potential effect on the project objectives and it is one way to determine the importance of addressing specific risks and guiding appropriate risk responses. (Simon and Burtonshaw- Gunn: 2009

The PM and team member undergo a brain storming session where ideas on how to reduce risk will be conducted. These subjective data may be expressed as likelihood and consequences of risks high or low terms or estimates of specific values of risk variables that fit simple probability distribution, these uniform, triangular, trapezoidal and discrete

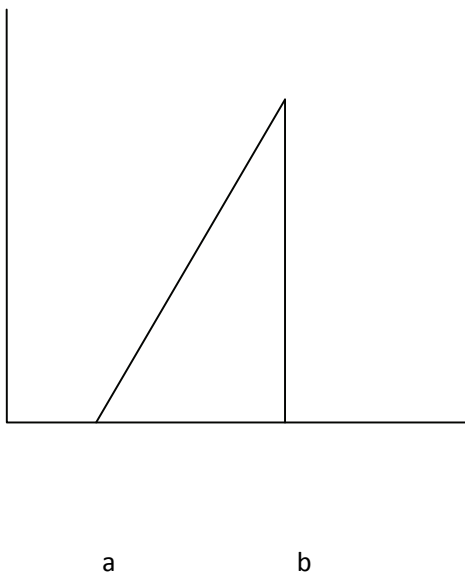
Choosing a technique for risk assessment depends on the size and the general nature of the problem being modeled, the amount and reliability of information available and the nature of the output required. It is very important to use practical and approximate approaches when quantifying risk and selecting the probability distribution. The key factor in this stage is that, the team members should focus on events that could cause failures to a project and not the consequences of failure, if this is the case potential solution can be found (Gray and Larson: 2006). Another effective tool in identifying specific risk is structuring a work break down structure (WBS). Using a WBS reduces the chances a risk event will be missed.

- **Uniform distribution** assumes that the range of possible values for a given risk variable can only be expressed between its minimum and maximum limits, meaning the decision will have equal probability of a whole range of cost.
- **Triangular distribution** is viewed as being adequate for most applications, particularly in estimating cost and time. It is characterized in addition to its minimum and maximum limits of values, by the most likely value. Low and high probabilities will be assigned to the values close to the minimum and maximum and most likely limits are distributed in a linear fashion. In assuming that the variable is cost, most likely value is 'b', the lowest possible cost is 'a' and the highest possible cost is 'c', figure 3 the distribution is skewed to the left, which indicates the downside risks (events that produce cost increases) are greater than upside risks (events that can reduce costs) and the opposite is true when the distribution is skewed to the right.
- **Trapezoidal distribution** is described by minimum and maximum limits and by two estimates of the most likely values.
- **Discrete distribution** shows frequency of occurrence of various outcomes of given risk variable. Such frequencies are in fact probabilities of occurrence that probability distribution, care is requires in determining their lower and upper limits.

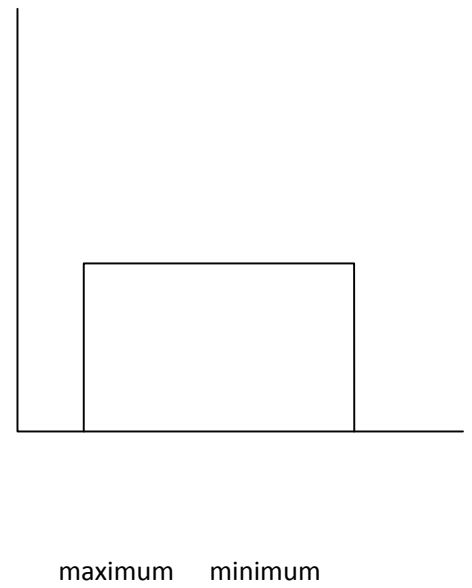
**Figure 2 Triangular distribution (Loosemore and Uher: 2006)**



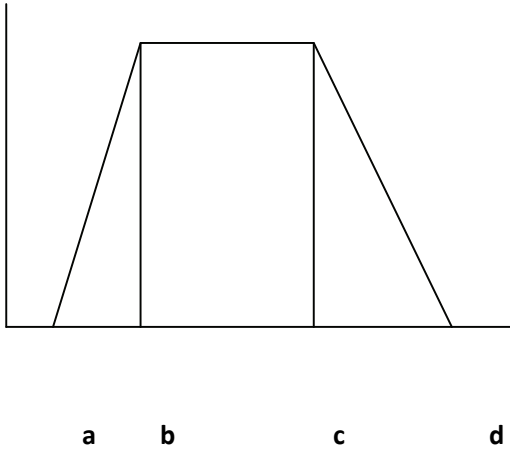
**Figure 3 Triangular distribution – left skew (Loosemore and Reilly: 2006)**



**Figure 4 Uniform Distribution (Loosemore and Reilly: 2006)**



**Figure 5 Trapezoidal distribution**



(Chau: 1993, Loosemore and Uher: 2006) has showed that triangular distribution cannot accurately represent the distribution cost and time values because such distribution is usually with a long right-pointing tail. The risk management matrix in figure 6 was found to be a solution in alleviating the shortfalls of triangular distribution. In simple matrix, minor risks will commonly be ignored. Moderate risk will be carefully analyzed and appropriate management responses formulated, while major risk will be given the utmost attention.

**Figure 6 Risk Management Matrix (Loosemore and Uher: 2006)**

|      |                  |                   |
|------|------------------|-------------------|
| High | Moderate risk    | Major risk        |
| Low  | Minor risk       | Moderate risk     |
|      | Low consequences | High consequences |

### 3.6.3 Risk Response

Because of combined project constraints, to achieve the client's objectives effectively risk response should be able to evaluate the probability at which a given project failures to meet its original objectives. This section will deal with the client's objectives and how risk management techniques are able to evaluate and reduce any risk that may go with it.

A risk response plan is developed to addresses the adverse risk and enhance opportunities before they occur. There are a range of responses which should be developed in advanced during the planning phase these are eliminate risk, mitigate risk, deflect risk and accept risk (Burke: 2001) the natural sequence will be to first eliminate the risk completely on failing to do so the last resort will be to mitigate the risk.

- **Eliminating Risk:** This means the risk is avoided by removing the cause or taking an alternative course of action.
- **Mitigating Risk:** To mitigate risk involves reducing the probability and impact of risk, by a way of techniques used in determining the outcomes of certain requirements are; simulation and modeling and developing prototypes.
- **Deflecting Risk:** Transferring of risk to another party

Action plans are needed for all significant risks identify and particular to those with a high criticality from the impact matrices, the action plans must be cost effective. If the mitigation action is not proving successful and risk becomes a problem then a fallback plan will be initiated, the following have been identified by (Ahuja and AbouRizk: 1994) as the most effective action plans on a project.

- **Corrective measures**

As mentioned above that corrective measures have to be taken to correct whatever risks affecting the project, mostly before construction. In project management the concept of the project plan responding to the changing conditions in order to meet the project objectives. The project plan responding to changing conditions in order to meet the project objectives is viewed though project management, therefore the first element in corrective action is to manipulate the available resources within the project constraints. Secondly the design must be a completely new network model from the current position to design. Introduction of a new construction method and equipment, together with other additional resources is added and the net total cost is determined. The greater the frequencies of

feedback and response, the higher will the probability of attaining the project objectives, (Ahuja and AbouRizk: 1994)

- **Review meeting and interpretation of reports**

The review meetings are aimed at translating latest work status and critical problems into a specific action plan. The construction supervisor and scheduling and cost engineer maintain intimate progress of work under daily and weekly schedules. Weekly reports with information on the actual and forecast to complete quantities of work serve as the agenda for weekly meetings. By analyzing the actual manpower distribution and material or equipment usage, the allocation and availability of resources can be adjusted. These meetings include, i) progressive monthly meetings; these form the bases of effective plan of action decision making process, when done weekly the effect is much better and improved, ii) the monthly meetings reports on critical matters requiring immediate upper management attention as well as long-run decisions . Routine reviews in construction project management encourages all levels of organization to become involved; it is especially useful to executive management in that it permits them to examine the latest trends in physical progress and resource expenditure. Major delays, overruns and bottlenecks can be analyzed and recommendations for alternative action plans and decision making can be acted upon.

- **Labor cost analysis**

One of the more common and also most complex causes of schedule slippages and cost overruns can be traced to labor productivity. This is especially true on labor intensive projects such as building construction. It is important to realize that the factors affecting labor productivity are the many and varied. In addition to physical causes for low production rates, a number of psychological factors can lower morale and therefore productivity; examples of these can be, acquisition rate of direct labor, craft ratio etc, (Ahuja and AbouRizk: 1994).

- **Material cost analysis**

Another common cause of delays and cost overruns is acquisition, transportation and storage of material used on the projects; examples of factors affecting equipment cost are equipment unsuitable for the organization, low productivity of equipment, etc.

### **3.6.4 Risk control**

The last step in risk management process is risk control executing the risk response strategies, monitoring triggering events, initiating contingency plans, and watching for new risks. It also involves establishing of changes in scope, budget and schedule of the project is an essential element of risk control. Risk profile should be reviewed to test to see if the original responses held true. The project manager needs to monitor risk just like they track the project progress. Risk assessment and updating needs to be part of every status meeting and progress report system. The project team needs to be on constant apery for new unforeseen risks. Management needs to be sensitive that other may not be forthright in acknowledging new risk problems. (Gray and Larson: 2006) Another key factor in controlling the cost if risk is documenting the responsibility, that same author continues to say, that this could be problematic in projects involving multiple organizations and contractors.

### **3.7 Change control management**

Another and major element of CPM in risk control process is change management. Change control systems involve reporting, controlling and recording changes to project baselines.

According (Gray and Larson: 2006) most change control systems are designed to accomplish the following:

- Identify proposed changes
- List expected effects of proposed changes on schedule and budget
- Review, evaluate and approve or disapprove changes formally
- Negotiate and resolve conflicts of change, conditions and cost
- Communicate changes to parties affected
- Assign responsibility for implementation change
- Adjust master schedule and budget
- Track all changes that are to be implemented

Change in construction has an impact on resources resulting in increased expenditure for one or more of the stakeholders. As the construction project progresses from inception to construction the cost of changes increases. Changes made at the design stages will involve redesign; this may be limited by the architect's details but may also affect structural engineers and mechanical and electrical engineer's drawings and specifications. However, changes made during the construction stages may result in

redesign, modification and rebuilding of completed work. All abortive work results in a cost to be or more of the parties involved. Conflict is found at all stages in the processes like briefing design and construction. Although the occurrence of conflict is the highest in the design stages, it is also found to be prominent during construction. The potential financial impact of changes on a project increases as the project progresses from inception to completion, which calls for proper management (Fenn and Gameson: 1992) a better understanding of the relationship between conflict, changes and PMS would enable the PM to make a greater and more effective use of feedback information in the formulation of their PMS.

### 3.8 Case studies of risk management

#### 3.8.1 Case study 1

##### Luxor Technologies

During the 1992 and 1996 a company Luxor success was attributed largely to the strength of technical community. The company's revenue came from manufacturing, but it was regarded as being a technology driven company by Wall Street. The majority of their products were based upon low cost, high quality applications of the state of the art technology. Luxor used application engineering and process improvements to improve productivity. Luxor saw a need for expertise in technical risk management.

##### Exhibit I ( Like hood of a technical risk)

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| Event  | Like hood rating |
|--|------------------|
| • State of the art advance needed                      | 0.95             |
| • Scientific research required ( without advancements) | 0.80             |
| • Concept formulation                                  | 0.40             |
| • Prototype development                                | 0.20             |
| • Prototype testing                                    | 0.15             |
| • Critical performance demonstrated                    | 0.10             |



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community was only able to achieve 75-80 percent of the desired specification limits, the product was released as it stood, accompanied by an announcement that there would be an upgrade the following year to achieve the remaining 20-25 percent of the specification limit, together with other features. In 1996 Luxor's lost on its profits because of competition it was catching up quickly because of the major technologies breakthroughs. Marketing estimates indicated that Luxor will be a "follower" rather than a market leader. Luxor hired an expert in risk analysis and risk management to help Luxor assess the potential damages to the firm and assist in the development of a mitigation plan. The consultant received project histories and lessons learned on all projects undertaken from 1992 through 1998. The consultant concluded that major risk to Luxor would be technical risk and prepared Exhibits I and II. Exhibit I shows the likelihood of technical risk events that could occur.

### Exhibits II

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| Event   | with state of the art changes | Impact Rating |
|---|-------------------------------|---------------|
| • Product performance not at 100 percent of specification   | 0.95                          | 0.80          |
| • Product performance not at 75-80 percent of specification | 0.75                          | 0.30          |
| • Abandonment of project                                    | 0.70                          | 0.10          |
| • Need for further enhancements                             | 0.60                          | 0.25          |
| • Reduced profits margins                                   | 0.45                          | 0.10          |
| • Potential systems Performance degradation                 | 0.20                          | 0.05          |

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### 3.8.2 Case study 2

The 200 million euro refurbishment of the Royal Opera House was one of the largest and most complex projects funded by the National Lottery Board. The project was executed using the construction

management approach as this was considered an ideal process managing risk. The aim was to identify risk at the earliest possible opportunity and proactively manage them through the risk register. Actions were taken to contain and reduce the risks and transfer the risks remaining through the contract to consultants and trade contractors. Project risks were therefore only transferred to trade contractors after they had been identified, analysed, quantified and minimized. The risks were clearly described in the tender documents and specific actions agreed with the trade contractors. Cost risk on the project were minimized by the early award of those key trade packages, which have a large element of specialized detailed design, on a lump-sum design and construct basis. Around 70% of the total project value was procured prior to the project construction; the remaining 30% was the subject of a detailed cost estimate. Rigorous cost control procedures were established to identify analysis of the programme, construction methods and sequences, resources and logistic. Method included critical path analysis, resource analysis and resource leveling, 3D CAD modeling of construction phasing and construction programme. Detailed method statements were produced for each critical element and comprehensive RA undertaken of the programme linked to the probability simulations.

By Source: Trotter, 1995

### **3.8.3 Case study analysis**

The first case study indicates the significance of risk management, after a risk management consultant was appointed the company had a clear vision of where it is going and the major opponents it is facing. The same applies in construction projects where a CPM is applied, there is more enlightenment, and solutions are bought beforehand. In as much as there is a possibility of the risk not being eliminated, RM benefits indicate that the liability of risk is being reduced to a great extent. In the second case study, indicate that the RM enforces management commitment when the risk is identifiable; this resulting into reduced project duties which have an effect on the cost and time of the project. The main benefits of RM are decisions being supported by thorough analysis and minimum risk exposure, meaning reduced failure of project objectives, therefore risk management being a service to CPM and it being efficient and effective on client's objectives, make construction project management an effective procurement strategy.

### **3.9 Hypotheses**

If corporate businesses are increasing profitability through risk management techniques, risk management should be an improvement of client's objectives in the construction industry: yes, from the

two case studies risk management has show to be an effective management tool in corporate business, therefore making it an effective management too towards improving client's objectives.

### **3.10 Conclusion**

The chapter has illustrated how effective a risk management process can attain client's objective by a way of key factors that the project manager use to be competent in their work. The Projects differ and constraints will always surface, but not having a risk management processes in a project, is a receipt for disaster, therefore risk management is one of the measures of effectiveness of constructions project management.

## CHAPTER 4

### THE SUCCESS OF CONSTRUCTION PROJECT MANAGEMENT

#### IN SOUTH AFRICA

##### 4.1 Introduction

The question that this research proposes to project management in general is why fix something if it's not broken. Chapter 2 of the research identified the traditional of procurement systems in the construction industry that lead to construction project management. Is the traditional system broken for it to be dissolved by the CPM? Looking back in the renaissance era, technology was increasing at a massive speed and countries were attacked by the so called recession. This period was a wake-up call to industry that management of project had to compliment the risk that a project inherits. Companies started losing money and the current traditional system was failing to tackle the constraints. Some form of management had to be introduced to manage the issues at hand. Executives finally began taking a serious look at PM as the solution to some of their management problems to decentralize corporate decision. This was indeed the birth of construction project management but was it the death of traditional system or an improvement of it? This sub problem tries to illustrate the whether CPM is addressing the issues that the TM could not address though literature review; specifically looking at the management, cost, time and overall client satisfaction. It also illustrates whether CPM is working effectively or not in the South African industry by a way of questionnaires analysis.

##### **Major factors that could not be addressed in the renaissance era: (Kerzner: 2007)**

- Clients were facing difficulty in complexity of projects that are sophisticated that required flexible organization approaches.
- The size and scope of projects required the development of management systems for planning and controlling project performance, schedule and cost.
- The accelerated rate of external changes and uncertainty of changes brought required new management approaches that provided rapid internal response capability.
- The concept of total quality management, concurrent engineering, self-directed teams, empowerment and life cycle costing drove long term solution than short-term solutions

## **4.2 Traditional Management Verses Construction Project Management**

### **4.2.1 General management**

In CPM, the project manager manages a project from inception to complete on and the project manger is an employee of the principal. The project manager is appointed to be a project team leader and to bring a businesslike approach into coordination and management of a diverse range of skills and organizations in producing a facility. While in TPM, an architect is appointed on a technical base with the view of managing cost, time and quality only; meaning the architect must manage the overall project as well as the design. According to (Havranek :1999) the technical difference between TPM and CPM is that, TPM was characterized by focusing on cost, schedule and achieving specification; but with CPM there is a broader range of focus like quality, risk management, human resources, leadership, organizational structure, and information system, which enhance cost, time and quality.

The other problem with the traditional system is that, it focuses more on the technicality of the work to be done than cost and time, (Kerzner: 2004) “a good engineer may produce the best products but may not be able to market the product”. The architect is more technical orientated and the probability of the project to achieve quality objectives is high and sideline cost and time. CPM introduces a different of management where the PM is more involved in the different aspects that is a contributor towards success of the project

(Walker: 2007), feedback is the basis of a system’s control function, it is through feedback and subsequent action that achieved outcome can be compared with desired outcomes so that adjustment in behavior of the system can be made. Effective control systems require that the procedure for testing the sample against the objectives be designed with appropriate methods of measurement of the sample against the objectives and importantly with the ability to take action on the basis of feedback information. TPM does not possess this ability as the relationships of contributors, process arranges in such a way that people reporting on the current state of the project visa versa its objectives are not in a position of sufficient authority to ensure that the project returns to its intended course. This is a result when the architect is in both at operational capacity as a designer and also in focal management position for the project.

The structural base of traditional system is that it is reliant on the various professional and trades, normally with this approach the architect will be the client’s representative, his role will involve advising and assisting the client in carrying out the project definition and contracting process. The role also

involves management and execution of design, plus administration, supervision and quality control of the construction contracts.

The structure of CPM also indicates that there is a dynamic link between the client's objectives; time, cost and quality and the management principals, processes and stages of project management. For example the management processes are applied to cost function during a particular stage of the project and the management functions includes scope, time, cost, quality, communication, human resources and risk, look at figure 4.1 The management requirements of the constraints are planning , organizing, execution and monitoring and control which form the management processes in CPM.

#### **4.2.2 Cost management**

Early employment of the construction professional at the earliest planning stages of a project reduces cost in the long run, resulting into early delivery of fewer conflicts and highly quality. Effect of changes on a project has an impact on the cost, but changes cannot be avoided as explained earlier. Proper change management strategies are the solution to reduction of any rise in cost as a result of change, with the help of risk assessment process changes are identified as early and most changes can take place as early as possible with is less expensive than if the change had to be done later on; It would be far less expensive to decide to add extra electrical outlet during the wall framing stage than it would to make the change after the drywall portioning was up and the walls were painted, so the earlier the changes occurs the less cost effective. The golden trick with CPM is that is allows early decision making processes which in turn have a positive effect on the cost and time. The TPM system

#### **4.2.3 Time Management**

Time in construction project is measured in terms of project scheduling method using either, Critical Path Method (CPM) and program evaluation and review techniques (PERT), for the scheduling projects as well as for supporting resources and cost planning. Time is monitored and controlled by detailed schedule breaking each item of work down into its components parts. Once all of the purchasing of material, installation and construction steps have be identified a time element is assigned to each step. The success is to complete each of the work items within the time frame assigned. In TPM time is monitored from cash flow; this is time is technique that involved time and cash flow to indicate the progress of work

#### 4.2.4 Quality management

**Table 2: Changing Views of Quality ,( Nkhabu: 2010)**

| TRADITIONAL MANAGEMENT ERA  | CONSTRUCTION PROJECT MANAGEMENT ERA  |
|---|--|
| <ul style="list-style-type: none"> <li>Quality was the responsibility of blue-collar worker and direct labour employees working on the floor</li> </ul> | <ul style="list-style-type: none"> <li>Quality is everyone's responsibility, including white-collar worker the indirect labour force and the overhead staff</li> </ul> |
| <ul style="list-style-type: none"> <li>Increase in quality lead to the increased project costs</li> </ul>   | <ul style="list-style-type: none"> <li>Improved quality saves money and increases business</li> </ul>  |
| <ul style="list-style-type: none"> <li>Quality is internally focused</li> </ul>   | <ul style="list-style-type: none"> <li>Quality is customer focused</li> </ul>  |
| <ul style="list-style-type: none"> <li>Quality occurred during project execution</li> </ul>   | <ul style="list-style-type: none"> <li>Quality occurs at project initiation and most be planned for within the project</li> </ul>                                      |
| <ul style="list-style-type: none"> <li>Quality lead to blame, faulty justification and excuses</li> </ul>   | <ul style="list-style-type: none"> <li>Quality problems lead to cooperative solution</li> </ul>  |

#### 4.2.5 Clients satisfaction

A project address five basic process: project initiating, planning, controlling, executing and close-out process but life after a project includes option and maintenance process; which TPM ignores and the management wash their hand after close out. The issue here is there is no full customer/ client satisfaction, (Fame: 2002) emphasis that clients satisfaction is achieved even after project close-out. The life cycle extended to encompass one more phase. The objectives time, cost and quality all satisfy technical and business orientation and looking at TPM and the fact that is address technical issues,

because its management system is technically orientated the result of the project out-come on this system will be a project success will be defined in technical terms only. Meaning there issue here will be deviation of clients satisfaction. The skill of CPM are business orientated risk management integration of skills and human resource are how part and parcel of project management.

#### **4.2.6 Planning**

Planning can have a great effect on both the time and cost of project which calls for proper strategic and techniques while planning. Planning can be in a form of milestone to milestone which poses some difficulties when the project has to adopt to changes as changes are an inherent part of any construction project; while life cycle phases allow the flexibility of changes because the different phases lead into another, the first phase is completed and approved and towards the end of it the second phase planning commences and official starts after approval of the first phase; this approach is adopted by the CPM. While in TPM takes the approach of milestone to milestone, which poses failure as explained, this is the case because 15 - 20 percentages of direct labour hours is spent on of planning. In CPM only 8 - 10 percent of the total labour hours are required for planning.

#### **4.3 Short comings of traditional management**

- The one problem in this type of management is that; consultants maintain their work independently, contractors compete for work and specialists struggled to maintain the integrity of their skill and knowledge against market driven demands for lower cost and faster delivery, (Harrison and Lock: 2004) these left clients with no attainment of objectives and to add to that, projects are left with delays, defects, disputes and ineffective approach.
- There is no single point accountability and responsibility for the whole project,
- Overall integration between client, design and construction contractor is weak or missing
- There is an adversary bias behavior because the PM has conflicting interest in the project
- Crisis management is only implemented at the time of the crisis occur and not at hand, the following chapter will elaborate more important of risk management



**4.3.1 Requirements needed for effective use of traditional management strategy, (NPWC/NBCC 1990:14)**

- The design for the project is established without involving the prospective general contractor or subcontractors.
- The clients manages the interface between the detailed design or documentation and construction and selects and engaged the consultants, who are directly responsible to the principal
- The principal requires the consultants to provide advice and monitoring of the project through the design, documentation and construction stages
- The time available for the project is such that the detailed design of the project is completed or may be substantially completed before construction commences
- Few variations to project design are expected to be required during construction.

**4.4 Empirical survey**

**4.4.1 Did the use of construction project management help improve or worsen the attainment of client’s objectives?**

**Table 3: Attainment of various client objectives on construction project management projects, (Nkhabu: 2010)**

| <b>Client’s Objectives</b>      | <b>Improved</b> | <b>Worsened</b> |
|---------------------------------|-----------------|-----------------|
| 1. Cost/ Budget                 | 60%             | 40%             |
| 2. Time                         | 80%             | 20%             |
| 3. Quality                      | 90%             | 10%             |
| 4. Overall Clients Satisfaction | 80%             | 20%             |

**NOTE:** Some of the respondents stated that an improvement in each of these objectives only resulted from proper implementation of CPM. Some clearly stated that these benefits can only result if the project is properly managed - if not controlled and maintained, it could be “chaotic.”

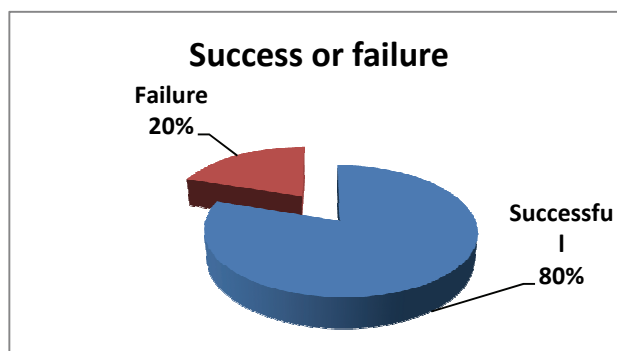
The results of this table are the real determiners of whether the hypothesis is true or not. It also answers the main heading of these treatise as to whether construction project management is effective towards the client’s objectives or not, in the South African construction industry. 90% of the respondents indicated that quality is better improved, 80% improvement of time and other project constraints and cost budget are the least managed. Most respondents did indicate that cost budget is the most difficult element to manage; this could be the case because it is always not sufficient in most projects.

**4.4.2 Were most of your construction projects successful with the involvement of construction project management?**

Yes - 80%

No – 20%

**Figure 7: Outcomes of (success or failures) of most construction project management projects, (Nkhabu: 2010)**



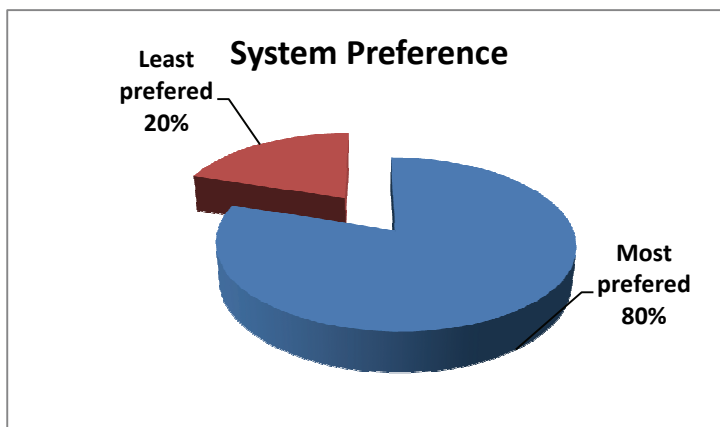
Construction project management is an effective procurement system that can resolve to most constraints.

**4.4.3 Kindly indicate the preferred type of procurement system**

**Table 4: System Preference, (Nkhabu: 2010)**

|                                 |     |
|---------------------------------|-----|
| Traditional System              | 20% |
| Construction Project Management | 80% |

**Figure 8 System Preference, (Nkhabu:2010)**

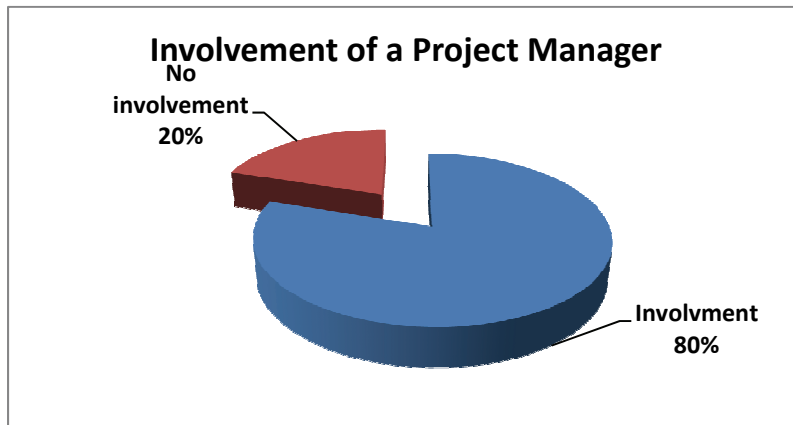


The most preferred project system is construction project management; this confirms the answer to the question of whether CPM is resolving the shortcoming of the traditional system, the answer being yes it is tacking the shortfall of the traditional system because it's the preferred use.

**4.4.4 What was the level of involvement of the Construction Project Manager on your project?**

- High- 80%
- Average- 20%
- Low- 0%

Figure 9 Project manager's involvement,(Nkhabu: 2010)

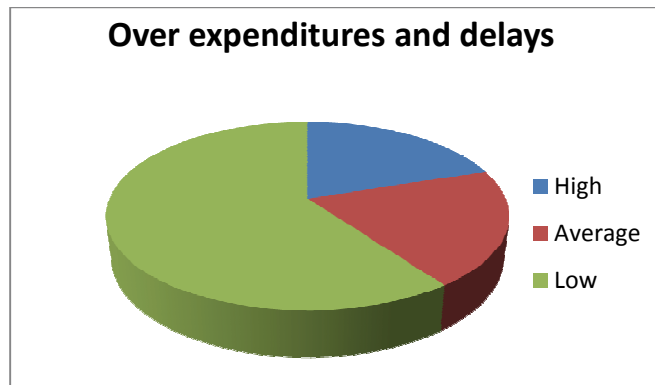


As indicated in figure 9, a large percentage of respondents indicated that they had used CPM in South Africa in the past 5 - 10 years and the involvement of the CPM is higher than expected.

**4.4.5 What was the level of over expenditure and delays in the project?**

- High- 20%
- Average- 20%
- Low- 60%

**Figure 10 Expenditures and Delays, (Nkhabu: 2010)**



The overall project requirements may not be as satisfactory as it will be expected in CPM, but the main objectives are achieved with care. Sometimes a project can run late during the construction period but proper manage skills and functions improve performance.

#### **4.4.6 Please indicate the problems you encountered while using construction project management**

- PM have no design co-ordination
- Their cost is not justifiable in big project where the contractor is well skilled
- In multiple projects where there is only one point of responsibility, therefore it takes long to issue reports because the PM is overloaded.
- PM's do not understand their roles and cannot interpret the construction risk
- PM do not have control over the design team because, their understanding of the construction industry is not sufficient.
- Inability to co-ordinate information in time.
- Failing to approve programme, extension of time and variation orders

#### **4.5 Hypotheses test**

Construction Project Management is an improvement of the traditional system, meaning it does address TPM seatbacks: CPM allows flexibility to changes through planned strategies, table 3 show an improvement of quality, these are seat backs to the TPM. From the empirical survey table 4, most clients prefer CPM than TPM and most projects have improved client's objectives; therefore, yes, CPM has successfully improved client's objective in the South African construction industry.

#### **4.6 Conclusion**

The chapter has highlighted that the old way of management only focused on cost, time and quality as the main objectives but through experience and project failures it was observed that management should include quality management, risk management, human resources, leadership, organizational structure, and information system, which are an efficient way to have CPM discipline at its best. Although this might not be the case on site, but the structure of CPM shows that it is tackling most project constraints and it is in line with today's demands, as opposed to the TPM structure which has little to show in today's industry, but is still suitable on project that do not have the same constraints as today. Though CPM has its shortcomings, the results of the questionnaire indicate that failure of CPM is a result of lack of background knowledge of the project manager.

## CHAPTER 5

### SKILL, FUNCTIONS AND COMPETENCE

#### 5.1 Introduction

As indicated at the beginning, that many projects have succeeded in the past without the project management skills, examples of this being the ancient structure such as the Egypt pyramids, the great wall of China, the templates of Hindus, Greeks and Romans etc. And today these projects serve as examples of human integrity and are unique, and despite all that they were successfully completed without PM skills. This was the case because of the unlimited labour resources that were used and the unlimited time factor, but today time, cost and quality are highly constrained and need extra monitoring and control. Management of time, cost and quality are greatly affected by the project constraints either through external factors or poor management. The real factors affecting the parameters have been identified in the previous chapter. Some of these factors have been explained in the previous chapter but this chapter tries to establish the impact of the constraints on the parameters and to what extent can they cause project disorder; how is construction project management through skills, functions and duties addressing these issues or how has it tried to reduce the impact of risk in these issues for the improvement of the clients objective. As much as construction project management will try to achieve 100% of the client's objectives it can never be 100% because some factors or project constraints are not controllable, but careful monitoring between the scope, quality and cost during the development of the design and construction has shown improvement of project objectives. This part of the research establishes typical construction project constraints and seeks to find whether construction project management skills, functions and competitive knowledge are in line with a typical project demands caused by the constraints.

## 5.2 Project factors on and the parameters

### 5.2.1 Construction project constraints

Project conditions such as construction complexity, importance of timely completion, resource limitation and substantial costs puts great emphasis on planning scheduling and control of construction operations. Even worse, the greater the need for exhaustive project planning, skill the more unremitting management and control is required on the project, budget and time schedules, close management control of field operation is a necessity, CPM should not been seen as a title to a profession, but it should be an identical beneficial skill towards project objectives. The word “management”, relates to planning, organizing, directing and controlling of a business enterprise. Business management includes the management of company’s internal activities like: finances, property, human resources and other resources. Construction project management applies to a given project, the various phases of which usually are accomplished by different organization. Therefore the management of a construction project is not so much a process of managing the internal affairs of a single company as it is one of coordinating and regulating all of the elements needed to accomplish the job at hand, (Sears et al 2008).

Project constraints have a final impact on the final cost and schedule, but how do these factors affect cost or how is the overall project parameters affected by the constraints? Some of the project constraints are controllable and some are uncontrollable. For example scope changes and poor estimates are regarded as internal constraints or project constraints that a project inherits because of poor management and can be controllable though proper management. Some are uncontrollable or they can be explained as constraints not perpetuated by the project, but environmental conditions outside the project itself, e.g. market conditions and site conditions. Regardless of internal or external constraints the job of a project manager is to find corrective ways in eliminating the problem. To be able to achieve this the PM must have effective skills and operational functions to manage.

#### Typical construction project constraints

- Project schedule changes
- Engineering and construction complexity
- Scope changes
- Scope creep
- Poor estimation



- Market condition
- Inflation fluctuations
- Improper issue of information
- Lack of effective decision making
- Unforeseen conditions ( site conditions)
- Labor disputes

#### 5.2.1.1 Poor estimates and cost management

A poor estimate can result from incomplete architect drawings, cost estimator's negligence or poor decision making assumptions of risk related items that may not surface at the time of costing. Information on estimates must be in a form that can be understood checked verified and corrected. The foundation of a good estimate is the formats, procedure and processes used to arrive at the cost, poor estimation also includes general errors and omissions of the building plan and poor performance in planning and estimate procedures and techniques, (NCHRP R 574, 2007).

Poor cost management can result from internal project affairs like lack of construction information can affect the cost objectives. Sometimes the cost is already exceeding the budget; and to manage cost overruns at construction stage require continuous updating of the project plan in the light of the latest information and seeking ways to have cost savings these are signs of successful information gathering effort and project monitoring. If information is not updated this could result into claims from the contractor, which then affects the time scale of a project.

Project scope covers a much wider range of information feedback and which includes at least the time management as well as the implementation of the design to the right level of quality and resources planning for the product delivery. Mostly it leads to project cost escalation; this could be in a form of additions or omissions from a project scope it also leads to delays as more work has to be done than what was planned. The key issue in managing scope is determining the obligations and responsibilities of the project team, (Fewing: 2005).

Normally the QS prepares cost estimates and the PM has a duty of verifying the estimate and ensuring that it is within budget and checks that all risk items that are unforeseen at the time of estimating are included in the estimate.

#### 5.2.1.2 Scope creep

The tendency to accumulate minor scope changes to increase project cost. While individual scope changes have only minimal cost effects, the accumulation of these minor changes which are often not essential to the intended function of the facility can result in significant cost increase over time. The project seems to grow naturally as the project progresses from inception through development to construction. For the PM to manage scope he must fully insure that:

- The scope of the project is currently clear to the project team
- The client must have the same view of the project
- If the scope has an effect on the time or budget corrective measures should be insured

#### 5.2.1.3 Project schedule changes

Extensions caused by budget constraints timing of fund allocation, environmental impact or design challenges can result in unanticipated increases in project overhead and inflation. Project schedule changes can be viewed in terms of time value of money. Two primary components to the issue are the inflation rate and the timing of expenditures; the longer a project takes to complete the more cost it will accrue this is a result of the diminishing real value with time. If the cost of a project is a fixed X amount per year and there is a delay, the project will require more money to complete it. For example government project work on fixed budget therefore time must be well monitored. The schedule must often be adjusted to ensure that project funding is available as needed for all projects and that the construction project period is not exceeded. Estimators frequently do not know what expenditure time adjustments will be made by management or caused by external circumstances; therefore a good estimator will work ahead and include allowances for such circumstances.

### 5.3 Project control

All the constraints explained above have an impact on the project cost, "cost is the least manageable project parameter" (NCHRP R 574, 2007) and mismanagement of it can result in inferior attainment of client's objectives. To be clear on this subject, here is an example showing the interrelation of the three

project parameter, firstly it will be idea to know how increase in cost is affected and where it affects the project.

Change in scope will have a major effect on the cost of a project; this will call for variation orders. For example, misunderstanding on specifications of ceramic tiles will have a direct change in cost on the item ceramic tiles in the bill (not on preliminaries) therefore adjustments on costs will be made.

On the other hand the cost for hiring machinery or electrical connection on site is set against the duration of the contract period, should there be a delay of five more weeks this calls for extra hiring cost or additional electricity required because there will be work needing electricity for extra time on site.

Cost of ceramic tiles= R2, 000,000.00

Under measure = R800, 000.00

Actual cost = R2, 800,000.00

There client will incur an extra cost of R800, 000.00 on the project, and the overall project will have not reached its set objectives. Poor design will affect the cost and time because there will be additional items left out which will have to be added, having a cost implication of the project. On the time factor; there will be more time added to the overall project because the contractor will have to add more time on the schedule to finish whatever is left out.

### 5.3.1 Cost Management

There are three elements that the PM uses to control or to achieve the best results in managing a project cost; time schedule and estimates, progress report, manpower contract cost and they are interrelated. Project control is of most importance, in that it resolves project constraint, which then affects project objectives positively. It is also good for quality, safety, human relations and many other functions which are part of the project plan.

Lack of budget control causes an increase in project costs, which translates into a reduction in the number of projects that can be completed at a given time, (NCHRP R 574, 2007) says budget control successfully needs a disciplined cost estimation and monitoring system must be established as early as possible and can be used continually until a project is constructed. The client employs a quantity surveyor to monitor the cost of the project but the project manager is in charge of controlling the budget. The PM tries to reduce his budget costs by various measures such as economizing the scope of

work by using value analysis techniques and offering incentive to contractors for early completion, which may yield the PM early revenue from project than the originally planned completion time.

Cost management aims to control the project budget and predicts the timing of payments, it is important that budgets set for design and construction stages should be monitored and kept within the cost and cash flow limits sets. (Fewing: 2005) identifies two ways of system control, which are feedback and feed forward that PM uses for competence cost management.

(Loosemore and Uher: 2004) has identified the following benefits to project control:

- (i) Removal of misconceptions about the objectives and policies of projects management
- (ii) Improves interpersonal relationships
- (iii) Improves interaction and cooperation between the various disciplines involved and
- (iv) Improves morale and attitudes leading to increased increases commitment on the project.

Typical feedback system:

- Cost value reconciliation bases on monthly or stage valuations process which measures the level of spending with the value of same priced activities
- Cost centre control, which is a more sophisticated system and allocates all expenditures to a cost by activity.
- Cash flow, which measures the scheduled cost value against time, a curve for the actual value earned according to project valuations, this is called earned value. A reconciled actual expenditure curve which discounts expenditure not yet valued.

#### **5.4 Construction project management skills**

The APM identifies eight characteristics of certified projects manager which are more on a social level than technical. These are; an open positive 'can do' attitude, common sense, open minded, adaptability, inventiveness, prudent risk taker, fairness and commitment. Many of the skills are associated with managing team have been a feature of periodic industry wide reports. From the client's point of view these quality will make the project manger easier to work with, reliable and realists. However, they might want to add 'a' willingness to see those things which are important to their business and adapt the system and parameters of the project to suit. They would also need to have assurance of general

competence and experience especially in dealing with projects that have similar characteristic as their own. (Fewings: 2005) the above will help to provide customer focus and to draw the client into the team. This gives more certainty to the client approval process. Meeting customer requirements means gaining knowledge of the customer's business, sharing problems at an early stage, so that trust is built up and reviewing project goals at regular intervals to ensure that the development of project brief meets the expectation.

In addition to the social skill, in order to fulfill the role and carry out the functions required by project management a project manger needs a demanding range of skills. The skills needed are well expressed by the Construction Industry Council (CIC) and they are on technical prospective than social. The skills are identified in five topic areas and classified as to whether a PM should have competence in a skill or need only to have an awareness of it. CIC skills believes that these skills are of most importance to the PM, the skills identified are self-explanatory and an identification of the skill requires a comprehensive and useful, classifying 'organization' and people skills as requiring only awareness on the part of project management is surely abnormal, (Walker:2007)

**Table 5 Skills Requirements of Project Manager, (CIC, 2001)**

| Strategic                      |   | Project Control           |   |                            |   |                            |   | Technical                 |   |                          |   | Commercial       |   |                           | Organizational & People |                           |   |
|--------------------------------|---|---------------------------|---|----------------------------|---|----------------------------|---|---------------------------|---|--------------------------|---|------------------|---|---------------------------|-------------------------|---------------------------|---|
| Strategic planning             | ■ | Developing a schedule     | ■ | Monitoring                 | ■ | Information management     | ■ | Design management         | ○ | Estimating               | ○ | Business case    | ■ | Marketing and sales       | ○                       | Legal issues              | ○ |
| Value management               | ■ | Managing changes          | ■ | Action planning            | ■ | Client / project interface | ■ | Value engineering         | ○ | Monitoring and testing   | ○ | Financial manage | ■ | Procurement               | ■                       | Organization structure    | ○ |
| Risk management                | ■ | The project control cycle | ■ | Information management     | ■ | Information management     | ■ | Configuration management  | ○ | Configuration management | ○ | Procurement      | ■ | Legal issues              | ○                       | Selection of project team | ○ |
| Quality management             | ■ | Developing a schedule     | ■ | Managing changes           | ■ | Client / project interface | ■ | Business case             | ■ | Configuration management | ○ | Legal issues     | ○ | Organization structure    | ○                       | People issues             | ○ |
| Safety- health and environment | ■ | Monitoring                | ■ | Action planning            | ■ | Information management     | ■ | Marketing and sales       | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| The project control cycle      | ■ | Managing changes          | ■ | Client / project interface | ■ | Information management     | ■ | Financial manage          | ■ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Developing a schedule          | ■ | The project control cycle | ■ | Information management     | ■ | Information management     | ■ | Procurement               | ■ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Monitoring                     | ■ | Managing changes          | ■ | Client / project interface | ■ | Information management     | ■ | Legal issues              | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Managing changes               | ■ | The project control cycle | ■ | Information management     | ■ | Information management     | ■ | Organization structure    | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Action planning                | ■ | Developing a schedule     | ■ | Monitoring                 | ■ | Information management     | ■ | Selection of project team | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Client / project interface     | ■ | Monitoring                | ■ | Action planning            | ■ | Information management     | ■ | People issues             | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Information management         | ■ | Managing changes          | ■ | Client / project interface | ■ | Information management     | ■ | People issues             | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Design management              | ○ | The project control cycle | ■ | Information management     | ■ | Information management     | ■ | People issues             | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Estimating                     | ○ | Developing a schedule     | ■ | Monitoring                 | ■ | Information management     | ■ | People issues             | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Value engineering              | ○ | Managing changes          | ■ | Action planning            | ■ | Information management     | ■ | People issues             | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Monitoring and testing         | ○ | The project control cycle | ■ | Information management     | ■ | Information management     | ■ | People issues             | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Configuration management       | ○ | Monitoring                | ■ | Action planning            | ■ | Information management     | ■ | People issues             | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Business case                  | ■ | Managing changes          | ■ | Client / project interface | ■ | Information management     | ■ | People issues             | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Marketing and sales            | ○ | The project control cycle | ■ | Information management     | ■ | Information management     | ■ | People issues             | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Financial manage               | ■ | Developing a schedule     | ■ | Monitoring                 | ■ | Information management     | ■ | People issues             | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Procurement                    | ■ | Managing changes          | ■ | Action planning            | ■ | Information management     | ■ | People issues             | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Legal issues                   | ○ | The project control cycle | ■ | Information management     | ■ | Information management     | ■ | People issues             | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Organization structure         | ○ | Monitoring                | ■ | Action planning            | ■ | Information management     | ■ | People issues             | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| Selection of project team      | ○ | Managing changes          | ■ | Client / project interface | ■ | Information management     | ■ | People issues             | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |
| People issues                  | ○ | The project control cycle | ■ | Information management     | ■ | Information management     | ■ | People issues             | ○ | Configuration management | ○ | Legal issues     | ○ | Selection of project team | ○                       | People issues             | ○ |

**Key**

|            |   |
|------------|---|
| Competence | ■ |
| Awareness  | ○ |

**5.4.1 Minimum competences required and recognized by the (SACPCMP, 2006) guide are as follows:**

**5.4.1.1 Technical Competencies**

Knowledge of construction science

- Understanding Structures
- Understanding Construction and Building Science
- Understanding Construction and Building Finishes
- Knowledge of building material

**5.4.1.2 Knowledge of construction science**

- Site, plant and equipment
- Formwork systems
- Quality management
- Health and Safety Management

**5.4.1.3 Knowledge of the design processes**

- Sequence of design processes
- Time required for design processes

**5.4.1.4 Knowledge of financial and cost factors**

- Financial processes
- Cost of construction

**5.4.1.5 Project management competence**

As principal consultant the CPM should have the knowledge and Ability to:

- Facilitate the development of a clear brief
- Clearly define the roles and responsibilities of the consulting team
- Co-ordinate and monitor cost control by cost consultant
- Co-ordinate and monitor the preparation of procurement documentation
- Facilitate the preparation of all conditions of contracts
- Facilitate and monitor the preparation of the Health and Safety specifications

#### **5.4.1.6 Manage the pre-qualification, tendering, adjudication recommendation and appointment processes.**

#### **5.4.1.7 Must have the ability to:**

- Knowledge and understanding of the Basic Principles of Law of Contracts
- The ability to establish and implement Time Management Processes on contracts with respect to and not limited to the following;
  - i) Agree and monitor contract programme and working programmes
  - ii) Monitor and review construction progress and programme updates

#### **5.4.1.8 Selection criteria of a CPM**

Assessment on selection of a construction project manager in South Africa is based on the body of knowledge, experience, (Continuing Professional Development) CPD and other development within the Built Environment, (SACPCMP, 2006). When (SACPCMP, 2006) selects a consultant competent for CPM services, it recognized Voluntary Association as per section 25 in determination of competency standards in terms of section 13. On public projects the minister pays particular attention to both theoretical and practical experience on selection of appropriate company to provide project management services. With Individual qualification, a person without any University or Technikon qualification but with 8 year experience in CPM can apply for registration, according to (SACPCMP, 2006) which might not be the right approach because the individual has no knowledge framework and makes incompetent professionals.

#### **5.4.1.9 The skills and functions of a CPM**

##### **(Functions of Project Management (Loosemore and Uher: 2004))**

##### **i) Establishment of the clients objectives and priorities**

According to (Loosemore and Uher: 2004) of project management, this activity takes place during the conceptual stages. The role of the project manager is to advise the client on the viability of the proposed development strategy within a context of economic, environmental and social influence and on the attractiveness of potential alternatives. This stage enable the PM to provide informed advice upon the alternative construction strategies available and so provide the basis for the developing an appropriate brief for the project. This process leads to the client's establishment of appropriate objectives and priorities, according to (SACPCMP, 2006)



this services as the first stages of the guidelines and the major deliverable from this is the project brief procurement policy to employ competent consultants.

**ii) Design of a project organization structure**

Here the role of the PM is to assist the client in defining the most appropriate organization structure for a project. In design a project organization structure, the paramount factor is the client's objectives. If time was the critical objective a project structure would commonly embrace some form of fast-tracking? In the (SACPCMP, 2006) guide, this is the third service provided by the CPM which involves management, co-ordination and integration of the design by the consultants in a sequence to suit the project design, documentation programme and quality requirements. The major deliverables in this process are detailed design and documentation programme and updated indicative construction programme.

**iii) Some clients want to be directly involved in a project team while others prefer to be represented by a consultant such as the architect of the project manager.**

Past experience has shown that partnering projects suggest that direct involvement of the client on a project team is beneficial in the facilitating open communication and speedily resolving of issues or problems. If the client is involved the project brief will be easily grasped by the team members, therefore no extra cost of re-briefing will be incurred. The project manager's task is to persuade the client to integrate activity into the project team. The PM must ensure that the client responds to the need to integrate with the project team. This will take place at a formal level through meetings but the PM should seek to ensure that discussions and the need for those decisions are passed through the appropriate channels of the client's organization. This will require the PM to adopt a position close to the client's organizations and it is important for the transmission of the information to the client and for the project manager to sense and follow up any changes in the environmental context of the client's organization than may affect the project. (Walker: 2007)

**iv) Establishment of appropriate information and communication**

Feedback conveys information to responsible centers pertaining to their performance and its implication on assigned goals. It may reveal what was achieved what was targeted for ac

caused these deviations and what are the remedial courses of action possible. Feedback can be communicated in many ways. It can be transmitted verbally in the form of brief feedback report or briefings during regular planning meetings. In these planning meetings, the PM may highlight deviations in the planned performance and stresses the subsequent performance target. Where considered necessary, minutes of formal planning meetings can be recorded and distributed to all concerned. As far as possible, writing lengthy memoranda and notes should be avoided. It is important that feedback is given in time as delayed feedback may not serve the purpose. Timely feedback creates prompt awareness and enables initiation of timely remedial actions, with the right feedback the site contractor or the quantity surveyor can analyze their performance and take remedial measures where necessary, all team members need feedback to effect improvements of the project. It is unfortunate that at some sites, executives rarely come to know of their performance because of lack of monitoring or non-appreciation of the importance of feedback. It is difficult to change the behavior of people but the feedback does effect changes in behavior of the recipient with the least cost. (Chitkare: 2009)

**v) Advice on the selection and appointment of the contributor to the project and establishment of their terms of reference**

Assuming that the client has already appointed the PM on terms and conditions mutually acceptable, the client will then proceed to select other project team member. This commonly done by the client in consultation with the PM. Alternatively, the experienced client may feel confident to choose the team member without the PM's inputs. However the team members may have been selected, a crucial issue that the PM needs to pursue with the client is a careful definition of the terms of their appointment, particularly with regard to authority responsibility and communication. All team members should be informed of the role of the PM and the PM's authority.

**vi) Monitoring and controlling the work at different stages of the project lifecycle**

The PM's role is to develop a project strategy followed by its close monitoring and control to ensure that the plan is adhered to. The PM is responsible for taking appropriate action to ensure that the project proceeds to plan. The PM should be prepared to advise the client of its requirements if it cannot be met or if an alternative strategy to that contained in the brief emerges as more appropriate to the client's needs. The PM will be activating the feedback loops built into the process and measuring progress against the project's objectives, monitoring

the project's environment and responding as necessary. The PM will not be concerned only with the state of the project's development at the time as feedback sample is taken but must also be concerned with forecasting events in the future to anticipate potential problems and attempt to resolve them before they arrive. Clients generally do not feel that they are well informed about their project and the responsibility for this lies with the PM. Therefore client's involvement must be a priority in a project as previously discusses, the PM should keep the client formally update on the forecasts of the project team's performance so that action can be taken by the client in advance of the forecast event that may affect its organization, e.g. delay in completion of the project.

The individual tasks performed by the PM will vary from project to project but the types of tasks over which the PM will have to exercise control and co-ordinate are broadly

Summarized by (Walker: 2007), these are the areas the need close look at when exercising control:

- Land acquisition
- Applications for planning consent
- Outline of design strategies
- Budget and investment strategies
- Advice on finance, taxation and grants
- Detailed design
- Design cost control
- Disposal of the completed facility strategies
- Contractual arrangements proposals
- Appointment of most project team members including the contractor and subcontractor
- Cost control during construction

**Table 6 Link Between Strategies and Cost Escalation Factors in The Planning Phase, (NCHRP R 574, 2007)**

|                             |  | Strategies |                    |                  |      |                          |                  |                  |           |
|-----------------------------|--|------------|--------------------|------------------|------|--------------------------|------------------|------------------|-----------|
|                             |  | Management | Scope and Schedule | Off-Prism issues | Risk | Delivery and Procurement | Document Quality | Estimate Quality | Integrity |
| Section                     |  |            |                    |                  |      |                          |                  |                  | ✓         |
| Internal                    | Bias                                       | ✓          |                    |                  | ✓    | ✓                        |                  |                  |           |
|                             | Delivery and Procurement Approach          | ✓          | ✓                  | ✓                | ✓    |                          |                  | ✓                |           |
|                             | Project Schedule Changes                   | ✓          | ✓                  |                  | ✓    |                          | ✓                | ✓                |           |
|                             | Engineering and Construction Complexities  | ✓          | ✓                  | ✓                | ✓    |                          | ✓                |                  |           |
|                             | Scope Changes                              | ✓          | ✓                  | ✓                | ✓    |                          | ✓                |                  |           |
|                             | Scope creep                                | ✓          | ✓                  |                  |      |                          | ✓                | ✓                |           |
|                             | Poor Estimation                            | ✓          | ✓                  |                  | ✓    |                          | ✓                | ✓                | ✓         |
|                             | Inconsistence Application of Contingencies |            |                    |                  |      |                          |                  |                  |           |
|                             | Faulty Execution                           |            |                    |                  |      |                          |                  |                  |           |
|                             | Ambiguous Contractor Provisions            |            |                    |                  |      |                          |                  |                  |           |
| Contract Document Conflicts |  |            |                    |                  |      |                          |                  |                  |           |
| External                    | Local Concerns and Requirements            | ✓          | ✓                  | ✓                | ✓    |                          |                  |                  | ✓         |
|                             | Effect of Inflation                        |            | ✓                  | ✓                |      |                          |                  | ✓                | ✓         |
|                             | Scope Changes                              | ✓          | ✓                  | ✓                | ✓    |                          | ✓                |                  |           |
|                             | Scope Creep                                | ✓          | ✓                  | ✓                |      |                          | ✓                |                  |           |
|                             | Market Conditions                          | ✓          | ✓                  |                  | ✓    | ✓                        |                  | ✓                |           |
|                             | Unforeseen Events                          |            |                    |                  | ✓    |                          |                  |                  |           |
|                             | Unforeseen Conditions                      |            |                    |                  | ✓    |                          |                  | ✓                |           |

Table 5.2 provides a link and quick reference between project constraints and CPM strategies addressing them. The table can be used to select appropriate strategies when systematic project constraints found

in an agency from the application of the strategies, these strategies address cost escalation issues that arise early in the planning phase. All the strategies can address at least a portion of the cost escalation factors in the earliest development phases. The management, scope and schedule, off prism issues and risk strategies can and should be applied in the early stages of planning and continued throughout the project development process. The integrity strategy is also important in dealing with bias that can occur when projects are being developed without a definitive scope. The delivery and procurement strategy is only applied on those projects in which early decisions about procurement methods will be made. These strategies are not applicable during planning phase. The document quality and estimation quality strategies have less impact during planning phase than in the later phases of the project development process. However, these strategies can begin to be applied, particularly when consultants are being used, it's often the case to develop concept and related cost estimates. The faulty execution cost escalation factors are not considered an issue during planning phase.

- **Management Strategy**

Manage the estimate process and cost through all stages of the project development. A PM has the responsibility to issue the client a clear indication on how the project development process works and most importantly the responsibility of ensuring that cost estimation practice and cost estimation management processes are working. The PM must have good knowledge of cost estimates in order to interpret the information from the quantity surveyor and to be able to approve estimates, time schedules or cost estimates.

### **Scope and Schedule Strategy**

Formulate definitive processes for controlling project scope and schedule change. Scope control ensures that project changes are identified, evaluated, coordinated, and controlled reviewed, approved and documented. Scope control required that the proposed scope of a project be continually evaluated against the essential functions necessary to accomplish its intended purpose. Project often takes years to move through the development process. As the time frame is extended, there are more opportunities for external and internal parties to suggest changes in scope. Additionally, if the schedule is extended, cost impacts will result from increase in land costs and inflation effects. The cost effect of change depends on the point in time when it is introduced. Early in project development before estimations are prepared a change in scope does not cause significant problems. Scope changes during the later stages of engineering design and construction have ripple effects and can increase project cost exponentially.

- **Off- Prism Strategy**

Use proactive method for engaging external participants and assessing the macro environmental conditions that can influence project cost. In the case of most projects, engineering focus on technical solutions with little attention to community interest or concerns and often fail to recognize market and macroeconomic change.

- **Risk Analysis**

Agencies should estimate base amounts separately from risk and contingency costs. Understanding the associated with the project and having a clear definition of contingency coverage is very important. The definition of contingency helps in understanding what is or is not covered in the contingency amounts included in the planning level cost estimates and can aid in managing.

### **5.5 Hypotheses test**

There should be a linkage because the techniques and strategies of management for effective mitigation: table 5.2 Indicates that CPM principals and management services to be in line with the project constraints, therefore there is a linkage of the management skill and what has to be managed. Unlike the traditional system where the architect had knowledge on technical issues but could not interpret cost overruns and delays.

### **5.6 Conclusion**

The construction projects are highly fragmented with constraints and the more the demands the constraints but the better management skills and function. The chapter has highlighted that, poor estimates and scope changes require corrective actions and good management control as they occur. Corrective action and management needs continuous updating, monitoring and feedback on the constraints. In essence, the PM functions and skills must instill a lot of strategic planning and monitoring techniques in them. The characteristic of a project needs a management system that integrates and controls the work across different stages of the project lifecycle.

## CHAPTER 6

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 6.1 Summary

The following conclusions are based on the insights gained by the author from the literature review and the analysis of the research survey.

The literature review highlighted the following:

The following conclusions are based on the insights gained by the author from the literature review and the analysis of the research survey.

The literature review highlighted the following:

- Management in construction is solely driven by project constraints and the more complex the client's needs the more strategic the management system that has to be enforced. The selection of an appropriate building procurement system contributes to the achievement of the client's objectives in terms of time, cost and quality. Although there is no better procurement system when the systems are compared, management systems seem to resolve most critical issues of the clients better than conventional systems. The technical complexity, time reductions and fewer cost overruns are managed efficiently in management than other systems.
- If there are two conflicting objectives in a project there will be no attainment of client's objectives; if the contractor's objective is to make a high profit and the client's objectives is to spent less, clearly there is conflict. The choice of some procurement systems inflicts this conflict in their management strategy. Like design and built, the contractor manages the entire project and in the process the contractors objectives are put before the clients objectives, at the same time, some clients concerns are not on time and budget but are more concerned in completing the work without much involvement and prefer to use this strategy, therefore there is no better strategy, the strategy depends on the client's requirements.
- CPM was not implemented to face out other procurement systems. Risk management and other management strategies are a good illustration of this. The same management process in the conventional methods still applies in construction project management and the systems have similar characteristic but their objectives are different. The difference is with the additional services that CPM has to overcome the weakness of the TPM.

- Competition is increasing; the market is fluctuating therefore risk is increasing and the more protective allowance that need to be done. Through case studies it was discovered that in this era no projects will prosper without any risk assessment and mitigation done before hand. Failure without proper drastically if no risk assessment and elimination is done on a project before hand; project fail without.
- Construction project management is successful today as compared with other procurement systems because it addresses the complexity of today's projects requirements and design; it also runs parallel with the advanced technology which forces public sector departments and private sectors to be more productive. This calls for strategic management ethics on projects. Many dynamic projects have succeeded without project management simple because there were no time and cost limitations but today this parameter determines the success of a project and construction project management priorities on these objectives.
- The intense management strategies of the management system will also determine success of a project. Most management systems do not address the project constraints and for a system to be successful it must address the natural causes of failure; construction project management uses risk management as a tool that tries to address the natural project failure by eliminating them through corrective measures; this might not eliminate the risk entirely but a project that under goes a risk assessment will definitely reduce the risk to a great extent. Risk management proves that construction project management is effective towards client's objectives because of its management content. Project and their constraints require a lot of changes as the changes occur in all angles of a project; and the advantage with using construction project management is; the management process allows change as the construction progress; this includes strategies that allow a particular constraint to be addressed as it occurs. Change control management eliminating the risk therefore it improves cost reductions and time scales, therefore having a great influence on cost overruns and delays. Again if it was not for the complexity and advanced technologies that world is revolving around today, there would not be much risk that today's projects undergo; therefore there would not be a need for risk assessment that construction project management seem to use as a help tool, which concluded that construction project management is a success of today problems.



- The measure of project management is massive in that it is not only used in the construction industry, but in all South African business sectors and surprisingly succeeding when implemented.
- Any management skill, functions and roles must be modeled around the success requirements needed to achieve the objectives and also the mitigation requirement needed to waiving off the constraints; otherwise any professional will claim capable in managing a project without having the necessary skills, which is a result of failure of conventional system. Cost is seen as the most uncontrollable parameter in most projects and for that it requires careful control measures and it must take first priority, such a parameter will demand scope and schedule management; risk management and construction project management.
- The research found that there is a linkage between the construction project management strategies and constraints that a project inherits, again making construction project management an effective achiever of the client's objectives.

Survey used to test the theory and conclusions developed in the literature survey. The results of the survey indicated the following:

- Most clients preferred the use of construction project management on their project.
- Construction project management proved to be improving the cost and time mostly and tackling the project constraints.
- It is the most used procurement strategy and most buildings in South Africa have been constructed using it.

#### **6.4 Conclusions**

Based on the above literature review and survey analysis it could be concluded that the hypothesis stated that, "construction project management is an effective services towards the client's objectives," was proved

#### **6.5 Recommendations**

Based on the findings of the treatise, the following recommendations were made:

- Project managers need to put corrective management strategies that construction project management imposes in order to achieve success in their projects. And they need to be industry orientated to achieve the best results.
- The construction industry in South Africa needs to encourage more institutional knowledge in project management, because project managers lack background knowledge of the discipline.
- Clients should start to make more use of construction project management as it is beneficial to cost and time reductions.
- On commencement of the project the client's must assess their requirements in relation to the procurement strategy before hand, to choose the compatible strategy to their objectives.
- Clear communication needs to be enforced from the commencement of the project to completion stages.
- Roles of the role player need to be clearly defined to avoid misunderstandings.

It is recommended that the research needs to further explore the following:

- A comparative analysis must be done on a project with construction project management strategies and a project without these strategies.
- The success measures of a construction project.
- A survey research on the projects that have succeeded and those that failed using construction project management.
- A comparative analysis of the type of procurement system that the constructor prefers.

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*Appendix A*

*Questionnaire*

**CONSTRUCTION PROJECT MANANAGEMENT**

**ATTAINING CLIENT'S OBJECTIVES**

**QUESTIONNAIRE**

**AUGUST 2010**

## **EMPLOYEE SATISFACTION QUESTIONNAIRE**

### **INTRODUCTION**

This questionnaire is aimed at determining the effectiveness and extent to which construction project management is used in South Africa construction industry

Kindly complete the questionnaire carefully and send the completed questionnaire

**To:**

**Attention:** Liteboho Nkhabu

**Fax:** 079 478 2457

**E-Mail:** [mehery2001@yahoo.co.uk](mailto:mehery2001@yahoo.co.uk)

**NOTE: THE QUESTIONNAIRE CONSIST OF ONE SECTION**

**SECTION A MUST BE COMPLETED BY ALL RESPONDENTS**

**THANK YOU**

## SECTION A

### 1.1 What is your occupation regarding the building construction industry

- Practicing Built Environment Professional
- Client / Developer
- Other, please specify

### 2.1 What is your professional background?

- Construction Manager
- Construction Project Manager
- Architect
- Quantity Surveyor
- Civil and / or Structural Engineer
- Other, please specify:

### 3.1 Did the use of construction project management help improve or worsen the attainment of client's objectives?

| Client's Objectives             | Improved | Worsened |
|---------------------------------|----------|----------|
| 1. Cost/ Budget                 |          |          |
| 2. Time                         |          |          |
| 3. Quality                      |          |          |
| 4. Overall Clients Satisfaction |          |          |

**4.1 What was the level of involvement of the Construction Project Manager on your projects?**

- High
- Average
- Low

**5.1 Kindly indicate the preferred type of procurement system**

|                                 |  |
|---------------------------------|--|
| Traditional System              |  |
| Construction Project Management |  |

**6.1 What was the level of the project manager involvement in the project?**

**7.1 What was the level of over expenditure and delays in the project?**

- High
- Average
- Low

**8.1 Please indicate the problems you encountered in using Construction Project Management.**

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## ***Appendix B***

### ***Analysis of survey results***

A comprehension questionnaire was compiled and distributed to four major clients that have been involved in the use of the CPM services. Part of the questionnaire contribution was from clients and part of it was from ordinary construction professionals in the Gauteng region of South Africa.

Client rectifies as clients were:

- (i) The Department Of Public work Roads and Transportation: Gauteng
- (ii) IDT Pretoria
- (iii) Department of Health: Gauteng
- (iv) Tau pride Project Developers: Gauteng

#### **DISTRIBUTION AND RESPONSE:**

Total Number of Questionnaires Distributed: 50

Total Number of respondents: 20

## SECTION A

### 1.1 What is your occupation regarding the building construction industry

- 76 % - Practicing Built Environment Professional
- 22% - Client / Developer
- 2% - Other, please specify

### 2.1 What is your professional background?

- 0% - Construction Manager
- 32% - Construction Project Manager
- 4% - Architect
- 62% - Quantity Surveyor
- 2% - Civil and / or Structural Engineer
- 0% - Other, please specify:

### 3.1 Did the use of construction project management help improve or worsen the attainment of client's objectives?

**Table 1: Attainment of various client objectives on construction project management projects**

| Client's Objectives             | Improved | Worsened |
|---------------------------------|----------|----------|
| 1. Cost/ Budget                 | 60%      | 40%      |
| 2. Time                         | 80%      | 20%      |
| 3. Quality                      | 90%      | 10%      |
| 4. Overall Clients Satisfaction | 80%      | 20%      |

**NOTE:** Some of the respondents stated that an improvement in each of these objectives only resulted from proper implementation of CPM. Some clearly stated that these benefits can only result if the project is properly managed - if not controlled and maintained, it could be “chaotic.”

The results of this table are the real determiners of whether the hypothesis is true or not. It also answers the main heading of this treatise as to whether construction project management is effective towards the client’s objectives or not in the South African construction industry. 90% of the respondents indicated that quality is better improved, 80% improvements of time while other project constraints and cost budget were found to be the least managed. Most respondents did indicate that cost budget is the most difficult element to manage; this could be the case because it is never sufficient in most projects.

**4.1 Were most of your construction projects successful with the involvement of construction project management?**

- Yes - 80%
- No – 20%

**Figure 1: Outcomes of (success or failures) of most construction project management projects**



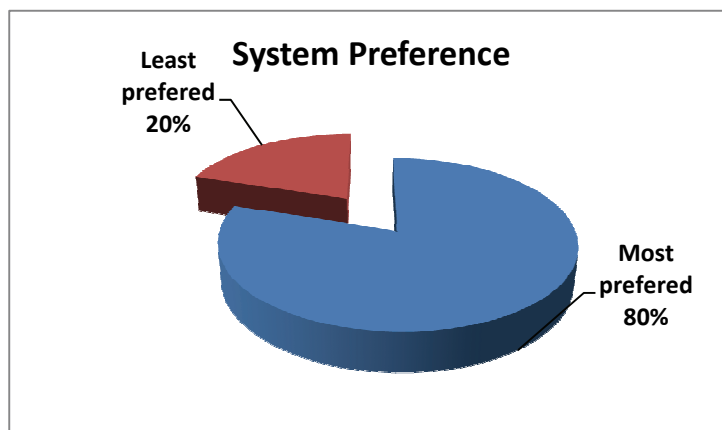
Construction project management is an effective procurement system and it can be applied to resolve most project constraints.

### 5.1 Kindly indicate the preferred type of procurement system

**Table 2: System Preference**

|                                 |     |
|---------------------------------|-----|
| Traditional System              | 20% |
| Construction Project Management | 80% |

**Figure 2 System Preference**

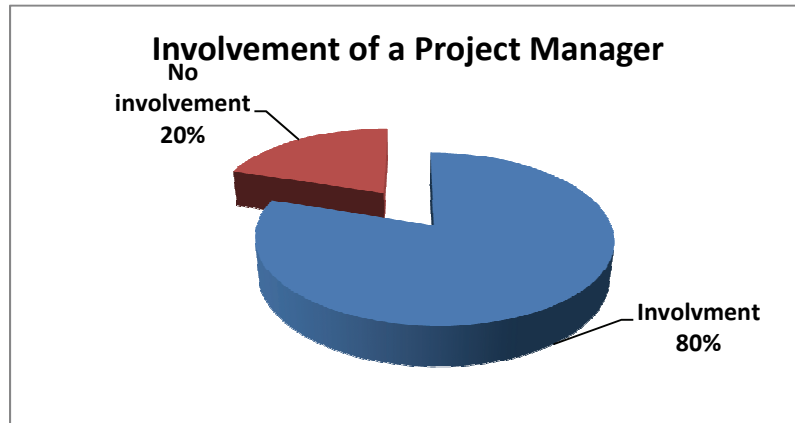


The most preferred project system is construction project management; this confirms the answer to the question of whether CPM is resolving the shortcoming of the traditional system, the answer being yes it is tacking the shortfall of the traditional system; its efficient use is an indication of its usefulness.

**What was the level of involvement of the Construction Project Manager on your project?**

- High- 80%
- Average- 20%
- Low- 0%

**Figure 3 Project manager's involvement**

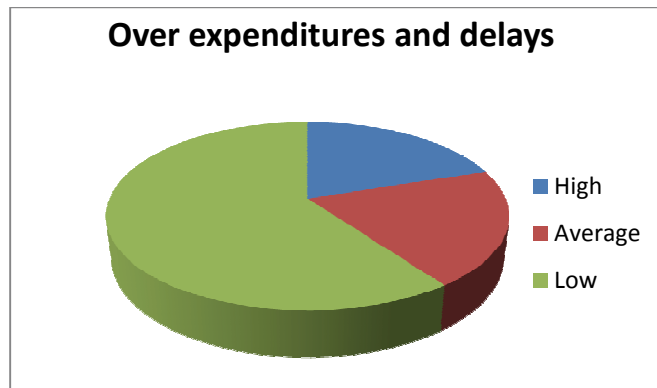


As indicated in figure 3, a large percentage of respondents indicated that they had used CPM in South Africa in the past 5 - 10 years and the involvement of the CPM is higher than expected.

**7.1 What was the level of over expenditure and delays in the project?**

- High- 20%
- Average- 20%
- Low- 60%

**Figure 4 Expenditures and Delays**



The overall project requirements may not be as satisfactory as it will be expected in CPM, but the main objectives are achieved with care. Sometimes a project can run late during the construction period but proper manage skills and functions improve performance.

**8.1 Please indicate the problems you encountered while using construction project management**

- PM have no design co-ordination
- Their cost is not justifiable in big project where the contractor is well skilled
- In multiple projects where there is only one point of responsibility, therefore it takes long to issue reports because the PM is overloaded.
- PM's do not understand their roles and cannot interpret the construction risk
- PM do not have control over the design team because, their understanding of the construction industry is not sufficient.
- Inability to co-ordinate information in time.
- Failing to approve programme, extension of time and variation orde