

**WHICH CONSULTANT AS PRINCIPAL AGENT  
CAN CONTRIBUTE THE MOST TO THE COST  
EFFECTIVENESS OF A BUILDING PROJECT?**

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MOST TO THE COST EFFECTIVENESS OF A BUILDING PROJECT?**

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STUDY LEADER: MR. J.H. CRUYWAGEN

**OCTOBER 2009**

## **DECLARATION BY STUDENT**

I, the undersigned, hereby confirm that the attached treatise is my own work and that any sources are adequately acknowledged in the text and listed in the bibliography.

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Signature of acceptance and confirmation by student

## **ABSTRACT**

Title of treatise : Which consultant as principal agent can contribute the most to the cost effectiveness of a building project?

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For a client to decide which consultant in the professional team of a construction project will be the best equipped for the role as principal agent, it is necessary to compare the different constraints that may influence each consultant when fulfilling this role.

Time, cost and quality are the main constraints that have an influence on any construction project. The objective of this treatise is to identify which consultant will be able to control these constraints to create a cost effective project for the client. The different constraints are investigated to evaluate the importance of each consultant's role in terms of these constraints. Thus arriving at a conclusion, which will help clients to appoint the most suitable consultant for the role as principal agent.

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# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

Throughout the years it has become the custom to appoint architects to act as principal agents on most of the construction projects. The rationale behind the assumption that architects will be the most suitable candidate for the job, is a historic custom that has never openly been proved or disproved.

There are different consultants that will be able of fulfilling the role as principal agent. They are the architect, the quantity surveyor, the project manager and the engineer. Of all these consultants, it must surely be possible to appoint a candidate, other than the architect, that is as suitable or more effective to manage the project more smoothly and efficiently. To make a statement like this necessitates an investigation in which the criteria will be decided in order to judge which consultant is the most suitable.

The most important criteria that need to be investigated are represented in the project triangle: time (T), cost (C) and quality (Q).

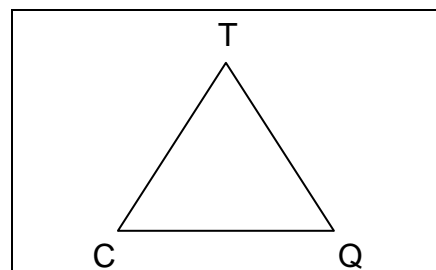


FIGURE 1: The Project Triangle

(Source: Own)



The project triangle is a model of the constraints of project management. It is often used to illustrate that project management success is measured by the project team's ability to manage the project, so that the expected results are produced while managing time and cost. (www.answers.com, March 2009)

**Time:** It is important to know that time has an influence on basically all the aspects of the construction process. If the construction period is too short, contractors won't be able to complete the process on time and thus need to pay penalties or rush their work to finish in time and thus doing unsatisfactory jobs that may not be of the requested standards. Other time related problems can occur, e.g. with the ordering of material, the loss of rent and interest on loans getting out of hand.

**Cost:** Without a proper budget reflecting the performance indicators, the client won't ever take on the project. Thus it is important for the project to stay within the budget. It is necessary to make sure that all aspects of the project don't exceed their approved costs. If cost overruns do occur, the relevant parties would be held responsible for the recovery of those funds.

**Quality:** For the client to be fully impressed and satisfied with a project, it is important to ensure good quality throughout. The different parties that are responsible for the different stages and phases should ensure that their area's quality is at a satisfying level. It doesn't pay to cut down on quality to save on costs, because it is possible that it will only result in extra costs to rectify it. During the last two years at least three sections of buildings collapsed just in South Africa. The question was asked whether the reasons could relate to poor artisanship or poor quality.

From the project triangle's point of view, it would be possible to evaluate the ability of the different consultants to manage each of the elements in the project triangle.

Each consultant's training at tertiary level focuses on different phases of the construction process. No specific training for a consultant is needed for that consultant to act as principal agent, thus allowing any consultant to fulfil this duty. The problem with this is that no consultant gets trained with the mindset to be a principal agent. It is possible to transfer general management skills but none of the curricula of the consultants' training is aimed to capacitate them with the skills that are needed to be principal agent.

This shows the big gap in the built environment for educating the different consultants, or at least the most favorable consultant, to act as a professional principal agent. Surely there are specific skills that can be transferred to the consultant to make him/her be a better principal agent. This research is an attempt to enlighten these factors to help to improve the built environment.

## **1.2 Main problem**

Which consultant as principal agent can contribute the most to the cost effectiveness of a building project?

### **Hypothesis:**

The quantity surveyor, with his training in cost management, which includes time and quality management, will be the best candidate to act as principal agent.

### 1.3 Sub-problems

1.3.1 What is the main role of the principal agent in the project?

**Hypothesis:**

The principal agent's main role is managing the complete project, making sure that all the relevant parties know exactly what is expected. As representative of the client, the principal agent needs to make decisions regarding immediate problems arising on site.

1.3.2 Which consultant as principal agent would manage time the best?

**Hypothesis:**

Out of a fully representative professional team, the project manager is the best qualified to oversee a construction programme and ensuring that specific tasks happen at the correct time.

1.3.3 Which consultant as principal agent would manage cost the best?

**Hypothesis:**

The quantity surveyor will, with his experience and training as a cost consultant, and knowing what a project will cost at a certain time, as well as to project cost for the future, be the best principal agent.

1.3.4 Which consultant as principal agent would manage quality the best?

**Hypothesis:**

The architect is the consultant who designs the project and prepares the specification, and the professional who sells the idea to the client. The architect will be the only one that can comment if he/she is satisfied with the quality of the project.

## 1.4 Delimitations

Seeing that it isn't only in the built environment that a principal agent is used, it is necessary to narrow down the research field to make it a more relevant study. Thus for thoroughness, research will only be done on construction industry projects. Note also that it is bound to projects within South Africa. Although it would be necessary to use additional information of studies that was done outside of South Africa.

## 1.5 Definition of Terms

The following definitions are taken out of the Government Gazette Nr 31429 of 19 September 2008.

**"Built Environment"** refers to the functional area in which registered persons practice. The Built Environment includes all structures that are planned and/or erected above or underground, as well as the land utilized for the purpose and supporting infrastructure.

**"Construction Management"** is the management of the physical construction process within the built environment and includes the co-ordination, administration, and management of resources. The Construction Manager is the one point of responsibility in this regard.

**"Construction Programme"** is the programme for the works indicating the logic sequence and duration of all activities to be completed by the contractors, subcontractors, and suppliers, in appropriate detail, for the monitoring of progress of the works.

**"Contractor"** means any person or legal entity entering into contract with the client for the execution of the works or part thereof.

**"Cost Consultant"** means the person or entity appointed by the client to establish and agree all budgets and implement and manage the necessary cost control on the project.

**"Principal Agent"** means the person or entity appointed by the client to manage or administer the services of all other consultants.

**"Works"** means the work that needs to be done within the project scope.

## **1.6 Abbreviations**

**"JBCC"** is the abbreviation for the Joint Building Contracts Committee

**"CPAP"** is the abbreviation for Contract Price Adjustment Provision

## **1.7 Importance of the study**

Throughout the built environment, it seems that there is an unwritten rule that the architect should act as the principal agent. When considering the different aspects concerning the responsibilities of the principal agent, it should be possible that there may be another consultant who will fit the requirements better.

This study can assist to make it clearer for the clients in the construction industry to appoint a more suitable candidate for the job as principal agent, who may save him/her money and get the job completed in the timeframe that was decided upon.

When the most suitable candidate is identified, it may be possible for tertiary institutions to implement more theoretical knowledge regarding the criteria for being a principal agent, in their courses.

## **1.8 Research Methodology**

The research methodology would be done through extensive research on the internet and different literature studies. It will be possible to gather enough information to come to the conclusion of who will be the most effective principal agent. If necessary, personal interviews with the consultants will be held to establish their views in this matter.

## CHAPTER 2

### PRINCIPAL AGENT'S MAIN ROLE IN A PROJECT

#### 2.1 Introduction

In the Series 2000 of the JBCC Principal Building Agreement, the term principal agent is defined as follows: “the party named in the contract data and/or appointed by the employer with full authority and obligation to act in terms of the agreement.” It also states that the principal agent will be the only party having the authority to legally bind the employer. The only exception to this rule is where the principal agent delegates some of his authority to other members of the professional team.

According to Finsen (2005:44) the employer is represented by a principal agent on whom nearly all of the employer's rights and obligations devolve. He states the following: “the employer retains the fundamental right to have the building built for himself, and the fundamental obligation to pay for it. The agent acquires the right, *inter alia*, to order additional work, to extend time for completion and to approve or reject work, and the obligation to certify completion and to certify payments from time to time.” (Finsen, 2005:44)

The principal agent's duties are linked to the following processes in the building project:

- Compiling of documents
- Appointing employer's agents
- Determining risk and setting up insurances
- Preparation for and execution of the works
- Coordinating nominated/selected subcontractors and direct contractors
- Issuing practical, works and final completion
- Authorizing payment
- Adjustment to the contract value
- Termination of contracts

## 2.2 Duties

The above duties to be performed by the principal agent can be described as per Maritz (2009) and are set out as follows:

- Documents
  - Completing of contract documents and arranging for signing, where after the principal agent is responsible for the safekeeping of the documents after distributing copies to the contractor.
  - Supplying the contractor with all the extra documentation needed to complete the project and acknowledges that the information in the contract data is of utmost importance for him/her and the contractor.
  
- Employer's agents
  - Receive notices on behalf of the employer.
  - State legal interest or involvement of the principal agent or any agents in the project in the contract data.
  - Delegate to other agents authority to issue contract instructions etc.
  - In June 2000, the JBCC set out an advisory note to help with the interpretation of the clause about the delegation of authority. The principal agent, as stated in this advisory note, **may not** delegate the authority to do any of the following:
    - Issue an interim payment certificate of a final payment certificate to the contractor,
    - Issue special payment certification in favour of a nominated or selected subcontractor or other parties,
    - Issue a certificate of practical completion, works completion or final completion,
    - Grant, reduce or refuse an application for a revision of the date for practical completion,



- Issue to the contractor notices of cancellation of the agreement; and
    - Determine a disagreement between the employer or his agents, on the one hand, and the contractor on the other.
  - Duties that **may** be delegated, to the extent that they relate to the agent's specific aspect of the works, as set out in this advisory note, is such as:
    - Accepting a design from a nominated or selected subcontractor in terms of the nominated/selected agreement,
    - Periodically inspecting the works,
    - Issuing practical completion lists, works completion lists and final completion lists and defects,
    - Preparing valuations for interim payment certificates; and
    - Valuing variations and preparing the final account.
  - The principal agent is allowed to delegate the above duties as long as he/she notifies the contractor of what authorities and duties he/she has delegated to whom.
- Risk and insurances
  - Keeping the employer informed of all the times and dates work starts and when responsibility gets transferred.
- Preparation for and execution of the works
  - Receive the priced document, documents specified in contract data, programme of the works from contractor and any revisions thereof and approve quality and standards of the works executed.
  - Use detail from contractor and quantity surveyor to compile a cash flow.
  - Issue written instructions to the contractor and notify him/her to proceed if he/she fails to do so in 5 days.

- Nominated and selected subcontractors and direct contractors
  - Prepare tender documents for nominated and selected subcontractors and call for tenders and appoint the successful contractor.
  - Request proof from the contractor that payment has been made to nominated and selected subcontractor by the contractor and if not satisfied, certify payment direct to a nominated subcontractor if instructed by employer.
  - Instruct the contractor to permit work to be executed and installed by direct contractors as described in the schedule of works.
  
- Practical completion
  - From time to time inspect the works and inform the contractor of the standard and state of completion required to achieve practical completion and when the anticipated date will be and issue a certificate of practical completion when it is reached.
  - Where practical completion has not been reached issue a practical completion list defining outstanding work and latent defects to be rectified in order to achieve practical completion.
  - Receive from the contractor all operating and instruction manuals, guarantees, etc.
  
- Works completion
  - Within 7 days of issuing the certificate of practical completion, issue a works completion list defining the outstanding work and defects still to be rectified to achieve works completion. If all works are done, issue a certificate of works completion.

- Final completion
  - Where the works has reached final completion and the final account is settled, after the defects liability period is over, issue to the contractor a certificate of final completion with a copy to employer.
  
- Payment
  - After receiving a payment claim from the contractor, the principal agent issues a monthly payment certificate that goes to the contractor and a copy to the employer.
  - As soon as the principal agent issues the final certificate of completion, he/she issues the final payment certificate to the contractor.
  
- Adjustment to the contract value
  - When an adjustment to the contract value occurs due to a contract instruction, the value needs to be calculated and adjusted according to the priced document. The value of the provisional work or original work needs to be omitted and the new work's value to be added.
  - Omit budgetary allowances and prime cost amounts and determine the actual value of work related thereto with allowances for waste.
  - Adjust the preliminaries in terms of the alternative selected as well as the adjustment for the CPAP if applicable.
  
- Termination
  - Notify all the parties if any event causes the contract to be terminated.
  - Needs to do status reports and final account on all the work done or not done and issue this report to the employer and contractor.

- **General**
  - Involved in all administrative work to be done on site, seeing that everything happens according to the laws and regulations, making sure that the contractor have access and information regarding the site before he/she starts execution of the works.
  - Have to be present when the site is set out, and levels are determined.
  - At the end of the works determine if revision of the practical completion date is justifiable and to ensure that all expenses and loses are recovered by both the contractor and the employer.

### **2.3 Consultants**

In the Series 2000 of the JBCC Principal Building Agreement no mention is made of any of the consultants to be introduced in the project. The employer appoints a principal agent, who can be any of the consultants, and then has the option of appointing any other consultant as he/she sees fit. This means that the architect, quantity surveyor, engineers and project manager still have their respective roles in the project; it is just not specified in the standard form of the contract and needs to be made provision for. It needs to be kept in mind that the agreement at this stage is between the employer and the contractor. The appointments of all the consultants are through a separate consultant agreement between each consultant and the employer.

For this study, it would be necessary to create a scale on which the different consultants can be judged accordingly. Each individual will be given a value, call in the PA-value, from one (1) to four (4), on how involved their profession is with each different constraint. One (1) being slightly to no involvement and four (4) being the most involved with that constraint. This will help to come to a conclusion at the end of the project on the involvement of each profession

throughout. Taking that the most involved professional will be the best principal agent for a project.

## **2.4 Summary**

As seen above, the principal agent's role runs throughout the whole project, from appointing the contractor right through to signing the final completion certificate. This means that he/she has to be involved in every step of the project and keep up to date on everything that happens on the project, positive or negative. To have the insight to make decisions, it is necessary to be well informed to ensure that the correct choice is made whenever the project needs direction.

## **2.5 Conclusion**

As seen above, there is no main role of the principal agent in the project, but needs to emphasize that the principal agent is of utmost importance to keep the project on track and needs to give input in almost every aspect.

## **2.6 Testing of hypothesis**

The principal agent's main role is managing the complete project, making sure that all the relevant parties know exactly what is expected. As representative of the client, the principal agent needs to make decisions regarding immediate problems arising on site.

The hypothesis is correct. The principal agent's main role is to make sure that all the relevant parties know what to do and it is expected of the principal agent to solve problems throughout the project lifetime.

## CHAPTER 3

### MANAGING TIME AS PRINCIPAL AGENT

#### 3.1 Introduction

Time is one of those things in life that once it has been lost it can never be regained or replaced. It is therefore necessary for managing time to the best of our ability. Time management is about controlling the use of your most valuable resource. ([http://www.doh.gov.za/pdphcp/monitoringproject\\_management.pdf](http://www.doh.gov.za/pdphcp/monitoringproject_management.pdf)) “In construction the effective time management principles must be employed to make it a resource.” (Kerzner, 2006: 280)

Resources are used throughout construction to complete any task or project. Time is not a resource that can be set aside to be used later, which makes it unique in this process. From the previous it can be seen that it is necessary to manage time to ensure a project is completed within a certain time frame. (Abrahamse, 2002: 40)

Two of the areas for which time management is of an essence, are during planning and during construction of the project. The following, according to the University of Stellenbosch’s Projektus program (July 2009), sets out the guidelines for both areas as:

- “Time management during planning
  1. Identify all the tasks that have to be undertaken within the project.
  2. Determine the interdependence between the tasks.
  3. The project team (preferably the person who will be doing the work) indicates how much time will be required per task.
  4. Distinguish between effort and duration. **Effort** entails how long a task will take in ideal circumstances. Once the availability of resources and

other factors have been taken into account this is referred to as **duration**.

5. Remember to plan for the review of planning and reports, management time and meetings.
- Time management during execution
    1. Concentrate on results, not upon "being busy".
    2. Each team member must be clear on what outcome he/she is expected to achieve.
    3. As the project a progress, each team member indicates exactly how much time has been spent on a task.
    4. The team member also indicates how much time will be required to complete the task.
    5. Every week each team member hands in his/her time sheet with the information included.
    6. The project plan is regularly adjusted according to the actual duration. This enables the project team to keep track of actual progress as well as potential adjustments to target dates. “

(<http://www.sun.ac.za/projektus/fases/prosesse/tydsbestuur/riglyneTydsbestuurE.htm>, July 2009)

There are a number of ways in the construction process in which time can be better utilized, for instance working overtime, cutting on lunch breaks and tea time, etc. Most of these are against the human rights of the labourers. It is necessary to act in a humanely way to respect the labourers and offer them a sense of work ethic that will make them enjoy work more and be proud of what they are achieving.

The real way to increase the utilization of time will have to improve management of time. This meaning that somebody must be responsible for applying leadership

where necessary and be skilled enough to convey this in the construction process.

### **3.2 Relationships with other constraints**

Time only has an affect on the other constraints, cost and quality, if the period of time is reduced or the project scope changed that increases the work load. As soon as the timeframe is reduced or the work load increased, the pressure is especially on cost, due to the fact that more labour resources are needed to complete the project in the new specified time. More labour means higher cost. Shorter time to complete the project also means that some corners have to be cut that can reduce quality significantly.

The only way to increase the timeframe is through an extension of time. “No client will just decide that he thinks it is worth it to increase the project’s construction period. With an extension of time, the contractor is usually the party that is in desperate need of extra time to complete the project. He has to have good reasons for the request of extending the time, and it is never certain that he will be granted the extension.” (Malherbe, June 2009) A lot of times the extension is regulated by the contract that has been signed. There are several clauses in the JBCC contract that give a detailed set of rules when and where a contractor may not make a request for extension of time.

### **3.3 Motivation through time**

Just as there are penalties imposed for late completion, it is possible for the client to adjust the contract to pay an incentive to the contractor if he/she completes the project sooner as what was decided in the contract as the construction duration. Some of these incentives can motivate the construction managers to encourage



their labourers to finish their task as soon as possible, because they will also taste the fruits of their actions.

The main consequence of rushing a project can lead to unsatisfactory quality, thus increasing the importance of quality management from both the contractor and the principal agent.

According to Nel (July 2009), it is not advisable to make a contractual incentive for finishing early. Rather tell the contractor that if he/she does finish within the designated timeframe, the client may see it good to pay out an extra incentive. This way you prevent the contractor to rush the project and cut on quality, rather just keep him/her from wasting unnecessary time.

### **3.4 Taking responsibility of time on a project**

Usually the different consultants have their own opinion of what timeframe is needed to finish a project. Generally they all decide on a timeframe that will be acceptable for a contractor to feel safe in completing the project on time. At no stage before the contract is signed, does the contractor really have a say in the contract period. This means that the professional team must have a really good sense of how long each process will take to complete.

It is then in the hands of the principal agent to ensure that the project keeps to the schedule set out at the beginning and to report and initialize a strategy on how to counter attack any such setbacks. Malherbe (June 2009) also stated that the principal agent must work with the contractor to help him/her keep to the programme set up at the signing of the contract and help identify any such delays that may still or have already appeared along the way.

As soon as a delay occurs, the principal agent and contractor must set a definite plan on how to rectify the problem and how they plan to handle the aftermaths of the situation. They then need to consult with the other professionals to determine what influence this plan may have on all the other constraints.

Nel (July 2009) also states that it usually is the cost constraint that may be influenced by the plan they initialize when they want to increase the timeframe, due to the fact that more resources are needed to implement this extension plan. The quantity surveyor must then consult with both the principal agent and the contractor to make this plan work without damaging the whole budget of the project.

Needless to say, it is definitely the responsibility of the contractor to stay on time, but the principal agent has a big role in representing the client in these situations, making sure that the client does not lose any unnecessary money due to a problem that could have been rectified at an earlier stage.

### **3.5 Consultants and the time on a project**

For a project to happen within a certain timeframe, the consultants play a crucial part. Each consultant can help to identify problems in their fields and solve the problem as soon as possible. Seeing that all consultants have experience in different projects, it is their responsibility towards the client to identify possible delays before they do happen.

In their initial project meetings, when they decide on how long it will take to finish the project, some individuals will have to take lead. The only consultant that gets any training whatsoever in determining the programme on a project, is the project manager. No other professional will have enough knowledge or experience to take on this task without burning their fingers.

Every consultant's course on their way to becoming a professional person, do touch on the ways of setting out a programme and listing activities to make sense of the order and magnitude of each task. For the project manager it is a matter of second nature. To become a project manager, it takes mainly post graduate studies and extra courses to establish one as a project manager.

The project manager gets trained how to set up a programme; manage the already set programme and how to deal with delays within the programme. This isn't just a responsibility that any consultant can walk into and decide that he/she can do. A lot of professionals believe that they are capable of doing this specialty without prior training, but there are a lot more involved than making a beautiful bar chart.

With external training any profession within the built environment can be trained to be a project manager. Usually it does happen that more quantity surveyors do these external training as project managers, due to the fact that it will help them in the forecasting and estimating of cash flows.

The project planning and construction periods (time) have an important effect on time-related cost aspects such as:

- Preliminaries (especially salaries, plant and other time-related items)
- Pre- and post-tender construction cost escalations
- Financing cost (interim interest)

It is also of benefit to the client if a project can be completed in a shorter period so that it can generate an income stream sooner.

The effects of time on final building costs as outlined above must always be taken into account in building cost estimates. This requires highly specialised knowledge and skill, as found in the competent professional quantity surveyor. (Social Housing Foundation: 2006)

Taking each consultant and awarding them a PA-value on their involvement, it can be seen that the project manager is the most involved getting a 4. With the time / cost constraint the quantity surveyor do have a relatively intuitive knowledge of how time will influence the project thus awarding them a 3. Due to the experience and knowledge on how the process works and how much time each part of the building process takes up, the architect is awarded a 2. Due to the fact that an engineer has very little to do with the time management on a project, he/she can only receive a 1.

By setting this into a bar chart, it is clear that the project manager is the most competent principal agent if time is taken as the primary constraint.

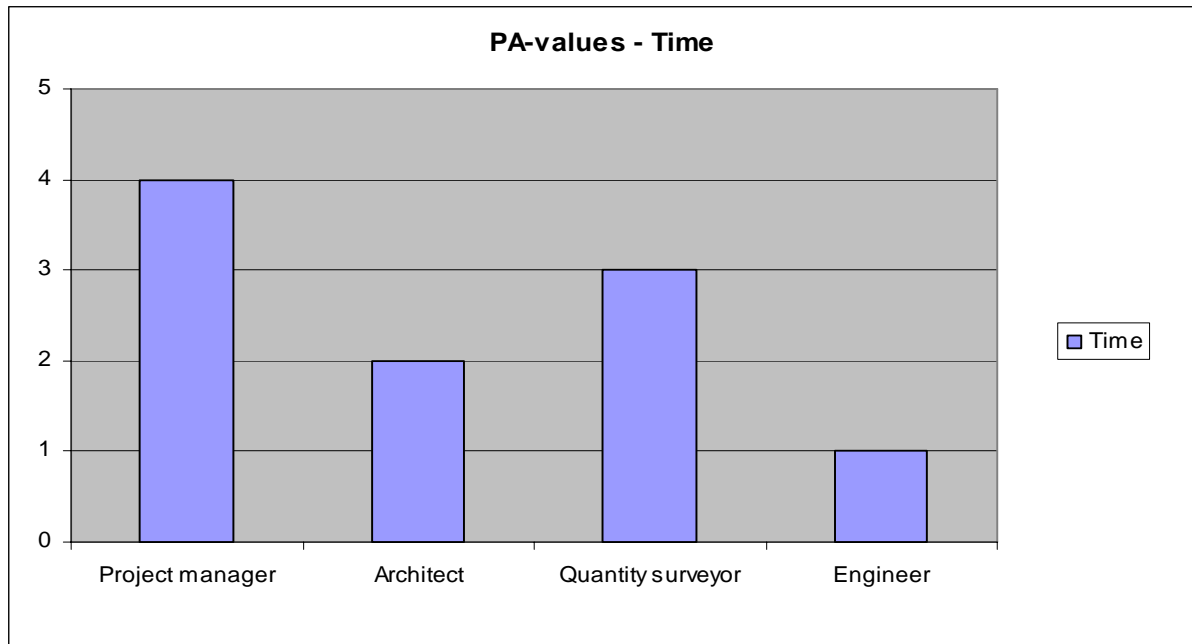


FIGURE 2: PA-values for time

(Source: Own)

### **3.6 Summary**

Time management is a very important part of any construction process. All the different consultants are influenced by the duration of the project, if it is due to extra costs, better quality or even earlier occupation. Thus is it necessary to employ a principal agent that can organize this process to the benefit of the project. From above it is clear that the only qualified professional to be capable of completing the task of time management satisfactory is the project manager.

### **3.7 Conclusion**

When a professional team is brought together to do a new project, it would be convenient to be able to employ a project manager as principal agent. Due to the nature of different projects, it is not always possible or feasible to appoint a project manager on every job. The job as principal agent then needs to shift to another consultant. All the different aspects will then apply to make the right choice in appointing the principal agent.

### **3.8 Testing of hypothesis**

Out off a fully representative professional team, the project manager is the best qualified to oversee a construction programme and ensuring that specific tasks happen at the correct time.

As seen above, this hypothesis is proven to be correct. If any other professional is chosen due to the fact that no project manager is appointed, the consultant chosen must have previously been a principal agent on a job with positive references.

## CHAPTER 4

### MANAGING COST AS PRINCIPAL AGENT

#### 4.1 Introduction

According to Kerzner (2006: 597) cost control is equally important to all companies, regardless of its size. He also states that small companies generally have tighter monetary controls because the failure of even one project can put the company at risk, but they have less sophisticated control techniques. "Large companies may have the luxury to spread project losses over several projects, whereas the small company may have few projects." (Kerzner, 2006: 597)

"Contract administrators, architects and managing engineers may not have the financial acumen or background on your organization to make decisions that could affect thousands or millions." (www.exed.wisc.edu, August 2009) Thus is it necessary for a professional that is trained to do this financial decisions to run the financial side of a project.

On www.exed.wisc.edu (August 2009) they claim that not many firms develop in-house expertise for construction projects, remodeling and commercial moves, although a quick review of the "cash flow" statement indicates that such projects may be one of the major uses of funds during a fiscal year. It is necessary to then employ or train staff to be able to manage all these funds and save the company cost on every level possible.

Another alternative to controlling cost is to appoint a principal agent with the necessary skills to control the cost while the project is running. It will be his responsibility to keep the project within the agreed budget and make decisions on whether or not it will be possible to do certain adjustments to the contract and contract period.

## 4.2 Relationships with other constraints

Of all the constraints in a project, cost is the easiest influenced by a change in the other two constraints. If time changes, it does not matter if the project lifecycle gets longer or shorter, it will almost always increase the costs involved in the project. When the project lifecycle gets shorter, it usually means that more resources are needed to finish the project on time. To implement more resources, money is needed to acquire those extra resources. This does not come cheaply.

The same will happen with any changes that may push the project lifecycle to be extended, the costs will increase. As shown in the Figure 3, the later the change, even just to shorten the lifecycle of the project, the more expensive that change may turn out.

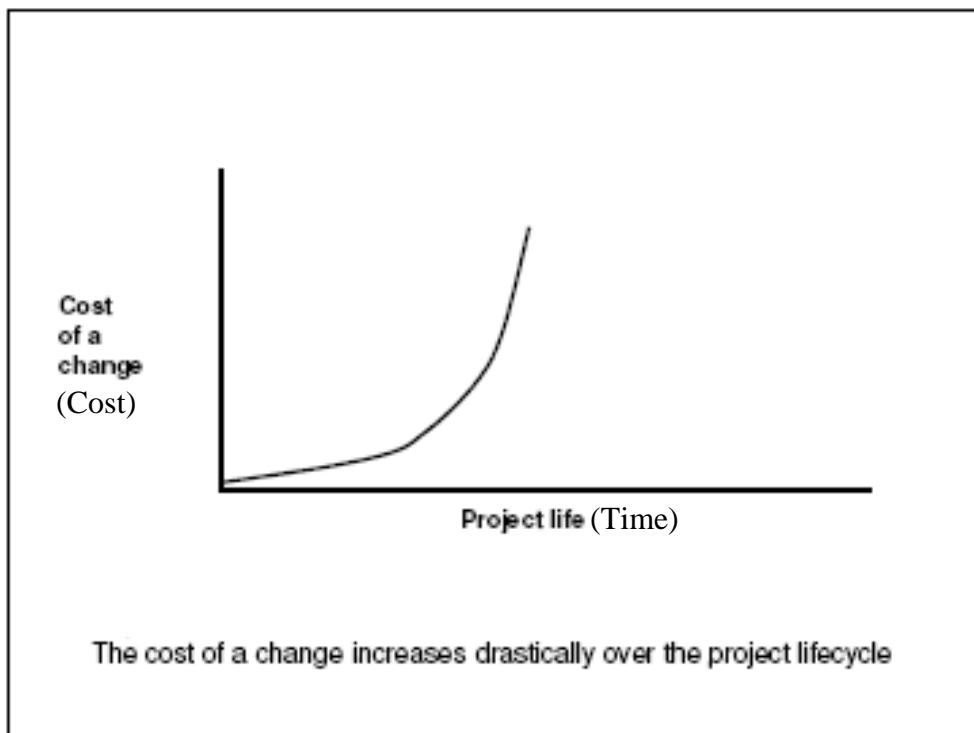


FIGURE 3 – The cost of a change increases drastically over the project lifecycle

Source: PMBOK 2004

Quality can also have a huge influence on the cost of a project. In the planning stages it is a necessity to design a cost effective project. This means that the quality level should be decided and then kept to those criteria.

As soon as a better quality material or finish needs to be used, the cost of the project will increase. That is why it is of essence that the quality level should not be changed during the project if there is a tight budget. It will most certainly lead to a cost overrun if this is not emphasized to the client from the planning stages.

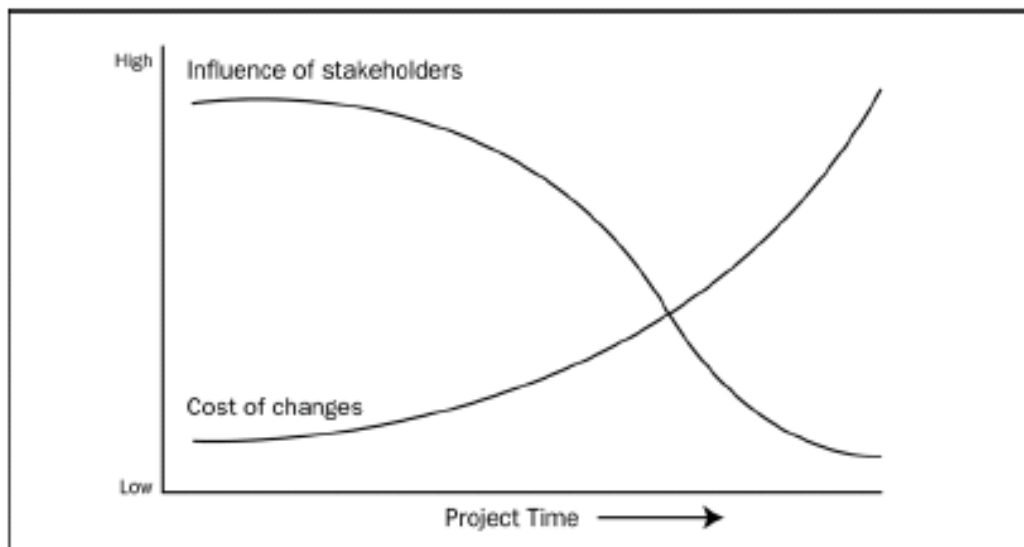


FIGURE 4 - Stakeholders' Influence Over Time

Source: PMBOK 2004

Figure 4 just shows how the cost will increase as the lifecycle of the project goes on, as well as that the little changes later in a project will cost much more than big changes at the beginning. This all comes down to planning again. If the planning in the beginning is up to standard, then it won't be necessary to change the scope later on in the project.

For any constraint to be altered, there must be a common understanding that it will influence the other in one way or another and that cost usually increases with that decision.



### **4.3 Motivation through cost**

For any employee in any sector, from state institutions right through to the construction industry, the main way to motivate is to give financial incentives. This does have a firm influence on the cost of the project.

For all the different professional consultants on the project this is a sensitive subject. Most of the fees are calculated on the total project cost. This means that as soon as you cut the costs and save money for the client, most, if not all of the consultants, will have less fees. This could lead to an unpleasant management of a project if some of the consultants now feel disappointed if they have to settle for the lower fees.

What is needed is a type of profit sharing incentive. According to [www.curt.org](http://www.curt.org) (August 2009) profit sharing appears to be the most frequent type of incentive program among construction companies. But the effectiveness of company-wide incentive systems is virtually impossible to determine. Two drawbacks inherent in profit-sharing programs are: 1) profit is controlled more by outside than inside forces, and 2) such rewards are irregular and infrequent. ([www.curt.org](http://www.curt.org), August 2009)

This is where the client must be fully aware of the state of mind of all his consultants and when it will be necessary to try and motivate them with possible incentives if they can manage to save him/her money on the project. Very few clients will ever settle for that approach and feel that it is him/her paying their fees, they must do everything in their power to keep the client happy. A happy client can mean more work in the future. Every consultant must then ask themselves what is more important, future endeavors or higher fees at the present stage.

#### **4.4 Taking responsibility of cost on a project**

“Many people have a poor understanding of cost control. Cost control is not only “monitoring” costs and recording data, but also analyzing the data in order to take corrective action before it is too late.” (Kerzner, 2006: 598) Not many professionals are capable of taking this action to correct the problem as it occurs within a project. Somebody needs to step up and take responsibility for the cost on the project.

Kerzner (2006: 598) states that the cost control should be performed by all personnel who incur costs, not merely the project office. Overseeing this actions a trained professional should be appointed. Due to the fact that good management is needed throughout the project, cost control implies good cost management, which must include some of the following:

- Cost estimating
- Cost accounting
- Project cash flow
- Company cash flow
- Direct cash flow
- Direct labour costing
- Overhead rate costing
- Other tactics, such as incentives, penalties, and profit-sharing

(Kerzner, 2006: 598)

“In general, there are key principles that should be adhered to when preparing a program cost estimate at any stage of a major project. It is important that care is taken to present an achievable estimate even in the early stages of the project.”  
([www.fhwa.dot.gov](http://www.fhwa.dot.gov), January 2007)

According to Kerzner (2006: 652) problems can occur with any cost and control system and states that there are common causes, some of which are as follows:

- Poor estimating techniques
- Out-of-sequence starting and completion of activities and events
- Inadequate work breakdown structure
- No management policy on reporting and control practices
- Poor comparison of actual and planned costs
- Material escalation factors that are unrealistic

Kerzner (2006: 652) further states that cost overruns can occur in any phase of project development. According to him the most common causes for cost overruns in the different phases are:

- Proposal phase
  - Failure to understand customer requirements
  - Unrealistic appraisal of in-house capabilities
  - Underestimating time requirements
- Planning phase
  - Omissions
  - Inaccuracy if the work breakdown structure
  - Misinterpretation of information
  - Use of wrong estimating techniques
  - Failure to identify and concentrate on major cost elements
  - Failure to assess and provide for risks
- Negotiation phase
  - Forcing a speedy compromise
  - Procurement ceiling costs
  - Negotiation team that must “win this one”
- Contractual phase
  - Contractual discrepancies
  - Proposal team different from project team

- Design phase
  - Accepting customer requests without management approval
  - Problems in customer communications channels and data items
  - Problems in design review meetings
- Production phase
  - Excessive material costs
  - Specifications that are not acceptable
  - Manufacturing and engineering disagreement

#### **4.5 Consultants and the cost on a project**

“Today the quantity surveyor is generally recognized as one of the key personnel, in addition to the project manager, responsible for the success or failure of a project. At the time of bid the quantity surveyor knows more about the project than anyone in the construction company. He or she is relied upon to furnish reliable costs.” (www.aspenational.org, August 2009)

Many professionals may through experience be able to control the costs of a project successfully, but only a quantity surveyor gets the training to run the finances on a project. From estimating a budget to making payments and settling the final account at the end of the project.

Butcher (2003: 3) believes that a quantity surveyor cannot be trained entirely in a classroom. The theory and science of estimating is important, but it takes experience with construction, as well as experience actually quantifying and costing work, to complete the training of a quantity surveyor. He also states that a person possessing the “art of estimating” has a good feel for the effort required to produce work, good construction experience, and knowledge of the theory and science of estimating. The less information available about a project, the more experience is required to do a cost estimate.

When it comes to costing of a project, the quantity surveyor is the only consultant sufficiently trained to be successful. That is clear to even the outside person looking at a project. Because of this the quantity surveyor gets awarded a 4 PA-value for his involvement. All the other consultants on a project do have knowledge of the cost of their relevant field but a limited knowledge of the total cost structure and price costing of the project and therefore receives a 2 PA-value.

This chart shows how the quantity surveyor stands out in the costing section of a project.

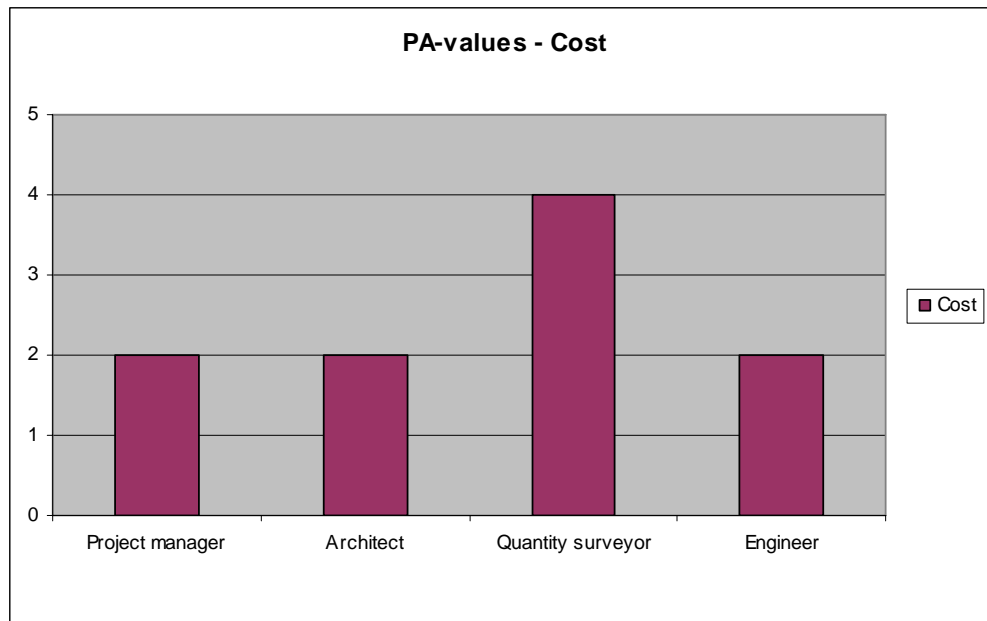


FIGURE 5: PA-values of cost

(Source: Own)

#### 4.6 Summary

After seeing that cost is a major factor on any project, it is important to have a specialist in charge of the financial part of a project. Fortunately there is a specialized professional that receives training in cost estimating, cost controlling

and budget planning. The quantity surveyor has all the skills necessary to drive and control the financial side of any construction project.

From a client's point of view it is a necessity to appoint a specialist in controlling the project's finances. Just like any other profession where there are financial managers that manage the finances of a project, the quantity surveyor is the professional in the construction industry with the best knowledge to control all the relevant financial matters.

#### **4.7 Conclusion**

The only professional that will be able to manage the financial controlling in the construction industry is the quantity surveyor. He/she is there to assist the client to complete any project within the budget and save money where possible. No other consultant will have the skill, either trained or through experience, to accomplish the financial advantages that a quantity surveyor will be able to bring towards a project. That will be a skill that any principal agent needs and this advantage will make the quantity surveyor the ideal principal agent to a project.

#### **4.8 Testing of hypothesis**

The quantity surveyor will, with his experience and training as a cost consultant, and knowing what a project will cost at a certain time, as well as to project cost for the future, be the best principal agent.

Thus the hypothesis is proven to be correct, the quantity surveyor will have through his viewpoint on costing, be able to keep the time and quality constraints in line to keep costs down.

## CHAPTER 5

### MANAGING QUALITY AS PRINCIPAL AGENT

#### 5.1 Introduction

To define quality in terms of the construction industry is not as easy as opening a dictionary and getting a definition for quality. The definition in the South African concise Oxford dictionary (2002) states quality as: “a degree of excellence; general excellence; attribute or faculty; relative nature or character.” In the construction industry, this is a vague way of determining if a job is done at sufficient quality.

Quality is determined by the customer and the marketplace and includes all the product’s attributes. Quality includes everything the client expects and requires and is continuously changing. (Hradesky, 1995: 2) At the end quality means that the product meets the client’s expectation. The Quality Digest magazine refers to quality as the customers' perception of the value of the suppliers' work output. It further states that quality is a momentary perception that occurs when something in our environment interacts with us and reported as good or bad quality value. ([www.qualitydigest.com](http://www.qualitydigest.com), May 2009)

The client is the one that must define the level of quality of the work that he/she desires. But according to Joubert (2002: 9), “today most companies admit that quality is not accurately definable as the client defines it”. He also states that today’s quality is considerate to be more of a process than a product. “It is a process where lessons learned are used to change future products to better satisfy the client’s needs and expectations.” (Joubert, 2002: 9)

## **5.2 Relationship with other constraints**

As seen with the project triangle, each constraint has an adverse effect on the other two constraints. The problem with the quality constraint is that as soon as you increase the quality on a project, it usually has an effect on both the time and cost constraints.

“The amount of time put into individual tasks determines the overall quality of the project. Some tasks may require a given amount of time to complete adequately, but given more time could be completed exceptionally. Over the course of a large project, quality can have a significant impact on time and cost (or vice versa).” (www.answers.com, March 2009)

Due to this effect it is of utmost importance to ensure that the design and budgeting at the beginning of the project, is at the standard that the client desires. For the client to expect a certain quality late in the project, that was not designed and budgeted for, can have a major influence on the programme and cost estimation that was originally decided upon.

## **5.3 Motivation through quality**

As with all the other constraints it is necessary to set goals to work towards. If the labourer at the lowest level is motivated to finish his piece of work at a high standard of quality and knows he/she will be rewarded, he/she will complete all his work at that standard. “The timing of rewards is critical. The more immediate the reward given after the desired performance is achieved, the more powerful the effect of the reward or recognition becomes.” (Hradesky, 1995: 188)

“People are not motivated by their salaries and therefore the company must provide alternative means of motivation. Rewards should also not only be



monetary rewards, but must give the person respect and enhance his pride in his work.” (Joubert, 2002: 118).

According to Joubert (2002: 115) setting relevant goals will help employees to get a better understanding of what quality is required. This must flow through all levels of management all the way to the consultants in charge and keep the people on the project motivated and involved all through the process of quality management.

#### **5.4 Taking responsibility of project’s quality**

For a project to have the desired quality at a reasonable cost and in a certain timeframe, it is necessary for consultants to make sure that this happens as fluently as possible.

Seeing that the client determines the quality, the consultants have to design; do cost evaluations and set enough time for the product to live up to the standards of the client. Therefore it is needed that each consultant in the professional team has the responsibility to keep up to the standards set by the client. To ensure that all the consultants work together on these goals, a main consultant is necessary to oversee all the work and needs to address the consultant that do not comply with the requirements of the client.

Sometimes it is necessary to create a quality system. This quality system must be implemented throughout the whole project, from the agents, right through to the contractor and subcontractors. Joubert (2002: 105) suggests that no quality system can function without regular audits and reviews. “The audits must ensure that actual methods are following the prescribed procedures while reviews will determine whether the quality system is attaining the desired results.” (Joubert, 2002: 105) These audits need to be performed by the consultant responsible for

the quality of the project. It is then his responsibility to give the go-ahead to the other consultants to sign off on the completed works.

For a consultant to sign off on work that is not of the desired quality, can be catastrophic, not only to the project but to the reputation and the professionalism of the consultant. No client will ever work with a professional consultant that will sign off on substandard work.

The one consultant that has the authority to instruct the other consultants to comply with the requirements, is the principal agent. It is therefore the responsibility of the principal agent to see to the maintaining of the quality of the project.

The principal agent will be the one, according to the JBCC, that will prepare a practical and works completion certificate. For him/her to do so it is necessary to inspect the work and supply the contractor with a works completion list of work that he/she considers incomplete. (Finsen, 2005: 135) Thereafter it is the responsibility of the contractor to finish the works satisfactory and only then the principal agent should sign off on the completed work.

The above clearly shifts the responsibility of the quality of the works from the contractor to the principal agent. Thus making him/her the one that will be called upon if the work doesn't adhere to the quality as was agreed in the beginning.

## **5.5 Consultants and the project's quality**

As seen in the above, the principal agent will be the party responsible to ensure that quality of the project is to the client's satisfaction. To determine which consultant will be the best in upholding the quality of the project, it is necessary to first determine how each consultant will view the changes in quality.

The consultant that will be the best informed to fulfill this job, must have the knowledge and insight of the products and processes needed to get the ultimate quality. According to Joubert (2002, 111), “a consultant should be chosen with specific attention given to his qualifications, experience, knowledge and proven previous successes.” It is not an ability that any educational institution can transfer to a consultant in training, but one that is acquired with years of first hand experience and intensive research.

It is a skill to be able to co-ordinate the constraints of the project triangle. For a consultant to be able to instruct a process of work to be of a higher quality, he/she should be able to know what the cost and time implications will be. No consultant, except the quantity surveyor and maybe the electrical engineer, are trained to work out the cost implication on the project. The project manager is the one who knows how a programme will be influenced if more resources needs to be used for a different task.

Architects are trained to know when to use which specification to suit their design. By designing a building using the best quality materials and processes can lead “to less construction waste and to optimum performance of the building operation and management stages. This will lead to significant cost savings both with regards to the project cost and to the cost to the environment.” (Conradie, 2008: 1)

This shows that the architect has the ability to influence the cost right at the start of the design without cutting on quality but actually improve the quality.

Conradie (2008: 1) shows that with the use of appropriate quality techniques, supported by predictive simulation procedures, the architect can ensure that the design solution for a given set of design constraints and for a specific building, is sufficiently explored and providing the client with the best possible design of the best quality inside of the budget and accepted design specifications.

The simulation procedures that Conradie (2008: 4) refers to, has to do with Computer Aided Design (CAD) used in architects' offices to maximize the benefit of a building throughout its life cycle at a minimal cost. This procedure is still not utilized at its full potential and can be exploited more by the architects to lift the quality of the building without using too many resources in the process.

Without these procedures, the architect must rely on his experience to maximize the output of his design in terms of quality and practicality. The architect will have the ability to scrutinize a piece of work and ensuring the quality is done to his/her approval.

In the paper "Quality management in South African architectural practices" Munting and Cruywagen (2008) reason that quality is of pivotal concern in the building and construction industries worldwide. The result, in a study including a number of South African architectural practices, indicates that these architects generally have a poor grasp of quality management theory. A systematic and documented approach to quality management is largely lacking in the profession.

For the project manager, quality is easily an oversight that may cause the project to run late, therefore the project manager only gets a 1 on the PA-value scale. The engineer again does not have a big involvement with the quality control of the project and also receives a 1. The quantity surveyor needs to understand when quality will interfere with the proposed budget and it is necessary for him/her to approve any cost adjustment influenced by the quality control of the project and is awarded a 3 on the scale. The architect is the liable consultant for all quality control and receives a 4 on the scale.

The comparison of the different consultants indicates that both the architect and the quantity surveyor will do a satisfying job of quality control, but the architect is the most equipped.

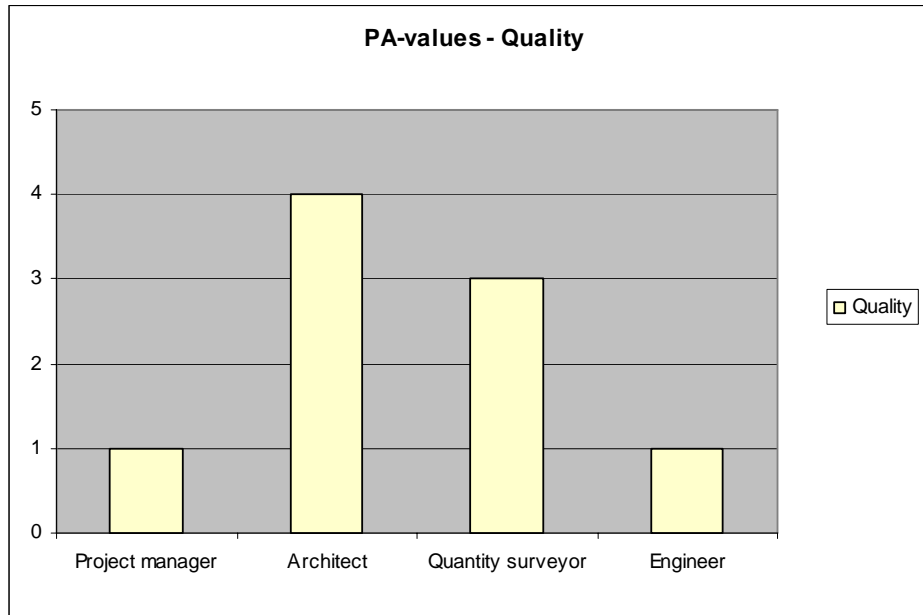


FIGURE 6: PA-values for Quality

(Source: Own)

## 5.6 Summary

When it comes to which of the consultants will have the best knowledge of what quality is to the correct standard, it can only be the architect. He/she did the design and specification selection, which the client approved on, and only he/she will know if the quality is sufficient to be worth called his work. Due to the professional opinion of an architect, he/she will be the only one with the trained eye to decide if the quality is according to the client's standard before the client makes a judgment himself/herself.

## **5.7 Conclusion**

Due to the fact that no consultant are specialized to be a quality manager and that every consultant with enough experience can perform quality checks, it still remains that the architect do have the right criteria to be the most suitable consultant to act as principal agent when it comes to the control of the quality on a project.

## **5.8 Testing of hypothesis**

The architect is the one who designed the project and prepared the specification, and the professional who sold the idea to the client. The architect will be the only one that can comment if he/she is impressed with the quality of the project.

As seen above, this hypothesis is proven to be correct. There won't be a professional in the construction industry that will have the knowledge to be a more suitable agent in charge of the quality of the project.

## CHAPTER 6

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 6.1 Summary

After considering the different aspects concerning the responsibilities of the principal agent, it is possible to come to a conclusion that may give more clarity on which consultant can contribute the most to the cost effectiveness of a building project, as the principal agent.

Throughout the study, every aspect of time, cost and quality was looked at in depth to be able to make any sort of recommendation or give a better understanding on how every consultant will be more suitable for the job as principal agent.

It is necessary to look at each profession individually.

As project manager it is clear that the sole responsibility is to make the project finish on time. Project managers get trained to identify and propose possible solutions for any problems that may occur that may influence the programme of the project, positively or negatively. Their responsibility in terms of cost and quality is very vaguely set out. Very little time and effort is dedicated to the development of their skills in terms of these other constraints. For them the most important task is making the project run on schedule and finish on or before the specified date.

The architect, from which the project idea originates, will have an input throughout the whole project. From different materials to use to any forced changes in the project. Architects usually need to make sure that any changes fall within their idea for the whole project. They will, at any cost, make sure that

the quality and precise workmanship will be of the highest standard. It is sometimes difficult to convince them that certain changes can make a budget escalate tremendously. For them any additional piece to the project that can improve the end product, is a necessity, but from a cost point of view may not always be possible. To come to the conclusion to make an architect principal agents on a job may cost the client more money and may extend the timeframe of the project considerably.

Quantity surveyors are on a project to control the cost and make sure that the client can receive the best interest on his investment. It is then necessary for all the other consultants to get clearance from the quantity surveyor to make sure that the budget will still be met with every proposed change. Concerning quality, the quantity surveyor usually looks for the best quality product for a specified amount of money. This may lead to confrontation with the architects, as they have their idea and will go to any lengths to try and make their idea come to life.

Usually the client is not happy or capable to have to increase his budget, to accomplish the idea of the architect. The question always gets put to the quantity surveyor why there weren't any provisions made for these kinds of changes. This is what makes the job of the quantity surveyor much more complicated than just measuring and making payments.

For any engineer to be the principal agent is a very unlikely scenario, but not impossible. A lot of projects only involve the client, an engineer and the contractors doing the job. This usually happens with civil works, where for example a road is build. It is appropriate for the engineer to be the principal agent on the job when only relevant engineering work is at stake. That would be ideal for the client to then let the engineer be the principal agent. The engineer has the skill to control the timeframe, the costing on the project as well as the quality management on the civil works.



## 6.2 Conclusions

By looking at the different PA-values that was awarded to the consultants at each constraint, it is possible to come to a relevant conclusion. In Figure 7 the PA-value of each consultant on the constraints are added together to see how many influence they have as principal agent.

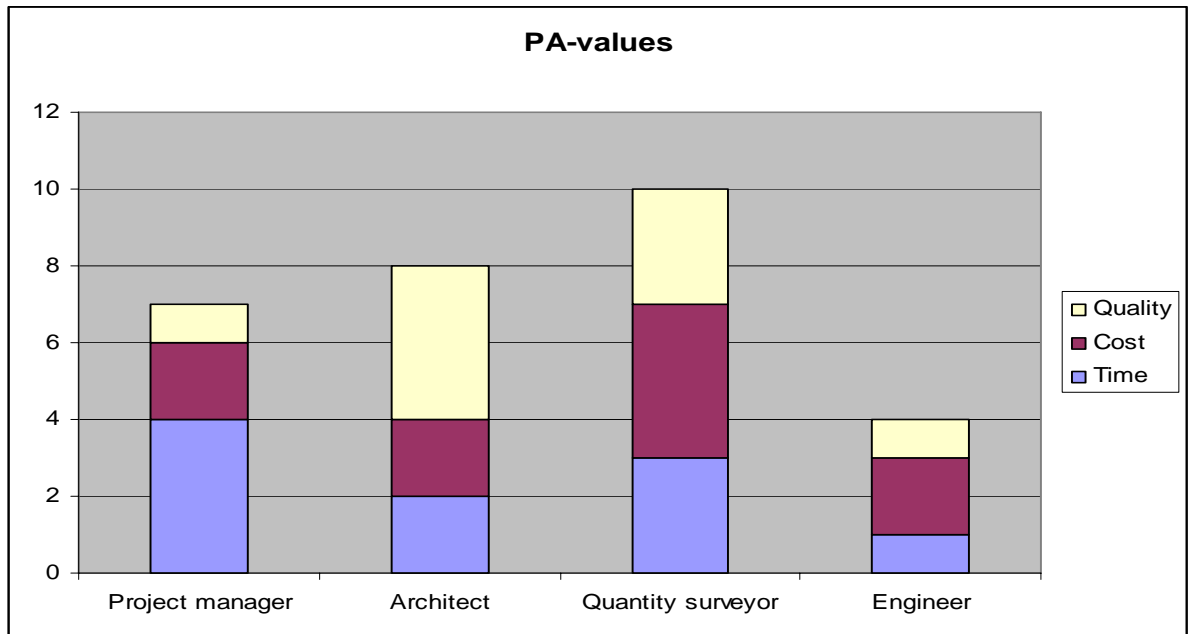


FIGURE 7 – PA-values added together for each consultant (Source: Own)

The figure shows the extend to which each consultant contribute to a project as a principal agent. For a clearer view, Figure 8 shows the percentages of the involvement in the project as per their PA-value.

The percentages are the total of each consultant's PA-values added together out of a possible 12 that could have been scored. This shows that the quantity surveyor is 83% capable out of the possible 100% of managing the role as principal agent perfectly.

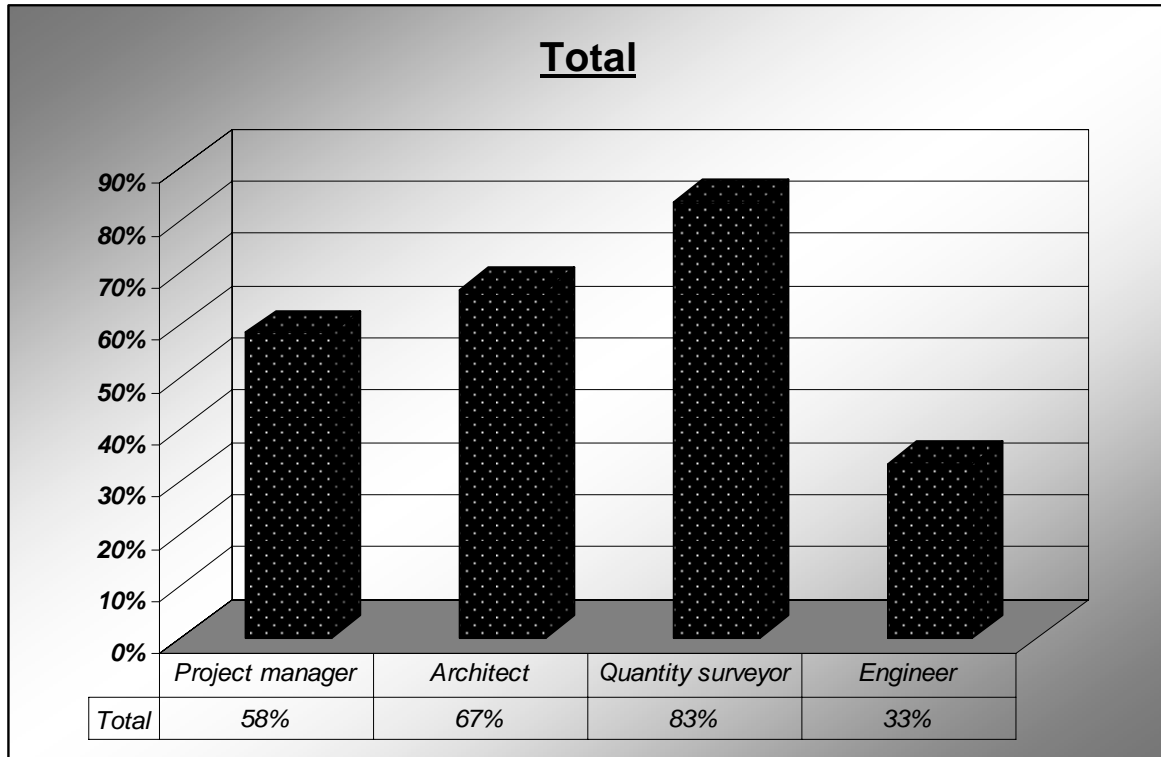


FIGURE 8 – PA-values as percentages for each consultant (Source: Own)

From the above charts, it is clear that this study indicates that the quantity surveyor will make the best principal agent. This proving that the hypothesis which states that the quantity surveyor, with his training in cost management, which includes time and quality management, will be the best candidate to act as principal agent.

### 6.3 Recommendations

Taking everything said in this study in account, it is necessary for more intensive research and an in depth look into actual projects to compare different consultants as principal agents, before it can be conclusive which consultant will be the best principal agent on a project.

Seeing that throughout all the different areas of studying in the built environment, not enough time is spent on training each individual profession to act as principal agent. When this role of principal agent is presented to a consultant, no one is fully equipped with the abilities to act as the principal agent in the different aspects that is required by the client.

In conclusion it is recommended that it is necessary for tertiary institutions to revise their course content in Engineering and the Built Environment, to be able to send qualified consultants into the construction industry who are able of acting as principal agents.

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