

**An investigation into the sub-contractor
selection process in the South African
construction industry.**

Graeme Stuart Fenton

**A dissertation submitted in partial fulfilment, to the Faculty of
Engineering, University of Natal, Durban, for the requirements
of the award in a**

**Master of Science
In
Construction Project Management.**

December 2003

ACKNOWLEDGEMENTS

I would like to take this opportunity to express my sincere thanks to Professor Rob Pearl and Keith Rennie for supervising this work. I would also like to thank Dave Crompton for his invaluable knowledge and advice on numerous occasions during this research.

I would like to express my appreciation for the time and effort that many companies and their employees have given me in order to make this research possible.

Finally, my greatest debt of thanks to my wife Loren, my daughter Brittany and my mother Marianne for their constant support, encouragement and understanding.

ABSTRACT

This dissertation acknowledges that there is a need for improvement within the South African construction industry. Due to the broad need for improvement in the construction industry, this dissertation has investigated only one of the important possible areas of improvement i.e. the sub-contractor selection process.

This dissertation investigates the existing sub-contractor selection methods used by sixteen established construction companies. Field research has been conducted by means of a questionnaire and all results have been compiled and analysed.

Improvement of the sub-contractor procurement process can be achieved by benchmarking against practices used in the South African petroleum industry. This industry has had similar problems yet succeeded in improving their quality, safety, timeous completions, health and environmental issues. The construction of refineries are implemented under conditions similar to those experienced by the construction industry yet “best practice” procurement methods have been achieved.

Sub-contractors presently undertake a large portion of the construction industries’ activities and therefore should be more committed and responsible for their workmanship. This could be achieved by principal contractors establishing a well-structured sub-contractor selection process, benchmarked against the petroleum industry. The petroleum industry believes that by procuring better contractors, they ensure better products. Their selection process ensures that all contractors meet certain requirements, which results in client satisfaction.

The hypothesis, states that by benchmarking South African construction industry processes in respect of sub-contractor procurement, against the South African petroleum industry contractor procurement process, all stakeholders in the construction industry will achieve higher standards.

If the principal contractors have well-structured sub-contractor selection processes, this will ensure the selection of the best sub-contractor for a particular project. The research and results prove this hypothesis.

Without a paradigm shift by all stakeholders in the South African construction industry, establishing “best practice” in the sub-contractor procurement process will be unattainable. All stakeholders need to change their paradigms and invest in better processes. The petroleum industry sub-contractor selection process can be utilized by the construction industry positively and thereby establish higher satisfaction levels for clients.

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CHAPTER ONE

1. INTRODUCTION

1.1. Background

This chapter provides an overview of this dissertation. The concept of benchmarking is explained and proposed as a method of improving procurement processes in the construction industry.

The construction industry, from a holistic view, is a very complex industry worldwide and thus construction processes are extremely diverse resulting in a perceived uniqueness by industry role-players. McGeorge and Palmer (1997) propose that the construction industry has a set of characteristics and a product which is uniquely its own.

Despite this uniqueness, Latham (1994) and Egan (1998) acknowledged that there is room for improvement within the construction industry. Egan (1998, ch.3) proposed a learning ethic for the United Kingdom construction industry in stating “We see that construction has two choices: ignore all this in the belief that construction is so unique that there are no lessons to be learned; or seek improvement through re-engineering construction, learning as much as possible from those who have done it elsewhere”.

The re-engineering proposed by Egan (1998) encompassed more than the mere introduction of alternative construction systems but incorporated addressing other issues such as the poor quality culture in the industry. Clearly this holistic approach is essential if customer satisfaction is to be addressed, thereby eliminating the existing stigma that clients are left to take care of themselves. What is at issue here is quality of product and service.

True quality does not come from a checklist requirement that has been fulfilled, but from a holistic approach aimed at total customer satisfaction. A quality driven approach must be adopted in all construction processes if true quality and the associated client satisfaction is to be achieved. Smallwood (1998) notes that achieving client satisfaction involves the implementation of a quality management system. Rwelamila and Hall (1995) support this, adding that the system enables

management to control and monitor client satisfaction. Langford and Male (2001) suggest that quality and thus client satisfaction, can be improved via the procurement process, in proposing that the overall building procurement process can be improved through the linking of the embedded organisational structures to client objectives and thereby selecting the most appropriate procurement routes.

There are three main areas that need to be addressed in order to plan and manage a successful project, namely: time, cost and quality (Ellis and Herbsman, 1990 and Harp, 1990 all as cited by Rwelamila and Hall, 1995). These three areas need to be equally balanced for the project to be successful and in turn give the client total satisfaction (Hughes and Williams, 1991 as cited by Rwelamila and Hall, 1995).

Unfortunately not all three areas are equally balanced during a project, which leads to client dissatisfaction (Hindle, 1998). The majority of the effort is placed on time and cost. Quality seems to be less important during construction and only after the project is complete does quality become more and more of an issue (Smallwood, 1998). “The most important issues for the clients of the construction industry are quality, cost and time and yet the vast majority of construction projects are procured based on only two of these major parameters, namely, cost and time ” (Bennett and Grice, 1990 as cited by Rwelamila and Hall, 1995, p. 235).

Barrett (2001) supports the holistic quality approach in stating that quality of workmanship is expected by the client, but completion on time, with added value, are important improvements that can be offered.

In the South African context, the basic client expectations referred to by Barrett (2001) are not being achieved due to poor workmanship (Kilian and Snyman, 1985). The contractor’s defence to poor workmanship may be that the construction industry’s economic status is unstable and volatile.

The cyclic nature of investment in the construction industry can impede consistent implementation of a quality plan. In times of recession, profit margins are low and work is scarce (Hindle, 2001; Kilian and Snyman, 1985). Competition becomes unhealthy and “win-win” scenarios are lost (Latham, 1994). Unfortunately the ‘easiest’ method of survival is cutting quality standards because this seems to reduce short-term financial costs. The long-term financial costs such as repairing poor workmanship are not considered until those costs have occurred.

The current phase of economic cycle that the South African construction industry is experiencing (2001 – 2002), can be identified as descending into the trough or presently at the bottom of the trough. The size or duration of the base of the trough is unidentified, which makes the output of the construction industry's forecasting extremely difficult. Kilian and Snyman (1985) suggest that the formula to survive the trough of the cycle is to improve productivity. The management of sites, training, knowledge collaboration, adequate pre-planning, accurate forecasting and client participation, all influence productivity and productivity influences costs. The construction industry in South Africa needs to invest in itself not only to survive, but also to strive for perfection (Kilian and Snyman, 1985).

Therefore it is in all stakeholders' interests to increase productivity. In some instances, improving productivity can be achieved by the more effective use of existing resources. An example of this would be the introduction of contractors to the design team early in the planning stages of the project. Kilian and Snyman (1985) propose the following advantages for this approach:

- The practical knowledge of the contractor with regard to the construction processes often leads to cost-saving changes in the design.
- Additional information gained by the contractor at design stage is beneficial to the construction process.

This early intervention is usually difficult and not readily practiced in the South African construction industry (Kilian and Snyman, 1985). During the difficult economic periods which the construction industry is exposed to, the industry needs to revive itself by striving to produce the best.

There is clearly a need to improve quality in the construction industry. The construction industry needs to re-think the existing process of delivering its projects with a new aim of procuring using "best practice" methods (Hindle, 1998). This may be achieved by benchmarking against other industries that have had similar problems and have been exposed to a similar environment (Deacon, 1998). These other industries have adapted themselves and succeeded in satisfying all their customers (Egan, 1998). "We know that it is not easy to sustain radical improvement in an industry as diverse as construction. But, we must do so to secure our future." (Egan 1998, ch. 1).

An industry that is a world leader in “best practice” procurement methods is the Aerospace Industry. As explained by Tookey and Betts (1999), the construction industry and the aerospace industry face similar problems. Both industries produce and deliver an expensive product in a relatively short period of time. This work is carried out under demanding variables and under extensive pressure. Yet only the Aerospace Industry is regarded as a world leader. The construction industry needs to benchmark against industries that have a quest for “zero defect”.

The Car Manufacturing industry was exposed to worldwide benchmarking when the gap between the Japanese and the Western car manufacturers closed. “Lean Production” was implemented in order to close the gap. To further the improvement in the car manufacturing industry worldwide, “Industry Forum” was introduced. This process involved bringing together experienced engineers from all around the world, to train and teach local engineers.

This dissertation will research the South African petroleum industry contractor procurement methodology in order to establish their “best practice” procedures. Adoption of these best practices in the construction industry will then be considered. The petroleum industry in South Africa is subjected to the same environmental conditions that the construction industry is exposed to, yet the construction industry’s “best practice” procurement methods are not of equal standard. Some of the procurement methods within the petroleum industry will be explained and then one of the methods examined in more detail.

Benchmarking is a process or vehicle that uses existing standards in order to achieve better results through comparison. Survey results indicate that leading companies from most industries are benchmarking and furthermore these results indicate that benchmarking is not just limited to a specific type of industry. All industries can use benchmarking to better their performance (Deacon, 1998; Bendell *et al*, 1998).

The definition of benchmarking is not consistent. Some definitions on benchmarking include:

- In Shukko, Japanese employees were encouraged to learn not only the systems that their company were using, but the systems of other companies. The Japanese encouraged the transformation of “best practice” and technology. Benchmarking is based on comparing work systems (Fisher, 1996).
- The Japanese are said to be world leaders yet they learn from everyone else: “The success of the Japanese in using western technology as a benchmark for their own performance is evident by their international reputation in the commercial arena” (Bendell *et al*, 1998, pp. 7-8).
- Robert C Camp, Xerox Corporation, (1989) as cited by Fisher (1996), describes benchmarking as: “... the search for and implementation of best practices ... The continuous process of measuring our products, services and practices against our toughest competitors or those companies known as leaders.” (Fisher 1996, p. 14).
- Benchmarking is seen as a reference point to which processes are measured: “This is the essence of Benchmarking – moving from where you are to where you want to be.” (Chang and Kelly 1995, p. 5).
- The Economist, reporting on a study of benchmarking by McKinsey, (1991) as cited by Fisher (1996) explains as follows: “The theory; by working closely with the best-performing firms, benchmarking teams can learn how to implement the process and skills needed to make their own company a world-beater.” (Fisher 1996, p.14).
- The Royal Mail, UK, (1992) as cited by Fisher (1996) sees benchmarking as follows: “A structural process for learning from the practice of others, internally or externally, who are leaders in a field or with whom legitimate comparisons can be made.” (Fisher 1996, pp.14-15).

- Sarah Cook, *Practical Benchmarking*, (1995) as cited by Fisher (1996) describes benchmarking as follows: “Benchmarking is the process of identifying, understanding and adapting outstanding practices from within the same organization or from other businesses to help improve performance.” (Fisher 1996, p. 15).

Points of commonality, derived from the above definitions, can be summarised as follows:

- A correlation with other industries.
- A never-ending improvement.
- A desire to become the best.
- A comparison with existing standards.

Four different types of benchmarking are recognised, namely: Internal, Competitive, Functional (non-competitive) and Generic (Deacon, 1998; Fisher, 1996)

Internal Benchmarking is the comparison of processes and systems within a company or organization (Bendell *et al*, 1998). The advantages of this type of benchmarking are that the results are quick because data is easily available (Chang and Kelly, 1995). All comparative processes or systems are kept confidential. Any new discoveries are channelled back into the company. Some disadvantages are that this form of benchmarking is limited. There is only so much to compare in a small company. Expanding the company’s parameters becomes difficult (Fisher, 1996).

Competitive Benchmarking is to seek better processes from direct competitors. Access to this data is often very difficult (Fisher, 1996) and can be misleading (Bendell *et al*, 1998). Some large corporate organizations release selected information on “best practice processes” to the public and to the industries in which they are involved.

Functional (non-competitive) Benchmarking involves comparing unrelated industries or organizations that exercise similar functions (Fisher, 1996). Some of the advantages of this type of benchmarking are as follows:

- Leading organizations are easy to identify.
- Large portions of the information required are obtainable.

- Wider range of processes can be explored.
- An interacting partnership could develop.

The biggest disadvantage of this type of benchmarking is adjusting these newly discovered processes to suit the different organisations. Correct modifications will be required to be completely beneficial to the organisation (Bendell *et al*, 1998).

Generic Benchmarking can be explained as Best in Class (Fisher, 1996) or as World Class (Chang and Kelly, 1995). This form of benchmarking is executed by extracting processes from a non-competitive organisation. This organisation must be amongst the world leaders with regard to “best practice”.

This dissertation will assume a **Functional Benchmarking** approach which is defined as studying an organization that is non-competitive but exercises similar processes to the construction industry. This form of benchmarking will help the construction industry identify different processes of the same activities. The aim is to establish the best possible way of performing an activity. Functional Benchmarking from a non-competitive industry helps the construction industry change its way of thinking which could encourage innovation.

It is important to adopt a definition for the word “benchmarking”, since it does not have a common meaning (Fisher, 1996). This dissertation will adopt the principles stated by Fisher (1996, p.18) as follows: “In summary, benchmarking is asking yourself this question, regularly and critically: How can we do what we do better by learning from how others do it?”

Benchmarking relates to continuous improvement and to achieve this the benchmarking partner must also be subject to continual improvement. Figure 1-1 shows the scenario for the construction industry where the benchmarking partner maintains consistent standards and practices. This form of improvement will not however result in progression. One needs to continually aim higher in order to **reach** the required benchmark and then **narrow** the gap between the industries.

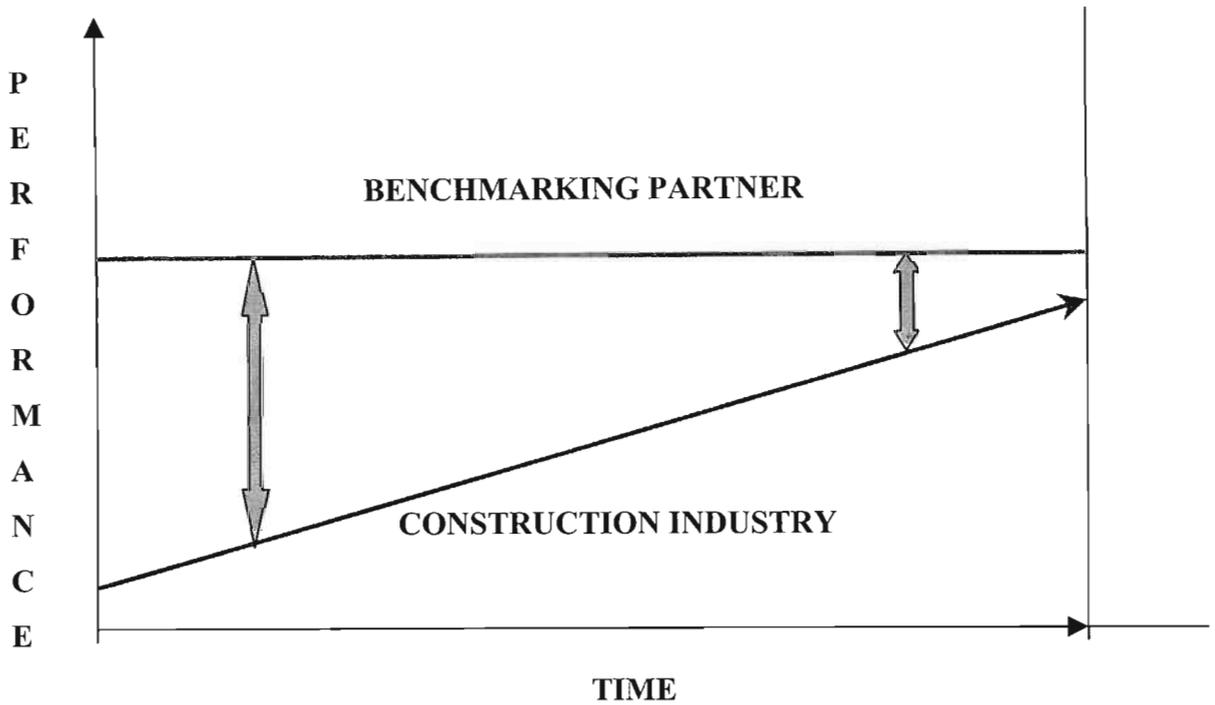


Figure 1-1 “Narrowing the gap” (Fisher, 1996).

It is a more difficult requirement to narrow the gap between the construction industry and an industry that is continually improving within itself. The petroleum industry is in a continual improvement process (Fisher, 1996).

Figure 1-2 shows the scenario when the construction industry benchmarks against an industry where continual improvement is present, such as the petroleum industry. The required benchmark is continually changing, making accelerating improvements very challenging. To close the gap between benchmarked industries, one needs to improve at a faster rate than the industry being benchmarked. This will ensure that the construction industry will reach the desired level and possibly become a world leader in “best practice” (Deacon, 1998; Preller, 1998).

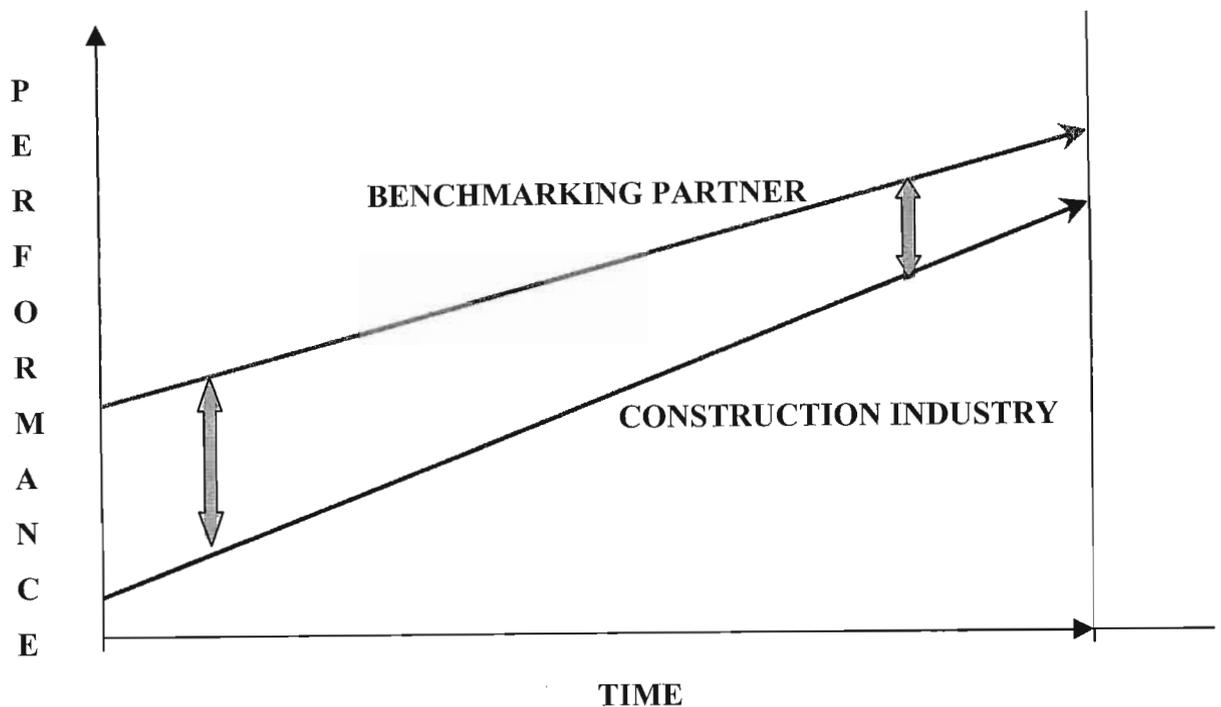


Figure 1-2 “Progressive Benchmarking” (Fisher, 1996).

1.2. Problem Statement

The problems that were evident in the United Kingdom as stated in the Latham (1994) and Egan (1998) reports, such as client dissatisfaction with quality, price and project duration, are similar to those in the South African construction industry (Hindle, 1998; Ofori, 2001). South Africa has additional issues, not covered in either of the reports, which adds to the complexity of the industry.

South Africa has experienced some dramatic changes in the past six years, resulting from a combination of two main factors. These are changes in government policy and economic instability. These particular changes have added to the South African construction industry’s problems (Hindle, 1998). These issues should be accepted and dealt with by all the stakeholders involved in the construction industry in South Africa (Ofori, 2001). Client satisfaction is not being achieved as a result of unacceptable quality, procurement systems and cultural attitudes (Smallwood, 1999).

The problem to be addressed in this dissertation may be stated as:

Quality management in the South African construction industry is considered to be unsatisfactory. To address this, performance enhancement can be achieved through benchmarking key activities against best practices established by other industries.

1.3. Research Objectives

The primary research objectives of this study are:

- 1. To establish the present state within the South African construction industry regarding quality management, specifically within the context of the sub-contractor selection process.*
- 2. To investigate the sub-contractor selection process within the petroleum industry and whether or not there is a clear indication that their systems achieve “best practice” status.*
- 3. To establish whether the practices within the petroleum industry can practically be applied to the sub-contractor selection process in the construction industry and whether such application is likely to improve the quality management process.*

1.4. Research Methodology

Latham (1984) and Egan (1998) identified problems within the United Kingdom construction industry and suggested a number of solutions, one of which was benchmarking. This dissertation, while accepting the findings and recommendations of Latham and Egan, seeks to further investigate the issue of benchmarking in the South African context, as the issues of the construction industry in the United Kingdom do not relate to those encountered by the South African industry. In most cases, when South African industries benchmark themselves with their international counterparts, the South African industries encounter different problems to the rest of the world (Ofori, 2001). For this reason, this investigation compares industries in the same environment (Deacon, 1998).

This study will therefore compare “best practices” taken from the South African petroleum industry to establish a “best practice” scenario in the South African construction industry. This study will focus on present methodology.

An investigation into the petroleum industry will be conducted. The findings of this investigation will then be modified to suit the construction industry so as to establish “best practices” that may be applicable. Contractor selection processes will be investigated with specific attention to the following issues:

- ***Quality*** of the finished product or building is measured by the client’s satisfaction, requirements and needs. Part of “best practice” adoption entails satisfying clients, not only by building that which is required, but adding value through ensuring top quality and zero defects.
- ***Information Technology*** in the construction industry is not being used to its full potential and older methods are still being practised. This paradigm shift needs to be addressed in order to advance the construction industry.
- ***Managing knowledge to facilitate collaboration*** will help improve the construction industry and improve client satisfaction.
- ***Ethics*** within the work place will be investigated. This is an area where the South African construction industry has much room for improvement. The “best practice” will be studied and compared.

These issues need to be addressed in the South African construction industry (Smallwood, 1998)

1.5. Hypothesis

The hypothesis to be examined in this research paper may be stated as:

The method of contractor selection used by the South African petroleum industry is a suitable benchmark model for adoption in the sub-contractor selection process within the South African construction industry.

1.6. Limitations

The limitations of this research are:

- It is limited to the South African petroleum and building construction industries.
- Only construction sector contractor procurement methods within the petroleum industry are investigated.

1.7. Structure of the Dissertation

This dissertation is made up of seven chapters, which will prove the hypothesis stated in this paper. The research is conducted in a logical process, which addresses all the relevant issues. The presentation format is as follows:

CHAPTER ONE is an introduction to the dissertation, which deals with all the background to the South African construction industry in relation to this study. This chapter also identifies “best practice” in other industries unrelated to the construction industry. A specific industry is identified, namely the petroleum industry. The chapter also states the hypothesis to be tested as well as the methodology that is to be adopted.

CHAPTER TWO identifies the existing literature on the petroleum industry with regard to the contractor procurement methods. The literature indicates that this differs markedly from systems applied within the construction industry.

CHAPTER THREE defines the contractor selection process, within the petroleum industry.

CHAPTER FOUR defines the sub-contractor selection methods that are practised in the South African construction industry.

CHAPTER FIVE analyses field research conducted with construction companies. The field research consists of questionnaire completed during interviews, regarding sub-contractors in the construction industry. All results are stated showing how the construction companies procure and manage sub-contractors.

CHAPTER SIX compares the results of the field research in Chapter Five with the contractors procurement methods from the petroleum industry. Comparisons are made between the two methods and 'best practice' methods are benchmarked with the petroleum industry.

CHAPTER SEVEN presents the conclusion of this research. The Hypothesis is discussed and recommendations are suggested.

REFERENCES lists the published material cited in the dissertation.

BIBLIOGRAPHY presents a list of publications not cited in the dissertation, but which have been collected and inspected during the research. Although they are not cited directly in the dissertation they have helped to shape the researcher's ideas and views on the subject. Their inclusion may also assist other researches interested in areas related to this investigation.

APPENDICES provide information that is pertinent to the study but is inappropriate to incorporate within the main body of the text.

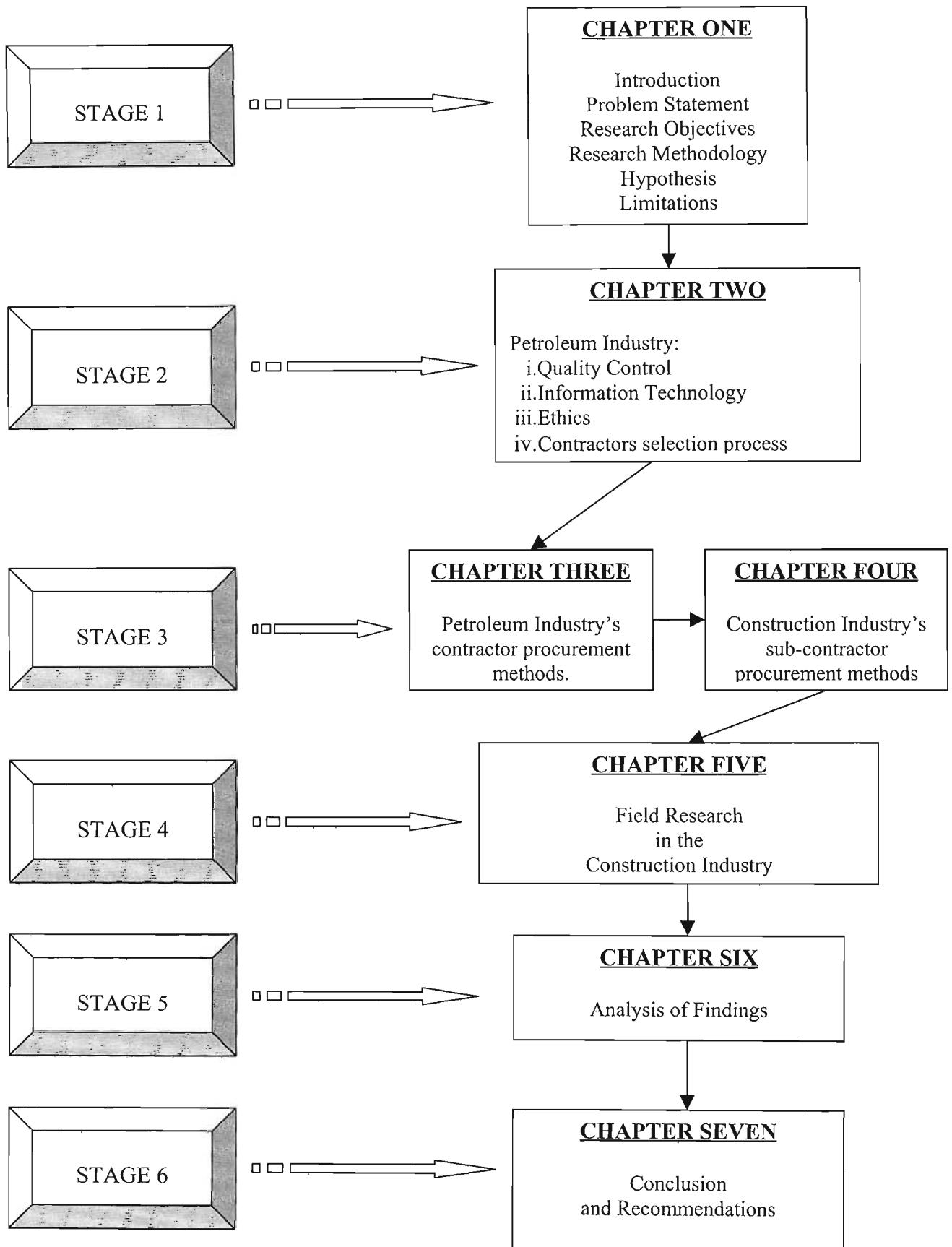


Figure 1-3 “A pictorial representation of this dissertation”

CHAPTER TWO

2. PROCUREMENT IN THE PETROLEUM INDUSTRY

2.1 Introduction

This chapter investigates the procurement environment in the petroleum industry and its effect on the construction contractor procurement process.

The procurement environment defines the framework within which procurement is implemented. Four key elements of this framework have been identified for analysis, namely:

- i. Quality control.
- ii. Information Technology: its use within the petroleum industry.
- iii. Managing knowledge to facilitate collaboration.
- iv. General ethics within the work place.

Analysis of these elements is via examination of best practise procedures used by Engen Petroleum Limited (EPL) and BP Amoco.

2.2 Quality Control

Engen Petroleum Limited (EPL) devotes significant resources to producing construction projects of a high quality standard. Being a large organization, effective systems are essential for the improvement of the organization as a whole. Quality control can only be implemented by introducing Quality Awareness (Rounds, 1985). The awareness must be introduced in such a way that quality control becomes a way of life within the work place (Egan, 1998).

Employees and Contractors should be proud of their workmanship. They should be able to deliver the finished product confidently. Fletcher and Sukes (2000) believe that the key to customer loyalty and support is how the product is sold, serviced and delivered. They believe that if any one of these three elements are lacking, that business's growth is jeopardized. Thus the quality awareness of the Contractors employed effects the quality of product, service and delivery achieved by EPL.

EPL use a standards approach to quality control, by adopting ISO 9000 / 9002, as well as other international standards, as their tool to achieve better quality control. This use of standards has created a vehicle for continual improvement. Engen Petroleum Limited (2001) believes that the use of standards ensure that they continue to strive for Operational Excellence and consistently meet their agreed Customers' requirements in a competitive and cost effective way.

Employee quality awareness plays a vital role in achieving high quality standards. The method used by the petroleum industry to implement employee awareness, is initiated by a specialist consultant interpreting the standard required. Employee training forms part of the understanding of customer satisfaction and added value (Vincent and Joel, 1995). EPL engage in regular meetings that comprise training, to ensure that the required standards are understood by all employees (Engen Petroleum Limited, 2001).

Kerzner (2001) suggests that responsibility is essential to ensure that employees are quality driven in stating "In many organizations, the employees at the lower end of the organizational chart have the least understanding and receive the least input regarding their functional capabilities". EPL addresses this by encouraging total employee participation throughout their organization. This allows every employee an opportunity to make suggestions to continuously improve any of the existing processes or procedures (Engen Petroleum Limited, 2001).

Employee meetings in the various operational divisions are organised on a regular basis. Suggestions are taken forward from these meetings, to head of division meetings. Different employees from each division attend each head of division meeting. This gives each employee a chance to learn and be present in the head of division meetings (Choppin, 1991). Kerzner (2001) supports this approach, noting that this process ensures that all employees participate as team players within the organization and become aware of the quality requirements. This process enables employees throughout the organization to develop their own form of quality analysis, teamwork and benchmarking improvements (Choppin, 1991). There is always a better way, and employees usually best qualified to establish this are those closest to the work itself. These quality requirements will improve customer satisfaction, which has been recognized as one of the driving criteria for any organization (Engen Petroleum Limited, 2001).

Continuous improvement by employees ensures that customer satisfaction will grow and thus strengthen a company's market position. "Continuous improvement allows a firm to maintain its competitive advantage even when the competitors counterattack." (Kerzner 2001, p. 1061). This is reinforced by EPL via supplementary employee training presented by each branch manager. Emphasis is placed on the employee's understanding of quality control and the need to improve. The link between quality control and customer satisfaction is direct and effective. Dr. Armand Feigenbaum of the General Systems Company in the United States of America reinforces this point in defining quality in the context of its relationship with the market, stating that "Quality is what the customer says it is. In today's market, when a buyer likes your product he or she tells six others; when they dislike it, they are likely to tell 22 others." (Feigenbaum, 2000, p. 3).

EPL have used many of Dr Armand Feigenbaum's systems, namely General Systems, as a guideline, adjusting them to suit South African environments. These General Systems have helped EPL attain "best practices".

EPL believe that it is attainable to achieve "best practices" and the resultant high quality level without incurring significant additional cost. Dropping the quality to save on costs, will only mean spending those savings later to fix poor quality (Egan, 1998). Unfortunately, fixing poor quality usually costs considerably more than the original saving made by dropping the quality. "... the non-conformance cost could easily be an order of magnitude greater than the conformance cost. The moral is clear: *"Build it right the first time."* (Kerzner 2001, p. 1100). Further to this cost is the reputation that a company gets once they are branded with producing poor quality. Many companies do not put a cost to this bad reputation (Rampsey and Roberts, 1992). EPL focus on quality improvement, which builds the company's strength rather than diminishing it.

Clearly quality control requires a holistic approach. Vincent and Joel, (1995) believe that the method to achieve this is constant emphasis on quality throughout the organization. Choppin (1991) notes that implementation of quality control requires an understanding the concept of quality and customer satisfaction. It is vitally important to achieve a high standard of quality and continually strive to better that quality (Evans and William, 1993). This approach of continuous improvement of quality control is demonstrated in EPL's belief that they can no longer focus their quality

programs only in terms of reduction in defects and poor workmanship. The company now strives to “add value” by anticipating unforeseen problems and avoiding them before they occur.

2.3 Information Technology: its use within the petroleum industry

EPL uses Information Technology (IT) throughout their entire organization. IT is not only for the use of top management but also for all employees at all levels of employment (Earl, 1989). All processes are computerized and it is a requirement for all employees to have this user knowledge. EPL insist on regular IT skills training due to the ever-changing nature of the IT industry. If employees do not attend these courses, promotions within the organization are jeopardized. This ensures that the all employees’ knowledge of IT systems is both adequate and current.

All employees receive and send information quickly within, as well as outside, the organization (Rothnie, 1995). Kerzner (2001, p. 58) supports this use of IT from a project management perspective, stating “With the rapid advancements in computer technology of recent years, management realized the need for timely access to information ...”. IT also monitors information flow, the time and date of each message being recorded. The process of IT is used extensively in Managing Knowledge within the organization (Engen Petroleum Limited, 2001).

2.4 Managing knowledge to facilitate collaboration

BP Amoco encourages their employees to share knowledge, which stimulates other kinds of resource sharing, resource coordination, group problem solving and group value creation. BP Amoco formed an internal division which they named Progress. Progress introduces knowledge-management practices into the organization through a process called BP Amoco Common Process, (ACP). This was implemented to encourage collaborative behaviour (Best Practices, 2000).

A framework was set up throughout the organization to ensure that all knowledge is transferred between divisions. This framework is depicted graphically in Figure 2-1 “*Knowledge Flow*”.

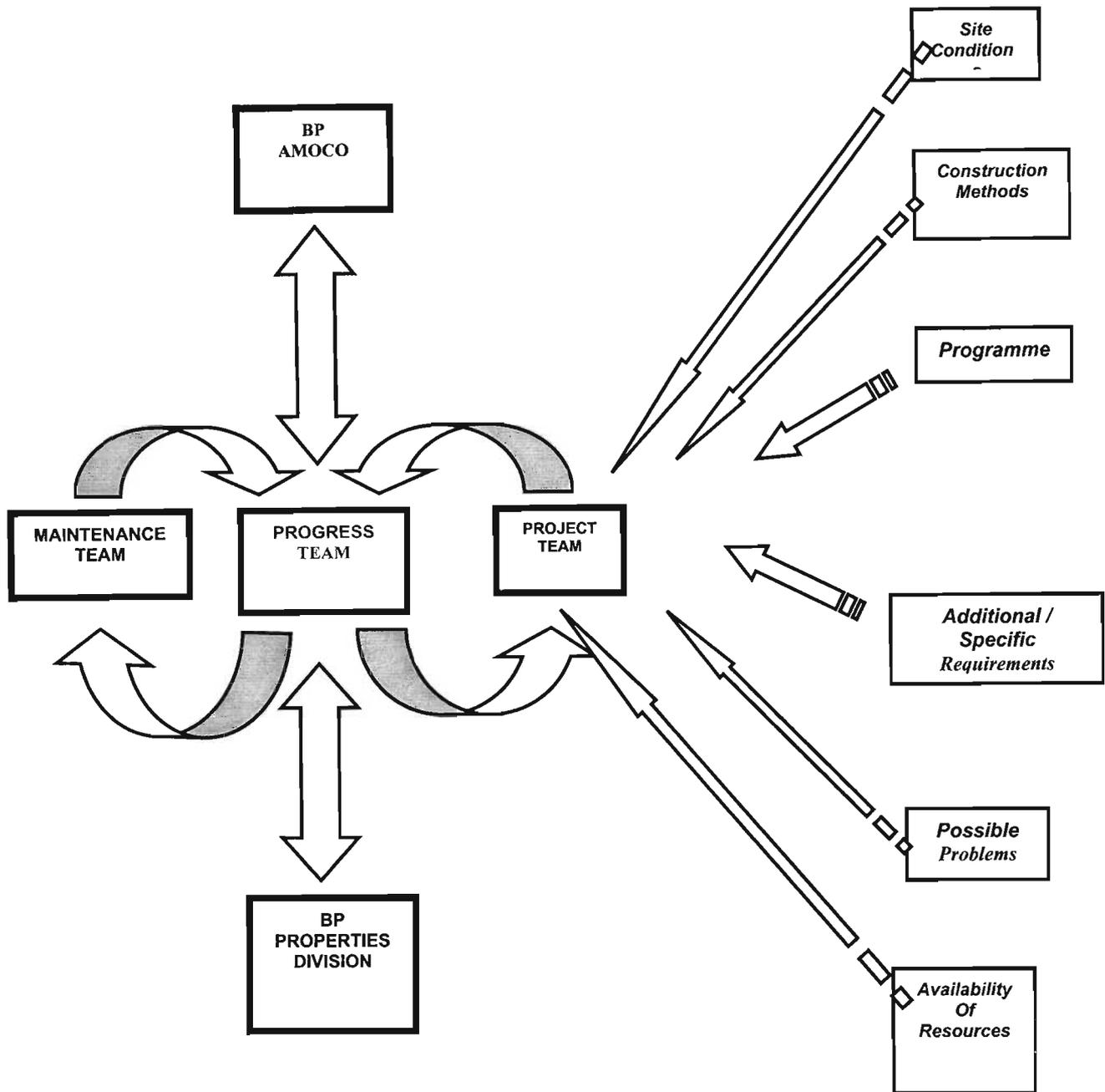


Figure 2-1 “Knowledge Flow” (Best Practices, 2000).

ACP has a staged and “gated” process in using knowledge to facilitate collaboration within the company. When a division encounters a new project/challenge/problem, the information is networked to all divisions via Intranet. Experienced teams (project teams) are formed to solve problems and streamline processes on new projects. The ACP guidelines require managers to exchange views with other divisions. These views are captured in a database. After every stage, data are captured onto the database. Managers cannot pass from one stage to another without meeting all the

knowledge collaboration requirements i.e. discussing and consulting with all divisions. Project team members have to review all options before moving onto the next stage (Best Practices, 2000).

In the short-term programme, this process is time consuming, but in the long-term, conclusions will be established more quickly and accurately via the intranet's knowledge collaboration. This process is essential so that in the future, when a similar problem arises, the answers or guidelines can be obtained on the database (Morgan, 1986).

The intention of ACP is to prevent employees from repeating each other's work, and making unnecessary mistakes. The project or task leader is called the Gatekeeper (Best Practices, 2000). The gatekeeper identifies clearly the main goals, objectives, strategies, possible short falls and limitations to the project team. After assessing these issues, the project goals, objectives, programmes and customers needs are then attended to (Mc George and Palmer, 1997).

The ACP guides each stage that the project team encounters. Past experiences, solutions and results are taken into consideration before any procurement methods are used. Considerations as to whether or not to proceed to the next stage are evaluated. i.e. to proceed, put on hold or terminate the projects are considered. Again all stages are documented into the database for other employees to review (Mc George and Palmer, 1997). The strength and usefulness of the database increases as more and more projects are added and can be accessed by others within the company. The bigger the database, the less chance of repeating mistakes. This process of decision-making helps less experienced employees gain vast amounts of information easily and quickly. The same knowledge gain might take a young employee many years to accomplish (Morgan, 1986).

Existing data are reviewed and discussed at regular meetings. Team members share their findings and problems with the whole organization. Conclusion are extracted from the data and formulated into summaries. These summaries are distributed throughout the organization to ensure knowledge collaboration (Best Practices, 2000). Kerzner (2001) supports this knowledge sharing warning that knowledge collaboration is something that has to be driven and maintained within an organization for it to be effective.

2.4.1 Problems encountered implementing ACP

Kerzner (2001) warns that knowledge collaboration is something that has to be driven and maintained within an organization for it to be effective.

In implementing the system, BP Amorco encountered many problems that had to be rectified to ensure successful continuation of the system (Best Practices, 2000). The problems were as follows:

- Employees were failing to update the database on a regular basis.
- The updating of processes and events was time consuming and therefore costly.
- Employees felt that they knew the answers to all problems and did not need to refer to the existing database.
- Employees felt that only certain projects should be recorded on the ACP. They felt that some projects were too small to be processed on ACP.
- Inaccurate and insufficient information processed into the ACP by employees.
- Some employees found that ACP was not “user friendly” enough. i.e. employees found the package difficult to use and therefore avoided using it.

(Best Practices, 2000).

These problems were attended to as a matter of urgency, to ensure the enthusiasm within the company was maintained. Problems with implementing similar systems in other industries were also encountered. BP Amorco believed that although it is important to benchmark against other companies, in implementing such systems, the system be tailored to suit individual companies and needs. Bogan and English (1997) support this approach noting that there is no single best approach to knowledge management and best practice. Each organization must customise a system that fits its employees’ work habits and cultural preferences (Best Practices, 2000).

Examples of solutions achieved by BP Amorcio are as follows:

- Stage Processing was introduced to ensure that correct processes were followed. Five stages were identified.
- Updating the database is time consuming and costly in the beginning. However, as more and more data are captured and stored in the database, quicker answers or solutions can be obtained for future projects. From a holistic view this process is not time consuming but on the contrary, will save the company money and time.
- Employees soon discovered that answers and solutions that they, as individuals, attain are not always correct or the right solutions.
- All information, from every project that is done, must to be captured to ensure that the database increases.
- The ACP has helpful guidelines to ensure that accurate and sufficient information is captured from each project to ensure maximum benefit for all employees. The “Gatekeeper” was introduced to ensure that all data were correctly captured before moving on the next stage.

(Best Practices, 2000).

2.5 General ethics within the work place

EPL strives to be a winning company by always operating within the laws of the land, in accordance with good business ethics and in a safe and environmentally responsible manner (Peale and Blanchard, 1988). In addition, they consider the nature of relationships established to be a reflection of their ethical approach. Win-win relationships are established with all stakeholders (Capra, 1997). EPL’s driving force of adding value to all ventures has become a way of life (Engen Petroleum Limited, 2001).

EPL’s general business principles derived from their desire to operate in an ethical manner, are as follows:

- Economic value will be supplied and delivered to all stakeholders.
- All the agreed needs of the customers will be met.
- Adding value will be a priority.

- Win-Win relationships will be established with all stakeholders to ensure total and complete satisfaction.
 - By having committed and competent employees EPL will establish a sustainable competitive advantage.
 - All business will be pursued with honesty, integrity and fairness.
- (Engen Petroleum Limited, 2001).

These principles are carried out nationally and internationally (Armstrong, 1999). Internal seminars are exercised regularly in order to sustain the high standard of general business ethics (Schwenke, 2000). Engen Petroleum Limited (2001) believe that they measure their success by how they meet their commitments, the long-term value they create for their shareholders, the pride of their employees in their accomplishments, the satisfaction of their customers, and the extent to which the communities, both local and international, judge their activities as beneficial.

EPL also believe that business values and people values are fundamental to achieving ethical business practice. “Engen’s Employment policies and practices are designed to be the best in South Africa. These include freedom of association, the right to organize and bargain collectively, prohibitions on forced labour, illicit child labour and any form of discrimination in employment.” (Engen Petroleum Limited, 2001, p. 2).

2.6 Contractor selection process

The primary procurement method differs between the South African Construction and Petroleum industries.

The primary procurement arrangement in the construction industry is the appointment of a main or principal contractor who contracts with the client for the provision of the construction project. The principal contractor will then appoint special contractors to undertake the work on his behalf, or undertake the work with own resources. The current trend of an increasing number of sub-contractors employed on construction projects, amending the role of the principal contractor, is well documented.

EPL has, for a very long time, sub-contracted their work. Their construction team is sub-contractor intensive and the construction process is managed by a professional

project team. This process of constructing refineries has been in practice in the petroleum industry for many years (Engen Petroleum Limited, 2001). Hindle, (1991) suggests that this trend is the result of modern day construction methods and higher demands from clients. Mohsini and Davidson (1991) point out that this process change within the industry will lead to a change in the way the construction projects are managed by the principal contractor. Managing sub-contractors has become vitally important in the construction industry. It now forms a large part of the process of fulfilling the client's requirements (Hindle, 1998; Egan, 1998).

Procurement of construction projects, within the petroleum industry (inclusive of maintenance type projects), is achieved via the appointment of a range of specialist contractors. All contractors have a direct contractual relationship with the petroleum company. The process is managed by a team of project professionals. EPL believes that this procurement method allows them to select the best contractor for a particular project without the complexity of working via a principal contractor. Contractors are pre-screened, analysed, evaluated and monitored (discussed further in Chapter 3), a process that EPL believes achieves the best results for the client. The time and money is well spent prior to the sub-contractor being awarded the project. This ensures the best results at the best cost (Engen Petroleum Limited, 2001).

A contractor database is available to all employees of EPL. This database is updated on a regular basis to ensure that the best contractors are available at all times (Rothnie, 1995). Once a contract is awarded, the construction team logs onto the contractor database and searches for the best contractor available for the required job. All the information about the contractor is available on the network for the user to read and view (Engen Petroleum Limited, 2001).

Having examined the procurement environment that exists in the petroleum industry, the effect that this framework has on contractor procurement can be summarised as follows:

- Contractors have direct contracts with the client (the petroleum company) allowing the establishment of a performance record and an ethical business relationship.
- Quality standards are recorded and monitored on a database, which is networked to all employees (Rounds, 1985). The user can log on to a

particular sub-contractor and find out their quality standards and see workmanship on previous contracts. The user can quickly establish if this particular contractor is suitably qualified for the project. All contractors on the database have been pre-screened by the sub-contractor selection manager (Engen Petroleum Limited, 2001). This creates an incentive for contractors to perform at a high quality level on all contracts.

- Information Technology allows the networking of information about contractors. This process helps with managing knowledge to facilitate collaboration. The database stores current information about the contractor so that the user can acquire information accurately and quickly. Information technology allows all users to receive the same information about the sub-contractor at the same time. Users express comments about the sub-contractor on the database. This helps the new user procure the correct sub-contractor (Morgan, 1986). This knowledge collaboration helps new user's not repeat previous mistakes made by earlier users (Engen Petroleum Limited, 2001). This has the effect of increasing specialisation in respect of work undertaken by contractors. It allows consideration of a contractor's track record in the selection process.

- The general ethics of the contractor are expressed on the database for all to see (Peale and Blanchard, 1988). Any good or bad experiences received by users are downloaded onto the database. For the sub-contractor, being continuously monitored encourages them to strive for excellence. This creates a 'win-win' scenario for all stakeholders (Engen Petroleum Limited, 2001).

2.7 Summary

The petroleum industry has adopted a standards approach to achieve high quality in a controlled environment aimed at customer satisfaction. Employee involvement and training have been identified as key success areas in achieving effective quality control.

IT is used to facilitate knowledge collaboration and record keeping. This allows consideration of performance history in the contractor selection process, even when new or inexperienced staff are involved in the process.

The adoption of ethical business practices and the creation of mutually rewarding business relationships are seen as criteria to measure overall success.

As shown in Chapter One, there is a need to benchmark against an industry that has a common process to the construction industry i.e. a large number of specialist contractors used in construction projects. This is common to both the petroleum industry and the construction industry although the overall procurements arrangements differ. What is not common is the procurement process of these contractors. This dissertation will reveal both processes and demonstrate the different results from each process.

The significance of this chapter is to show that the petroleum industry has implemented 'best practice' systems to achieve high quality levels in construction projects. Furthermore, the petroleum industry accepts that 'best practice' is a never-ending process.

CHAPTER THREE

3. CONTRACTOR SELECTION IN THE PETROLEUM INDUSTRY

3.1 Introduction

The petroleum industry has a large portion of their construction work implemented by contractors (Engen Petroleum Limited, 2001). Total quality management is an underlying philosophy in the management and selection of contractors. Through total quality management the petroleum industry believes that all contractors will benefit in a continuously improving process (Engen Petroleum Limited, 2001). EPL and BP Amorocho believe that the greater the unity between the project team and the contractors, the greater the positive improvements and the greater the problem prevention (Hellard, 1993). Thus they have developed active links with contractors.

Contractors in the petroleum industry play an essential role in the construction of the projects. Due to the vast diversity of processes in constructing a refinery, the cost, quality and timing are critical to the project's overall success.

In order to ensure adherence to total quality management, the petroleum industry insists that every contractor participates in the following procedures:

- Site induction courses involving total quality management are given to each employee that works on site.
- Each contractor must have a supervisor who represents the contractors organisation.
- The results of the contractor's assessments are fed back to the company in order to improve in the future.

The petroleum industry believes that by assisting in bettering the contractors' performances it will improve the overall project performance (Hellard, 1993).

3.2 The Contractor Selection Process

The process of procuring contractors in the petroleum industry consists of three main stages, namely:

1. A pre-qualification process.
2. A categorisation and selection process.
3. A performance evaluation, appraisal and re-categorisation process.

Each stage of the process is controlled and monitored by the contractor selection manager who is responsible for implementing the established company guidelines and the processes that need to be followed. They are also responsible for updating all relevant data. Knowledge collaboration plays an important role in this process. Information is easily accessible to all employees in the company. The interaction between all parties is the key to the petroleum industry procuring the *best* contractor for a particular project.

3.2.1 The Process.

3.2.1.1 Stage One : Pre-Qualification

Figure 3.1 is a graphical representation of the process more fully described in this section. The process is initiated by a request, via the company database, for a contractor for a particular project. If a database match between request and a contractor is found, the process continues directly into stage two.

If, however, there is no database match, contractors not on the database are approached and given an opportunity to complete and submit a pre-qualification form. This pre-qualification form must be completed and accepted by the contractor procurement manager before a potential contractor is allowed to complete the contractor application form.

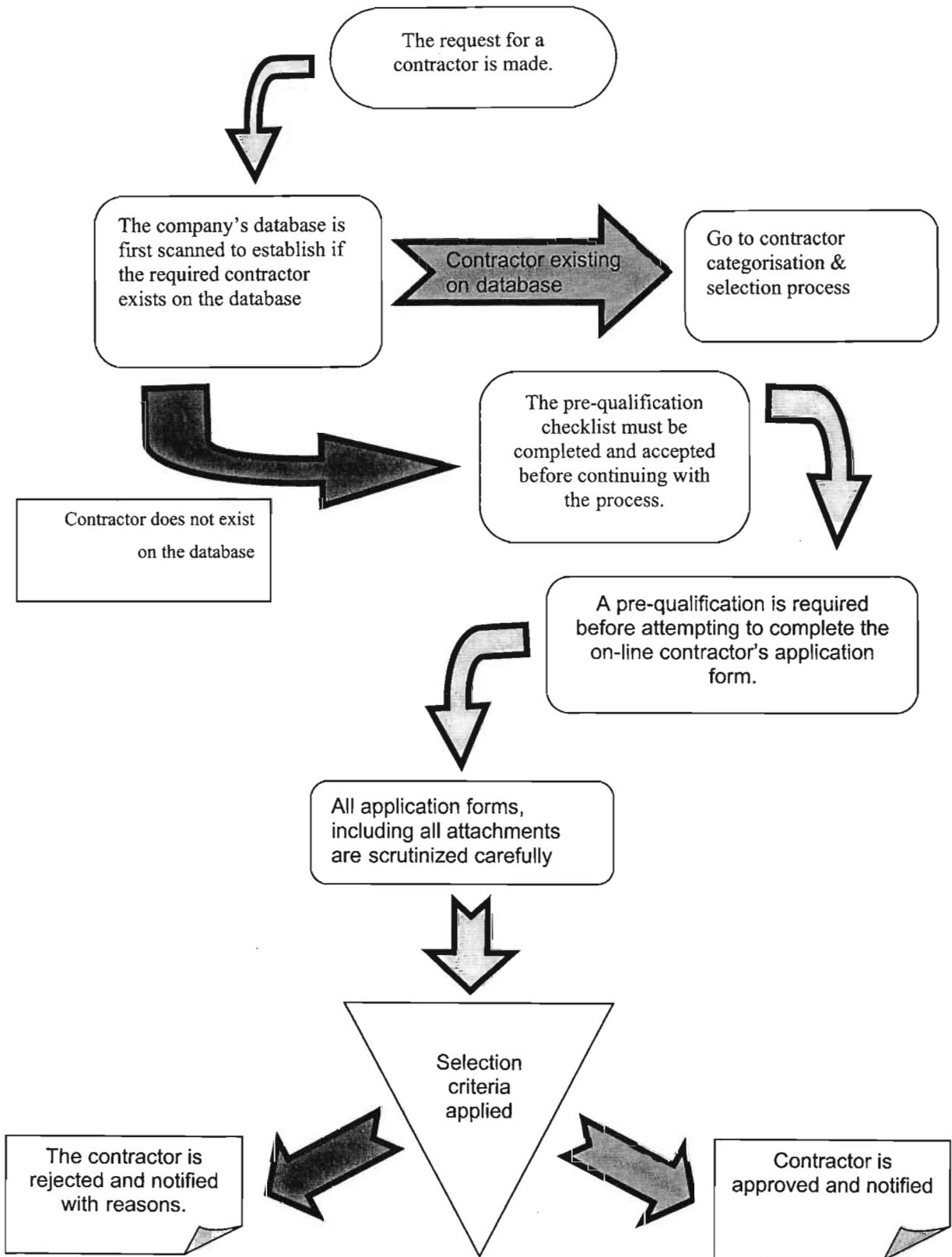


Figure 3-1 “Stage One” (Engen Petroleum Limited, 2001).

The following pre-qualifications documentation is required:

- Bank cancelled cheque.
- Completed contractor's pre-qualification questionnaire.
- Quality audit report.

The procurement manager screens the pre-qualification forms. This person acts as the gatekeeper to ensure that all contractors have the correct credentials in order to qualify for the submission of the contractor's application form (Engen Petroleum Limited, 2001).

Once the procurement manager has approved the pre-qualification form, the contractor then qualifies to attempt to complete the on-line contractor's application form.

The contractor's application form consists of five sections namely:

1. General Information.
2. Business Profile.
3. Quality Standards.
4. Previous Projects.
5. References.

All sections and all questions are compulsory. If any sections are incomplete, the application will be deleted off the system. Once the application is submitted, the process of approval proceeds (Engen Petroleum Limited, 2001).

The approval is calculated on a point system that is equal for all contractors. Each question and requirement carries a certain credit rating. The credit ratings for the sections one and two, 'General Information' and 'Business Profile' respectively, are done by the commercial and financial assessment managers. All information that is of a confidential nature will not be available to users of the contractors procurement database.

The commercial and financial assessment managers assess the following:

- The financial status of the contractor.
- The contractor's ability in achieving financial stability.
- The contractor's ability in fulfilling all contractual obligations.
- A contractor's office visit is carried out.
- The contractor's bank manager is required to give an accreditation on the contractor.

In section three and four of the questionnaire, 'Quality Standards' and 'Previous Projects', respectively, a Quality Manager and a Health, Safety and Environmental Manager assess the contractors previous work and previous projects. These managers carry out site visits in order to assess the contractor's work. The same points system is applied to assess the contractor's work (Engen Petroleum Limited, 2001).

The quality managers and the health, safety and environmental managers assess the following:

- The contractor's effective quality management.
- The contractor's innovativeness.
- The contractor's technical capabilities.
- The qualification of the contractor's employees.
- The contractor's current workload.
- The contractor's strength in after sales service.
- The equipment that is owned by the contractor.
- The contractor's ability in achieving the required goals.
- The contractor's actual safety representation on site.
- The contractor's actual safety facilities on site.
- The condition of the contractor's equipment.
- The contractor's actual supervision on site.
- The contractor's housekeeping.

All relevant assessors use the references submitted by the contractor to help with the points system. The credits are totalled at the end of the approval process. All information is then consolidated and submitted to the contractor selection manager.

The contractor selection manager scrutinizes the results and all relevant parties have a meeting to discuss the results. A final decision is made and the contractor is notified via a 'Welcome Letter' if approval or a 'Rejected Letter' with reasons, if disapproved.

3.2.1.2 Stage Two : Categorisation and Selection

Once the contractor has been approved, the assessment and categorisation process takes place as shown in Figure 3-2. This process places the contractors into a ranking order according to their points accumulated on the contractor selection point system. The database is updated on an ongoing basis to reflect the current rating of all contractors. The contractors become competitive to produce the best possible service to improve their current rating. In this way, the petroleum industry selects the best possible contractor for the project.

The petroleum industry acknowledges the need for a contractor network that consistently delivers the quality goods or services on time and at the best price. Procuring the correct contractor eliminates or minimizes problems that may occur during and/or after the project. The industry believes that this is the key to a successful project.

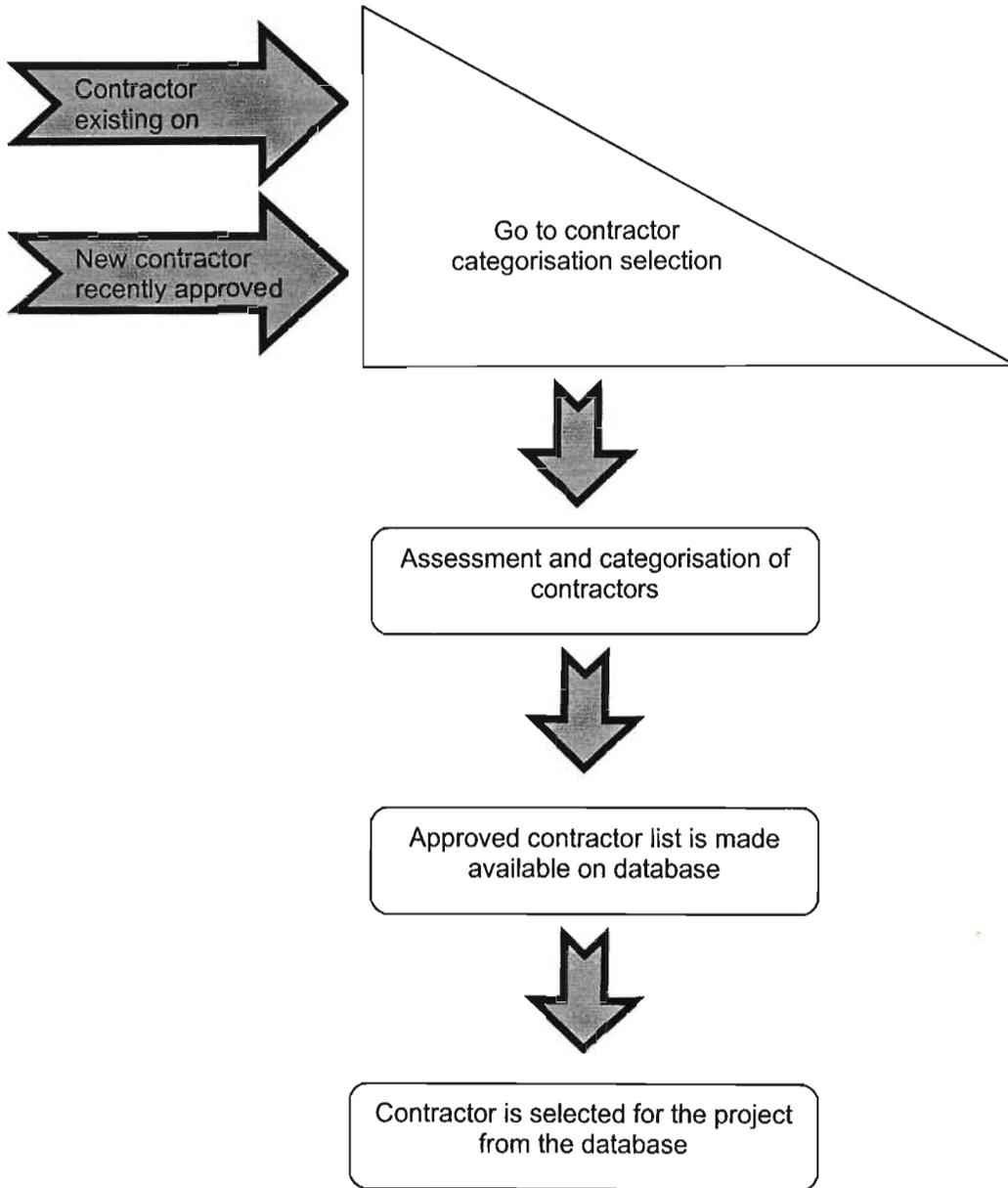


Figure 3-2 “Stage Two” (Engen Petroleum Limited, 2001).

There are four categories of contractors, defined as follows:

- A – **TOP** contractor in its category (a preferred contractor).
- B – **GOOD** contractor
- C – **AVERAGE** contractor.
- D – **POOR** contractor.

A **TOP** contractor is formally accredited in terms of SABS ISO 9000 and/or SABS ISO 14000 series; whichever is relevant to that particular contractor. If a contractor delivers outstanding performance but is not ISO accredited, this contractor can still qualify as a ‘Category A’ contractor. Conversely, if a contractor is registered to ISO and does not deliver or perform as required, they will not qualify as a ‘Category A’ contractor. This process will be elaborated later in this Chapter under ‘Stage Three’.

A **GOOD** contractor has a well-documented and effectively implemented quality management system complying with international standards. The contractor is not formally ISO accredited. This particular category of contractor delivers on time and displays a strong willingness to accommodate others in working as a team player to produce the same goal. (Engen Petroleum Limited, 2001).

An **AVERAGE** contractor has a quality management system that is only partially documented and effective. At least 50% of the quality management system procedures are documented and implemented. Great precaution should be taken with all quality and technical issues before proceeding with these contractors. (Engen Petroleum Limited, 2001).

A **POOR** contractor is only considered if there are no other contractors available. The contractor could be a sole supplier or possibly a monopolistic contractor. Great precaution should also be taken with all quality and technical issues before proceeding with these contractors (Engen Petroleum Limited, 2001).

3.2.1.3 Stage Three : Performance Evaluation

Once the contractors are on site and undertaking the work, they are monitored closely on all the criteria upon which they were selected. This enables the upgrading or downgrading of the contractor category, depending on performance and other relevant criteria. (Engen Petroleum Limited, 2001).

The points system allows each contractor the opportunity of achieving high points according to the required criteria. The process is unbiased and allows each contractor a fair chance of achieving an 'A' grade status. The points system allows a contractor without an ISO accreditation to achieve an equivalent or higher grade to a contractor who has an ISO accreditation. (Engen Petroleum Limited, 2001).

This is achieved when a contractor produces excellent work, on time and at the best price, as well as other added values, to help the petroleum industry achieve their goals. The particular contractor may have very high points in other areas and the overall total is sufficient to gain an 'A' grade status. This eradicates the notion of contractors being ISO accredited for purposes of having the certificate. (Engen Petroleum Limited, 2001).

Unfortunately it is harder for the 'excellent' contractor, without an ISO accreditation, to achieve an 'A' status immediately as they will have to prove that they are an asset to the petroleum industry and are worthy of a high status ranking (Engen Petroleum Limited, 2001). Figure 3-3 shows the process graphically.

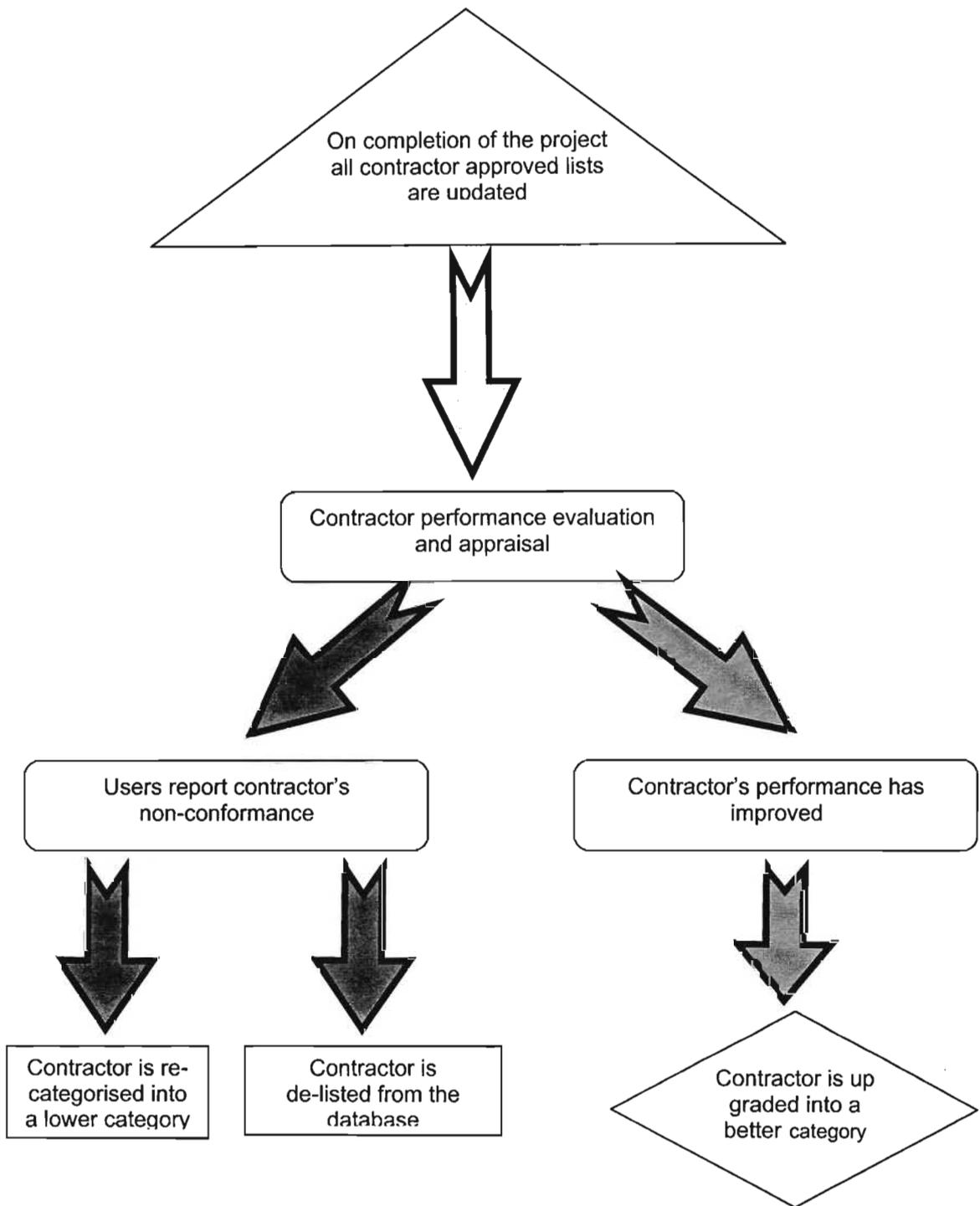


Figure 3-3 “Stage Three” (Engen Petroleum Limited, 2001).

The points system also ensures that all contractors work towards maintaining their status. Failing to perform will lead to re-categorisation to a lower status. The ongoing assessment of the rating of the contractor's performance ensures that a high standard is maintained at all times.

The users of the database in the petroleum industry are vital to the success of this procurement process. Each user must supply feedback on all the contractor's used. This information is a critical step in the contractors' performance monitoring process. Without this feedback an accurate assessment cannot be made.

If a user reports bad workmanship or non-conformance of a contractor, the contractor may have to be audited by a quality manager. If the users encounter critical non-conformance, the contractor selection manager will be notified and suitable action will be imposed. The result could lead to the contractor being de-listed.

The contractor's poor performance is addressed with great seriousness. The process, as shown in Figure 3-4, starts with the user notifying the quality management as well as the procurement management. An attempt to manage the non-conformance by all parties is pursued. If the problem is resolved, the contractor is officially warned and no further action is taken.

If the problem is not resolved, the quality manager audits and monitors the contractor over a period of time. If the contractor shows improvement, the process and details are recorded but no further action is taken.

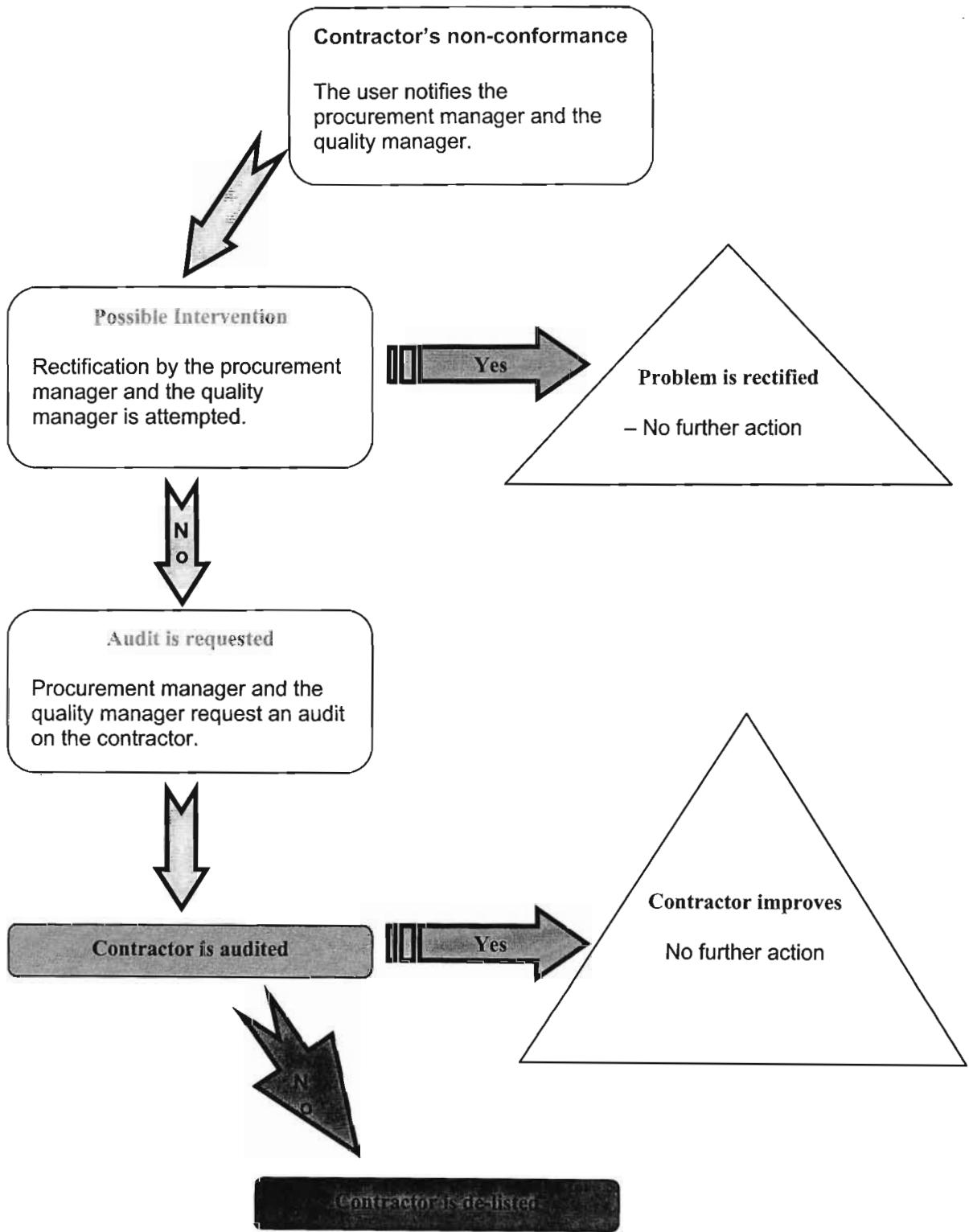


Figure 3-4 “Process of Contractor De-listing” (Engen Petroleum Limited, 2001).

If, however, the auditing team finds no improvement or no commitment to implement effective corrective action is noted, the contractor's ratings are lowered or the contractor is de-listed. The contractor is notified in writing of the reasons for being de-listed. Contractors not performing to the petroleum industry's requirements are deleted from the contractor's database. The database reflects the current category ratings of the contractors. All users are immediately notified of the contractor's de-listing. Some of the reasons for contractors being de-listed are as follows:

- The contractor is no longer able to offer a particular service.
- The contractor services are no longer required by the petroleum industry.
- The service that the particular contractor offers, no longer meets the petroleum industry's standards.
- The contractor's performance in terms of quality, service and competitiveness is no longer acceptable to the petroleum industry.
- The contractor is involved in unethical behaviour.
- The contractor becomes insolvent or stops operating.
- The contractor's Health, Safety and Environment record is poor.
- The contractor does not co-operate in periodic technical, quality, commercial or safety evaluations.
- A contractor under the one-time category will be removed from the contractor database list after six months.

All de-listed contractors will only be able to re-apply after a period of twelve months unless there are exceptional reasons. The procurement team will examine this closely.

The categorisation of a contractor is based on a dynamic rating system, which continues to measure performance on a continual basis. The ranking system

could categorise an ISO accredited contractor as a 'D' status purely due to consistently poor performance or other equally critical reasons.

The rating system ensures that the *best* contractor is awarded the project not just from one criterion or from an individual opinion, but from a structured selection process. The selection process has been structured to help all stakeholders in the petroleum industry.

3.3 Summary

All contractors are procured under a consistent selection process, therefore eliminating any biased awards. Each contractor is given a fair chance to conform to the petroleum industry's requirements. Preference will be given to a contractor who meets the required criteria and whose commitment to customer service, satisfaction and professionalism is evident. Via the process of selecting appropriate contractors, the petroleum industry invests considerable resources in identifying, developing and maintaining contractors who meet or exceed the industry's needs.

All contractors have to be approved and accepted in terms of a three-stage contractor selection system prior to being appointed to do any work in the petroleum industry.

The system relies on responsibility of the procurement team to ensure that the contractor database reflects current updated information. This requires review on an ongoing basis and capturing of review results.

The database forms a network for all users to input their comments about contractors allowing the next user, of that particular contractor, to be informed of the strengths and weakness of the contractor. This facilitates more effective contractor selection and monitoring.

Contractors are aware that they are under continual monitoring and therefore strive to maintain excellence. This process also allows each contractor the opportunity to upgrade into a better category, which will ensure more work. This process ensures a 'win-win' scenario is maintained.

CHAPTER FOUR

4. SUB-CONTRACTOR SELECTION IN THE CONSTRUCTION INDUSTRY

4.1 Introduction

This chapter discusses the South African construction industry processes of selecting sub-contractors. The process of selection and adjudication as well as the problems that stem from this process are explained.

The construction industry is in a state of flux with respect to the role of specialist sub-contractors in the industry. The industry has changed in many ways; one being, large portions of work are now being done by sub-contractors (Ofori, 2001; Lavender, 1996). The reason for this is that buildings are becoming more sophisticated and increasingly technical in complexity (Tinker, 2001; Levy, 1994). Thus projects have become more intricate and demanding, resulting in construction dead-lines becoming increasingly difficult to meet (Langford and Male, 2001).

Principal contractors have been forced to reduce their fixed costs because of the relatively small workload in South Africa (Hindle, 2001). In order to survive, the principal contractors are required to remain flexible and therefore only call on sub-contractors when required (Wylie, 2001; Hibberd, 1987).

In-house training has become too expensive and the principal contractors can no longer train employees to become specialists. This is another reason why sub-contractors are playing a more active role in the process of the project (Langford and Male, 2001).

The principal contractor is now taking a more managerial position because sub-contractors are doing most of the construction processes. The demands of the management role need to be addressed by implementing better systems. These new systems need to be benchmarked against other industries that have been through a similar process as the construction industry is currently going through (Ofori, 2001; Fryer, 1985).

4.2 The Traditional Role of the Principal Contractor

In the 1980's, construction teams consisted of a direct workforce (employees of the principal contractor) of 70%, an indirect workforce (sub-contractors) of 25% and a professional team of 5%, as shown in Figure 4-1 (Lavender, 1996). Many large construction companies such as Grinaker-LTA, Murray and Roberts and Group Five had in-house training programmes. These training programmes involved bricklaying, plastering, formwork and scaffold erecting, concrete placing and carpentry and joinery courses.

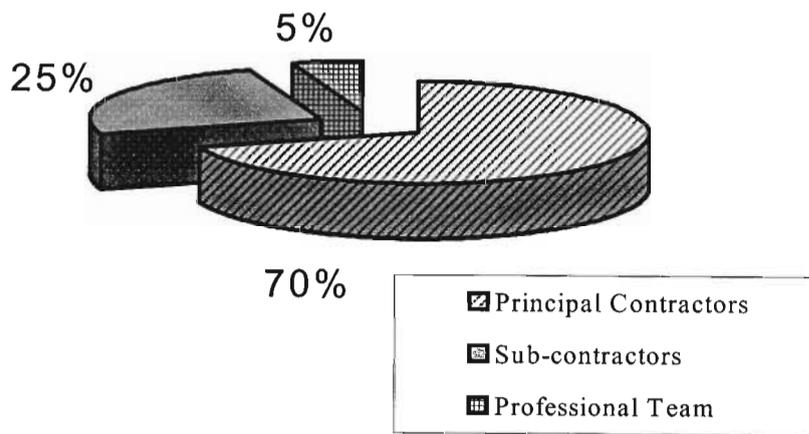


Figure 4-1 “Past Proportion of the Construction Industry”

During the same period, medium-sized contracting companies would undertake a wide range of construction work. This work would be done by their employed workforce. The company's number of direct employees was high and the company carried a large overhead each month. Only specialised work would be done by sub-contractors (Lavender, 1996).

4.3 The Present Scenario for Principal Contractors

The construction industry has evolved and now construction teams consist of 75% sub-contractors, 15% principal contractors and 10% professional team as shown in Figure 4-2. The in-house training has changed in nature to cover project management, total quality management, socio-economic awareness, environmental management and safety improvement programmes. These scope of these changes have been extreme for contractors. Added issues such as affirmative action and AIDS have made the construction industry's environment very difficult (Hindle, 2001; Robinson, 2001).

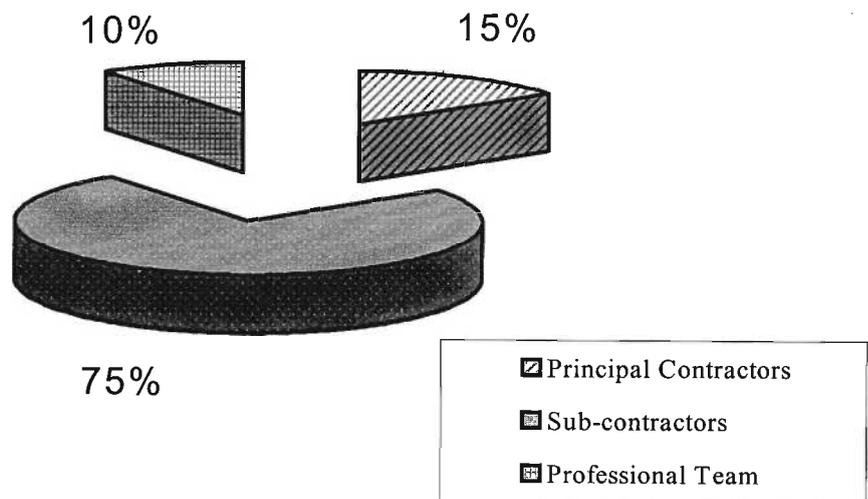


Figure 4-2 “Present Proportion of the Construction Industry”.

With these environmental changes, the construction industry needs to change procurement arrangements to suit the new environment. This change is necessary, since the bulk of construction work is being executed by sub-contractors (Healy, 1997). “A major feature of twentieth century construction has been the growth of sub-contracting. The success of many projects now depends heavily on the designer’s ability to integrate the work of the principal contractor and the various specialist sub-contractors, ...” (Fryer 1985, p. 47).

4.4 Sub-Contractor Procurement

Traditionally the principal contractor selects a limited number of sub-contractors to submit a price based on the following (Hibberd, 1987):

- Bills of quantities with all specifications and preambles.
- A set of drawings and specifications.
- Bill's of quantities with all specifications, preambles and a set of drawings.
- To go to the site, measure and price accordingly.

The objective of this exercise is to obtain the lowest price and best value for money for the principal contractor (Ofori, 2001; Lavender, 1996). Generally, the estimating department, when pricing a project, will put out enquiries for sub-contract prices. Details of the project are submitted to the sub-contractor by means of a 'sub-contract query sheet'. An example of this sheet is contained in Appendix No.1. This query sheet is provided in order to make the sub-contractor aware of the terms and conditions of the contract (Stuart, 2000; Hibberd, 1987). The query sheet also allows easy comparison between sub-contractors. The ultimate selection should not be on lowest price but upon several other factors such as (Smallwood, 1998):

- Business ethics.
- Guarantee of workmanship.
- Ability to meet or better the quality required.
- Ability to meet the programme.
- Financial stability.
- Approval by all managers on site.
- Facilities available.
- Work force available.
- Supervision on site.
- Complete understanding of all conditions of contract.
- Payment procedures.
- Applicable delays.

These are some of the factors that need to be studied before procuring a sub-contractor for a particular project. These issues need to be addressed prior to the sub-contractor being awarded the project to avoid misunderstandings (Smallwood, 1998; Levy, 1994). If all sub-contractors complete the query sheet properly, a competitive comparison can be made (Calvert, 1986).

4.5 Sub-Contractor Procurement Adjudication

The contractor's quantity surveyor scrutinises all the sub-contractor's quotations. Any errors and/or qualifications are noted. Comparisons of all the prices are then compiled (Levy, 1994). These are then discussed with the Contract / Site Manager, and a decision is made on whom to appoint. The decision is based on the sub-contractors financial strength, available equipment, reputation, as well as the ability to execute the work (Clough, 1975).

Once the sub-contractor has been decided upon, they are called to attend a pre-award meeting (Levy, 1994). The contract / site manager and quantity surveyor will be present at this meeting. The agenda at this meeting will be as follows:

- a) Programme requirements.
- b) Conditions of contract: Construction Guarantee, Form of Contract, etc.
- c) Quality requirements.
- d) Safety and Health regulation.
- e) Storage of materials.
- f) Security.
- g) Cart-away and rubble on site.
- h) Responsibility of works.
- i) Responsibility of equipment.
- j) Delay issues.
- k) Information required list.
- l) Setting out issues.
- m) House keeping responsibilities.

Once this meeting is concluded and the sub-contractor agrees to all the requirements, a letter of intent is issued by the principal contractor (Clough, 1975). An example of this letter is contained in Appendix No.2. The letter of intent contains the following:

- a) Sub-contract value.
- b) Order number (internal order number).
- c) Request for a guarantee within 7 days.
- d) Request for proof of insurance.
- e) Request for proof of registration for WCA.
- f) Responsible person and OHS Act Forms.
- g) Other relevant contract information.

Accompanying the letter of intent is a 'take on form', which is to be completed by the sub-contractor. An example of this form is contained in Appendix No.3. This form requires all the sub-contractor's details. Once all these letters and forms have been completed, the full appointment documentation is drawn up and signed by the sub-contractor and the principal contractor. No signing can be done until the principal contractor has received all guarantees and insurances. Once all requirements are in place the sub-contractor may proceed with the contract (Clough, 1975).

4.6 Critical Review of Process

There are many problems that exist in the construction industry and there is no panacea to take all the problems away. What can happen is that the construction industry can endeavour to implement the philosophies of 'zero defect' and 'right the first time' (Egan, 1998), (Lavender, 1996).

4.6.1 Time Constraints from Contract Acceptance to Contract Start.

During the pricing stage of a tender, the estimating department of a construction company receives prices from sub-contractors. These prices are incorporated in the principal contractor's price and submitted to the consultants. If the construction company is successful in being awarded the contract, the company has only a few days

to be on site for the official hand over of the site. This does not allow them much time to prepare themselves for the contract.

As a consequence the sub-contract procurement process is rushed and the selection is not done thoroughly enough. Details are overlooked and only established too late into the contract. This could be prevented by proper analyses being done on the sub-contractor prior to the adjudication. These analyses should include: checking the existing workload of the sub-contractor; checking that the insurances as well as health and safety procedures are in place; etc (Levy, 1994; Smallwood, 1998).

4.6.2 Quality

Lavender (1996) believes that quality is not something good but rather a product or process that meets a specific standard or requirement. This standard or requirement is set and expected by the client. Quality is only achieved once the product is handed over to a client who is completely satisfied (Verster, 1998). Each client will have different expectations and requirements. Quality levels will vary from client to client. The important issue of quality is delivery of a product that meets a client's needs and expectations (Haupt, 1999).

Unfortunately, quality seems to be at the bottom of the priority list for the sub-contractors, cost and programme take preference. Ironically part of 'quality' is finishing on time and within budget (Haupt, 1999). Egan (1998) expresses that real quality should exceed customer expectations and providing excellent service.

Part of the quality process is providing decent facilities for all the workers on site. Currently only rented ablutions are provided on site for all the workers. The workers use the existing or new buildings as their changing rooms. The additional cost to supply proper ablution facilities, uniforms, change rooms and rest areas, can easily be absorbed. The construction industry should be proud of their sites and workers. This will enhance quality and good workmanship on site (Egan, 1998; Smallwood, 1999; Verster, 1998).

4.6.3 Health and Safety

The safety record in the construction industry is not something of which to be proud. Smallwood (1998) strongly believes that accidents are caused as a result negligence from one or more parties. Accidents occur, as a result of the health and safety policies not being rigorous enough.

Problems stem from the fact that, although the principal contractors have safety policies and a safety officer on site looking after their employees, there are more sub-contractors on site than there are principal contractor's employees. This scenario leaves the majority of the site and its workers exposed to the dangers of construction (Lavender, 1996; Smallwood, 1998).

The health and safety requirements should be encouraged and all dangers made aware to all the sub-contractors in the construction industry (Haupt, 1999; Hellard, 1993). Many of the delays and extra costs experienced on projects often involve sub-contractors. These difficult and sometimes unreasonable programmes cause sub-contractors, for some of whom this option seems acceptable, to take short cuts and skimp on safety requirements. Clients also need to understand that there are indirect costs that need to be absorbed (Smallwood, 1998). "They may have to accept that there is a 'safety premium' to pay on the cost of construction; that if getting a rock-bottom price means that people will be killed or seriously injured, then the price is too low." (Fryer 1985, p. 211).

The biggest problem that the construction industry faces is that the sub-contractors do not take Health and Safety seriously enough. Furthermore, sub-contractors feel that allowing for health and safety in their price precludes them from being competitive in the market place (Haupt, 1999).

For this reason, there needs to be a stricter enforced legislation, which should apply to the entire construction industry. This will ensure that no corners are cut with regard to safety (Lavender, 1996; Smallwood, 1999).

The health and safety record of the construction industry is the second worst of any industry. Incidences have occurred due to lack of awareness and training (Egan, 1998). There needs to be an attitude change as well as a paradigm shift by all stakeholders; namely the client, professional team, principal contractor and all sub-contractors (Smallwood, 1998). A positive attitude needs to be portrayed by all. Benchmarking is a means of comparing certain aspects of the construction industry's performance to the best practice in other industries (Deacon, 1998; Hellard, 1993; Smallwood, 1999).

4.6.4 Communication

Communication between the principal contractor and the sub-contractor seems to be on a "need to know basis". This form of communication results in delays, incorrect fabrication and / or installation and frustration on site (Hindle, 1998). "It is vital that good communications are established at the outset and that contractor and sub-contractor have continual, direct contact throughout the sub-contract period." (Fryer 1985, p. 70).

In some cases the communication from the client and architect, to the principal contractor and sub-contractor, is delayed and / or un-specific. These problems face the constructions industry on a daily basis (Healy, 1997; Hindle, 1998). "... in no other important industry is the responsibility for design so far removed from the responsibility for production." (Emmerson 1962, as cited by Franks 1984, p. 5)

The dissociation of design from production stems from the beginning of the communication line. The sub-contractor, being at the end of the communication line, is most vulnerable to delays, incorrect construction and unnecessary additional costs. The communication between all stakeholders needs to be addressed positively in order to streamline the construction industry (Hindle, 1998; Levy, 1994; Smallwood, 1998). "It is ironical that with the massive increase in the availability of information and the higher level of sophistication of communication media, both of which have occurred in recent years, the problems of communication have increased rather than decreased" (Franks 1984, pp. 259-260).

4.6.5 The ISO Standards

The construction industry has become more aware of all the environmental, health and safety issues through the introduction of the ISO standards (Hellard, 1993; Smallwood, 1998). However, this is still not taken seriously enough. While many of the larger construction companies have implemented the ISO standards, there are still too many construction companies that have not acknowledged the need for this change (Haupt, 1999; Smallwood, 1998).

The problem is far greater with the construction industry sub-contractors. Very few sub-contractor companies are ISO compliant (Smallwood, 1998). As shown in this chapter, a large percentage of the construction teams are sub-contractors, which results in that percentage of the construction team not being ISO compliant. All stakeholders in the construction industry need to be part of the ISO standards in the way it is intended and not as a showcase in order to comply.

4.6.6 Responsibility

If the construction industry wishes to become a safer and better industry, it needs to change peoples' paradigms (Fryer, 1985). This responsibility has remained with the principal contractor. However, the responsibility extends further than just the principal contractor and sub-contractor. Latham (1994) suggests that the clients need to absorb some of the responsibility; while Franks (1984) states that the responsibility does not only apply to the principal contractor but also to the client, consultants and community. The sub-contractor needs to accept responsibility for their working environment. The sub-contractors would perform far better in the work place if they were forced to take full responsibility for their actions. All sub-contractors should be confident enough to be directly responsible to the client (Hibberd, 1987).

The principal contractor is responsible to the client for the project with regard to quality, cost and programme. As this responsibility includes the work that the sub-contractors have carried out, it is therefore very important to procure sub-contractors that the principal contractor can rely on. The principal contractor has to therefore change its managerial process of construction procurement (Hindle, 1998).

In the past all the emphasis on quality was placed on the principal contractors because they were the major stakeholders (Verster, 1998). At present the sub-contractor has become the body that executes the bulk of the work. Many of the sub-contractors working in the construction industry are not equipped for the responsibility. The industry therefore needs to benchmark against industries that have experienced the same issues (Deacon, 1998). "... benchmarking is an important means of gradually, continually and permanently improving performance – even in the construction industry." (Hellard 1993, p. 64).

4.7 Summary

This chapter has shown that the South African construction industry has experience a major evolution with regard to the amount of work done by sub-contractors as opposed to the principal contractor's direct labour force. The sub-contractor selection process needs to be addressed in order to manage this change. Principal contractors have become 'management contractors', managing sub-contractors. The management roles need to change, as managing a direct labour force is different to managing an indirect labour force. The need to benchmark, against an industry that also has a high content of sub-contractors and is successfully managing these sub-contractors, is vital.

The sub-contractor selection process in the construction industry has not progressed at a fast enough rate to close the gap between it and other industries that have successful sub-contractor selection systems.

Some of the South African sub-contractor related problems have been examined, such as: time constraints between contract acceptance and contract start; quality; health and safety issues; the lack of communication; the importance of ISO registration; and taking responsibility for one's actions.

All these problems can be addressed by benchmarking against an industry that has been through similar problems and succeeded in their processes thus becoming world leaders. Benchmarking against world leaders can only improve the construction industry and help achieve world-class status. The world is a changing environment and it is up to the

construction industry to incorporate this change in order to survive and possibly become leaders in 'best practice'.

CHAPTER FIVE

5. SUB-CONTRACTOR SELECTION IN THE SOUTH AFRICAN CONSTRUCTION INDUSTRY : FIELD RESEARCH

5.1 Introduction

In this chapter, the results of field research conducted in respect of sub-contractor procurement in the construction industry, is discussed. The research methodology used was an interview during which a questionnaire was completed. The purpose of this exercise was to establish the views and opinions of those directly involved in the sub-contractor procurement process i.e. the building construction companies. The research was conducted in a manner that would establish the existing processes of selection of sub-contractors for their projects. The results are then compared with the petroleum industries process of selecting contractors.

Sixteen companies that were willing to participate in this field research, were interviewed and completed questionnaires. The sixteen companies that participated in the field research were selected from the Master Builders Association and are recognised organisations within the South African construction industry. The interviews consisted of a brief introduction to the purpose of this research and completion of the standard questionnaire. Questions were verbally elaborated when required.

Although the number of respondents appears small in relation to the number of contractors carrying out business in Kwa-Zulu Natal, the annual turnover undertaken by the respondents is significant and therefore represents a significant sample. The collective estimated turnover of the respondents for the 2002/2003 financial year was 1.095 billion Rand.

The questions posed dealt with the procurement of sub-contractors for projects. Respondents were asked questions regarding the construction industry generally and the involvement of sub-contractor's. The questionnaire consisted of two sections: the first completed by the estimating department of the company (Stages A & B) and the second

by the site agent (Stages C & D). This ensured views from both “support” and “implementation” staff. This ‘on-site / off-site’ split also gave a true reflection of the actual procedures with regard to the sub-contractors in the construction industry. All of the participants insisted on remaining anonymous in order to answer all questions truthfully.

These findings were quantified and analysed to prove or disprove the hypothesis. All responses were analysed on the basis of the number of respondents giving a particular response. Due to the large disparity in the volume of work undertaken by the respondents, the results were also analysed on a comparative turnover basis. The annual turnover of the respondents ranged from six million to three hundred million Rand. This analysis incorporates the notion of volume of work as well as number of respondents.

5.2 Research Philosophy

The research has been conducted in a fully structured style, which consists of a series of questions. The type of questions that were used in the questionnaire were ‘Closed or Fixed-Alternative’ as explained by Robson (1993). The questions in the beginning of the interview are non-threatening but pertinent, and then progress to more direct or threatening questions. The questionnaire follows a logical sequence so that the interviewees understand the direction of the research (Sudman and Bradburn, 1982). Each interviewee was briefed as follows:

- The purpose for the interview was explained.
- They were all made aware that there were other interviewees from different size companies.
- They were made aware that their results, obtained through the research questionnaire, would be used in this document but without direct reference to them.
- The same questions were put to each interviewee.
- They were asked to be as honest as possible so the results could reveal a true reflection of the state of the industry.

After the introduction and briefing, the questionnaire was presented and then completed. Each interview lasted approximately forty minutes. Discussion was encouraged during interviews. In most cases, this resulted in a sharing of views beyond a simple answer of questions asked. The questionnaire that was presented in each interviewee can be found in Appendix No. 4 to Appendix No. 10

5.2.1 Advantages of an interview

- The questions could be asked in the way they were intended.
- The answers were quick and easy.
- The questions could be elaborated on there and then.
- There was a sense of purpose for the interviewee.

5.2.2 Disadvantages of an interview

- The interviews were time consuming.
- Some interviewees were reluctant to participate.

5.3 Research Structure

The interviews were divided into stages A, B, C and D. Stages A & B were conducted with the estimating department in the first interview, while Stages C & D were conducted with the site agent. The selection of questions was designed to be relevant to the procurement process in the petroleum industry. These are the type of question that the petroleum industry requires the potential sub-contractors to answer. The reasons for the type of question in each stage are as follows:

- Stage A: (Estimating Department - General)
 - ❖ To identify the company and the estimated project values.
 - ❖ To establish the percentage of sub-contractors now being used on projects.
 - ❖ To establish if the company had a sub-contractor selection system in place and how satisfied the company was with this current system.

- ❖ To establish, on average, on what grounds a sub-contractor was awarded a project.
 - ❖ To establish whether it was a criterion for the sub-contractor to be ISO registered.
- Stage B: (Estimating Department)
- ❖ To establish how much research was done on the sub-contractor, prior to the award being made.
 - ❖ To establish what documentation, if any, had to be in place prior to the sub-contractor starting on site.
- Stage C: (Site Agent on site – project commencement)
- ❖ To establish what information the Site Agent knows about the sub-contractor on arrival to site.
 - ❖ To establish what expectation the Site Agent has of the sub-contractor.
 - ❖ To establish if the Site Agent is confident about the sub-contractor completing the required workload.
- Stage D: (Site Agent on site – project completion)
- ❖ To establish whether problems arose during the project.
 - ❖ To establish the quality the sub-contractor produced.
 - ❖ To establish if the sub-contractor met the required safety, quality, and environmental issues.
 - ❖ To establish if the site agent believed that better procurement systems would produce better sub-contractors.

5.4 Research Results

The research results from the South African construction industry and a comparison to the South African petroleum industry, on a question by question basis, follows. A graphical representation of the results of each question has been included. All graphs

indicate the numerical result (the broader light shaded bar) and the weighted percentage based on turnover (the narrow dark shaded bar).

5.4.1 Stage A: (Estimating Department - General)

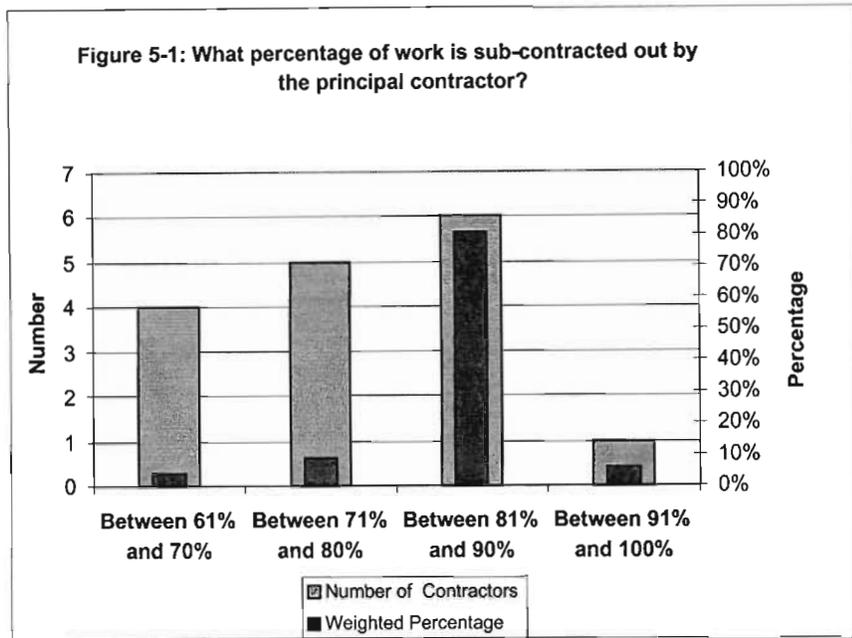
The purpose for questions A.1 to A.3 was to establish the name of the company, their average project values and the capacity of the interviewee in order to establish the extent and creditability of this research.

Question A.4: What percentage of work is sub-contracted out by the principal contractor?

The overall success of any project is achieved by all stakeholders involved in the project process. The purpose of this question was to establish what percentage of the construction work is implemented by sub-contractors.

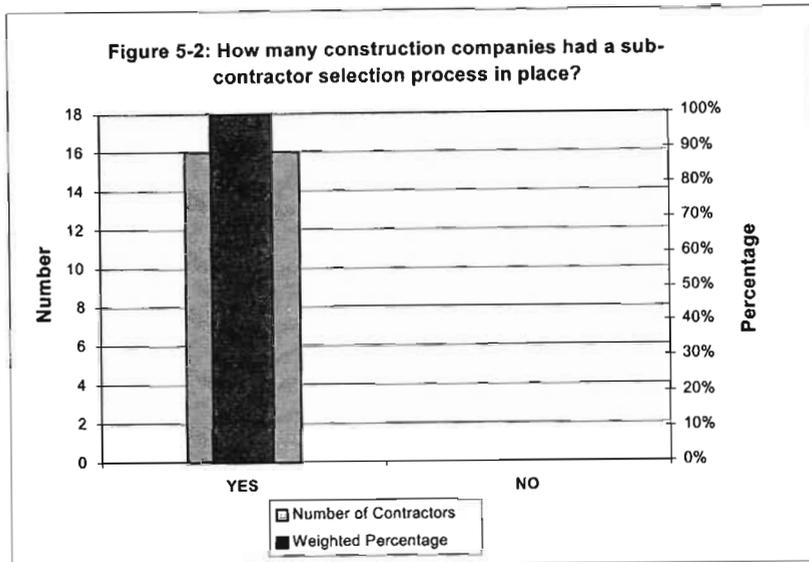
The contractors indicated that between 61% and 100% of their work was sub-contracted, indicating that sub-contractors perform a major portion of the construction work. Contractors in the petroleum industry (comparable to sub-contractors in the construction industry) perform between 91% and 100% of the work (EPL & BP Amoro). The turnover weighted analysis indicates that 80% of the work is sub-contracted. This data shows a growing similarity in the manner in which projects are implemented in the two industries.

There needs to be a change in the process of construction as the construction players are changing. The principal contractor is fulfilling a larger management role than before. Quality and productivity will lower if not managed correctly (Smallwood, 1999).



It is important to have a structured sub-contractors selection process in place to ensure consistency. The purpose for this question was to establish early in the interview whether the construction company had a selection process in place otherwise all questions would have not been applicable.

The results given by the respondents showed that all had sub-contractor selection procedures in place, as shown in Figure 5-2. This result was encouraging as systems can be benchmarked and improved. It would be difficult to implement sub-contractor selection systems in construction companies that did not have them.

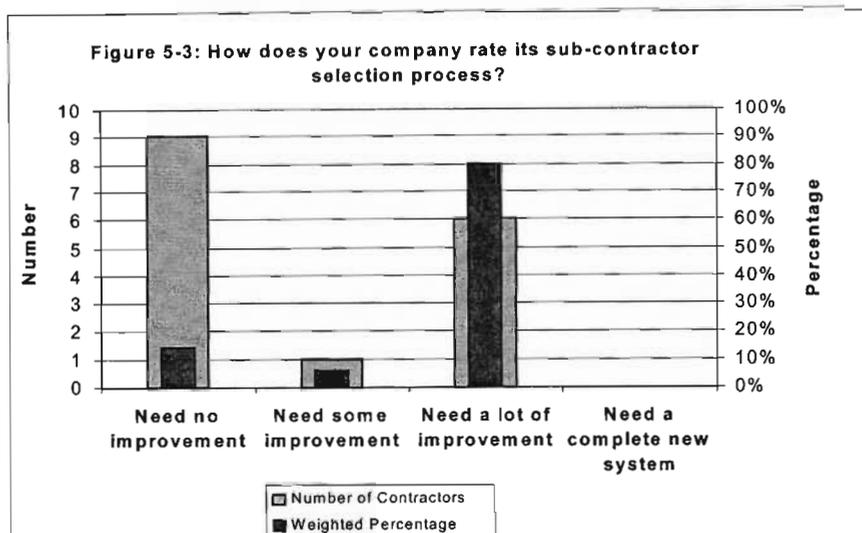


Question A.6: How does your company rate its sub-contractor selection process?

Change is ongoing and the room to improve is never ending (Deacon, 1998). The purpose for this question was to establish whether the respondents were prepared to improve their sub-contractor selection process.

The results, as shown in Figure 5-3, show that eleven out of the sixteen respondents (69%) believe that their sub-contractor selection process could be improved in some way, whilst five respondents (31%) believed that their systems required no improvement. The turnover weighted analysis indicates that generally the smaller contractors felt no improvement was required to the sub-contractor selection process. The eight respondents that made this statement had a collective turnover and therefore activity level of less than 15%. Based on this analysis, the industry as a whole recognise the need for improvement (85% based on turnover).

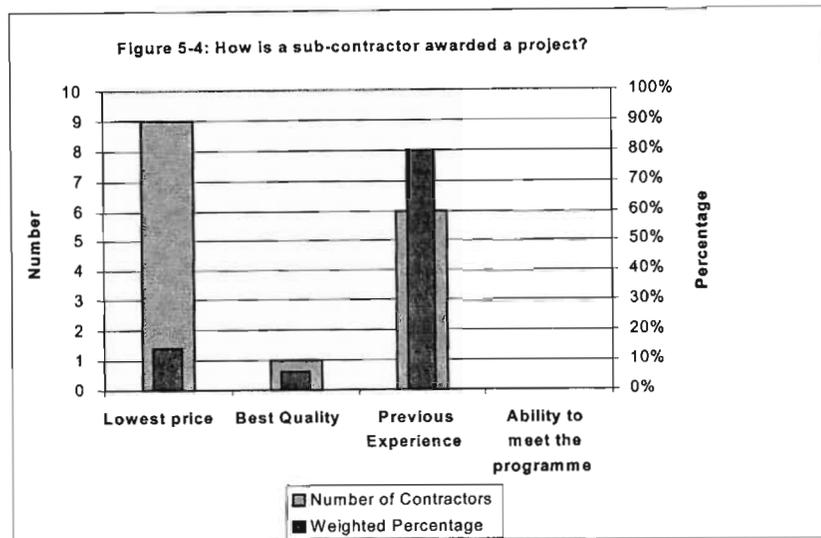
The petroleum industry are continually striving to better their processes by benchmarking themselves to other industries nation and internationally and similarly the recognition of the need to improve exists in the construction industry.



Question A. 7: How is a sub-contractor awarded a project?

The purpose of this question was to establish the main criteria was used by the respondents when selecting a sub-contractor. The results collected, as shown in Figure 5-4, show that nine out of the sixteen respondents (56%) selected a sub-contractor on the lowest price basis, whilst only one respondent (6%) used quality as the principle criteria.

Analysis on the basis of turnover weighting indicates a different scenario. Those using previous experience as a basis control 80% of the turnover and those who use price only control less than 15% of activity. The use of previous experience and best quality echo the fundamental elements of the systems employed by the petroleum industry. This would indicate that the construction industry, like the petroleum industry regards quality and experience as a vital component of contractor selection.

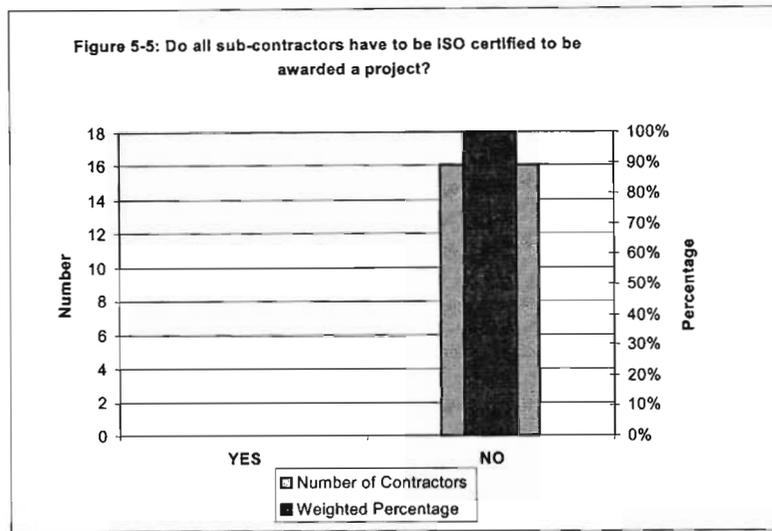


Question A. 8: Do all sub-contractors have to be ISO certified to be awarded a project?

While it is becoming more and more common to be ISO accredited in today’s construction industry, problems still stem from the construction industry not making this registration a requirement. The purpose of this question was to establish whether it was a requirement by the respondents for the sub-contractors to be ISO certified.

The results, as seen in Figure 5-5, show that this is not a requirement of the construction industry. The petroleum industry does not make this a requirement either, but having this certification, does help the contractor acquire a higher quality ranking.

If the construction industry intends improving its quality, health, safety and environmental sectors, the biggest and most challenging task is changing all the stakeholders’ attitudes (Smallwood, 1998). The answer might be that there is a premium that needs to be paid by the client to ensure the best standard is achieved (Fryer, 1985). ISO certification needs to be encouraged for all sub-contractors in order to achieve the best overall quality, health, safety and environmental issues possible in the South African construction industry.



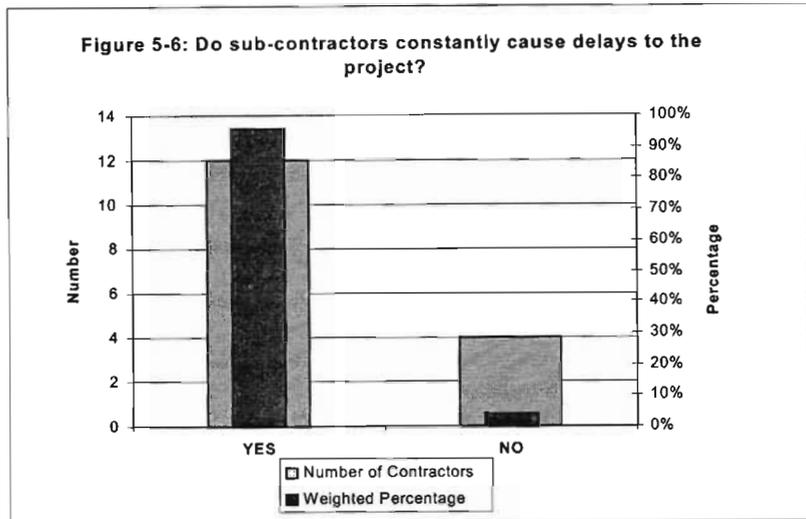
Question A. 9: Do sub-contractors constantly cause delays to the projects?

The purpose of this question was to establish if there was a delay problem caused by the sub-contractor. Fryer (1985) also believes that delays and extra costs experienced on projects, often involve sub-contractors. Often these delays are intensified from sub-contractor to sub-contractor, causing large overall delays to the project.

The results shown in Figure 5-6, show that twelve out of the sixteen respondents (75%) believe that the sub-contractors cause delays. More importantly, these twelve respondents control 95% of the turnover of the sample. Four out of the sixteen respondents believe that the delays are not caused from the direct result of sub-contractors.

The petroleum industry believes that very few delays are caused by contractors (Engen Petroleum Limited, 2001).

Clearly the difference in contractor (or sub-contractor) methodology has a significant influence on the performance of contractors (or sub-contractors).

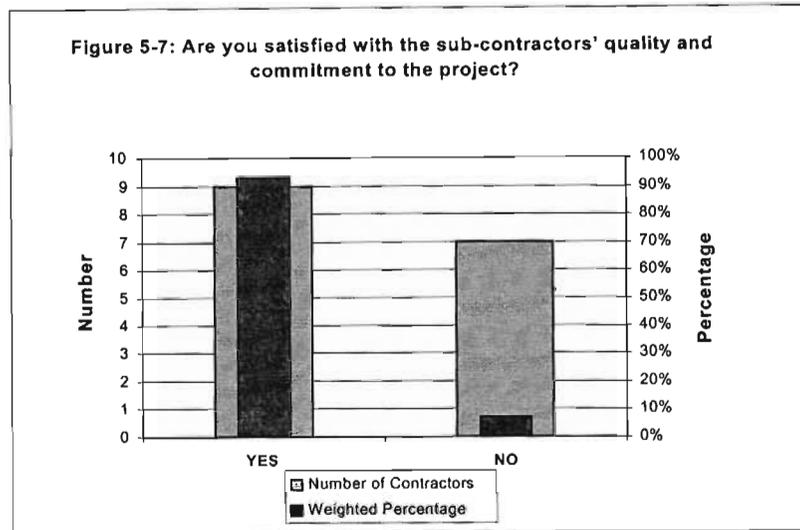


Question A. 10: Are you satisfied with sub-contractors' quality and commitment to projects?

The principal contractor is ultimately responsible for the quality of the overall project. The purpose of this question was to establish whether the principle contractor was satisfied with the quality that sub-contractors had produced.

The result, as shown in Figure 5-7, was that nine out of the sixteen respondents (56%) said that they were satisfied with sub-contractors quality. However, the respondents who were dis-satisfied with sub-contractor quality, controlled less than 10% of the turnover of the sample. This indicates a high proportion of the industry that are satisfied with sub-contractor quality.

This echo's the petroleum industry that believes that their high quality contractors stems from the process via which they are selected.



5.4.2 Summary: Stage A

Stage A was a general questionnaire to the sixteen construction companies to establish their position and general feeling on the performance of sub-contractors in the construction industry.

The research confirmed that the use of sub-contractors in the construction industry has increased. In the past a large portion of the South African projects were built and procured by the principal contractor's direct labour force. Now the principal contractor has a small direct labour force and large number of sub-contractors procuring the project.

Construction companies have sub-contractor selection methods in place, and recognise the need to improve such systems.

The construction industry tends to use previous experience and quality as a basis to select sub-contractors. This echoes the philosophy of the petroleum industry, stated as "Quality is found at a cost, which should be incorporated by all stakeholders, including the clients".

Contractors generally believe that sub-contractor quality is adequate but that delays are often caused by sub-contractors. This indicates a clear need for a change in sub-contractor selection and management processes.

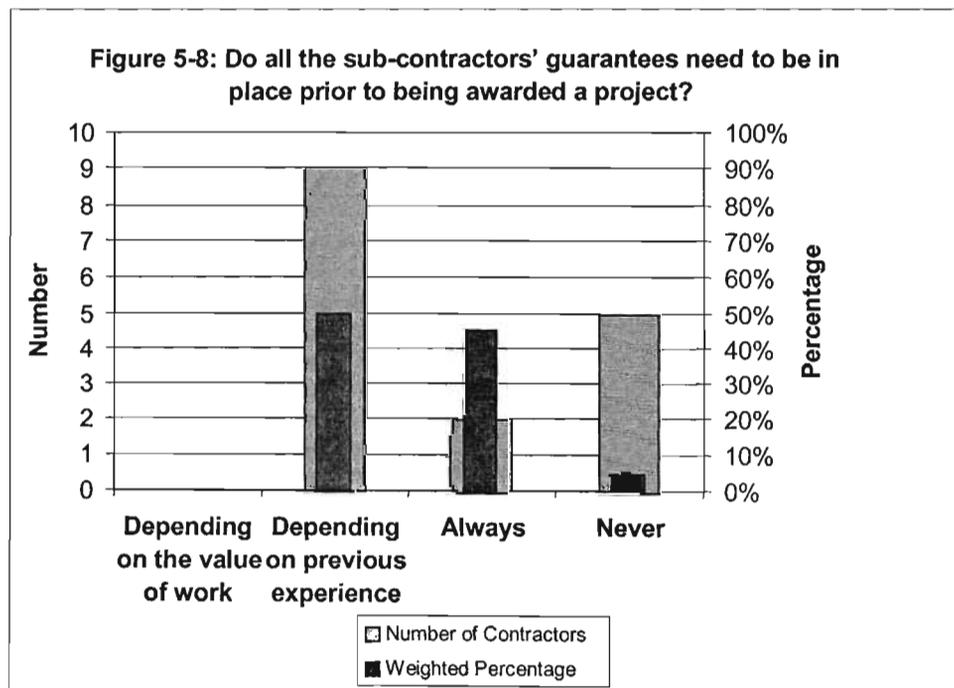
5.4.3 Stage B: (Estimating Department)

Question B.1: Do all the sub-contractor's guarantees need to be in place prior to being awarded a project?

The purpose of the question was to establish whether the respondents felt that it was necessary to have guarantees in place prior to being awarded projects. The results, as shown in Figure 5-8, reveal that the larger contractors rely primarily on the previous experience with the sub-contractor concerned.

The petroleum industry always requires these documents to be in place. They believe that is the only way security is ensured. This ensures that they are secured in terms of long term commitment (Engen Petroleum Limited, 2001).

Whilst allowing sub-contracts to start may represent high risk practice, it does reflect to some extent the petroleum industry's approach of considering the track record of the sub-contractor in the appointment process. What is clearly absent is the formality and the resultant security found in the petroleum industry processes.



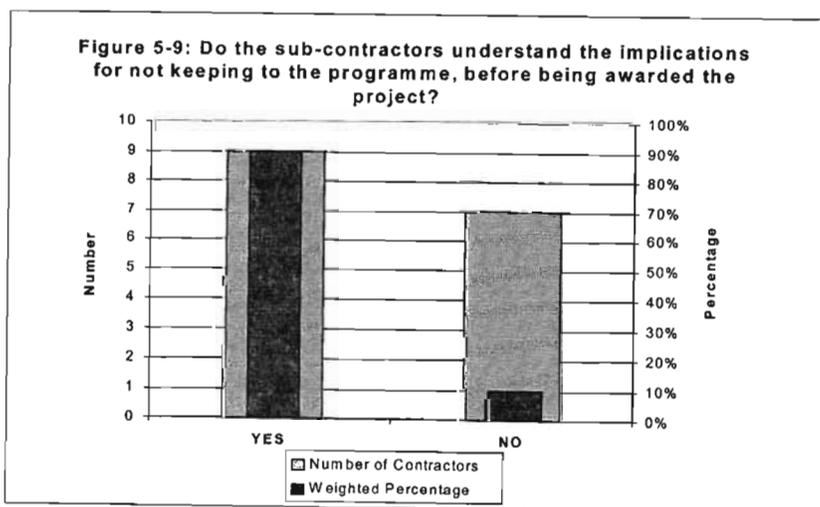
Question B. 2. 1: Do the sub-contractors understand the implications for not keeping to the programme, before being awarded the project?

Communication is one of the most important issues with regard to a successful project (Smallwood, 1999). The purpose of this question was to establish the communication with the sub-contractor prior to the award being made.

The result, as shown in Figure 5-9, shows that only nine out of the sixteen believed that the sub-contractors understood the implications for not keeping to the programme. However, the nine respondents controlled 90% of the turnover of the sample. This indicates that, in general, contractors believe that sub-contractors understand the implications of late delivery.

Clearly sub-contractors need to understand the programme and how important all deadlines are to the whole project. In some cases, sub-contractors have to order materials from abroad, which cause extensive delays if not addressed in time. The petroleum industry performs briefings to all the contractors to address this issue, thus contractors are fully aware of the implications of keeping to the programme (Engen Petroleum Limited, 2001).

The success of any project is influenced by the sub-contractors understanding the original and adjusted completion dates. Communicating any changes to the programme is essential to ensure that all stakeholders understand the same goal (Hindle, 1998).

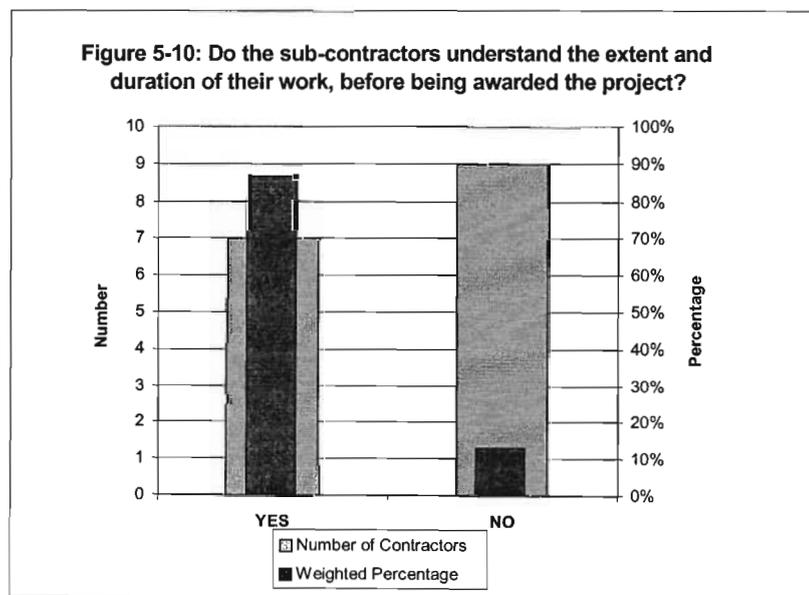


Question B. 2. 2: Do the sub-contractors understand the extent and duration of their work, before being awarded the project?

Communication plays an important role in the construction industry (Smallwood, 1999). The purpose of this question was to establish whether the respondents believe the sub-contractors understand the project before starting.

The results, as shown in Figure 5-10, shows that only seven out of the sixteen respondents believe that the sub-contractors understand the extent and duration of their work ahead of them, before being awarded the project.

What is evident from the turnover analysis of the question is that the larger contractors believe that the sub-contractors are adequately briefed. It seems that this issue is a problem with the smaller contracting organisations only. The analysis indicates that the larger contractors have systems for briefing sub-contractors that they believe to be adequate.



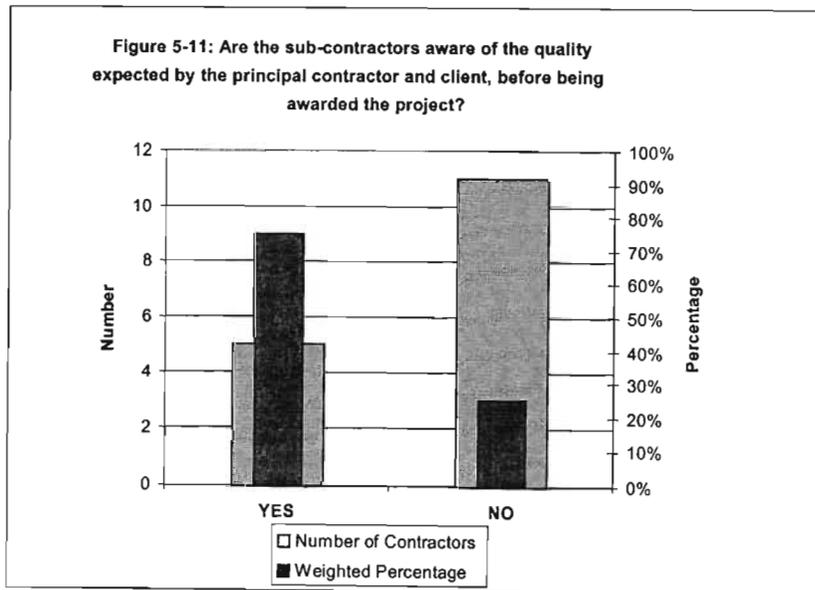
Question B. 2. 3: Are the sub-contractors aware of the quality expected by the principal contractor and client, before being awarded the project?

The purpose of this question was to establish whether the respondents believe that the sub-contractors understand the quality expectation of the client and principal contractor.

The results, as shown in Figure 5-11, show that eleven out of the sixteen respondents are not aware of the quality expectation. Analysis on the basis of turnover weighting indicates that the eleven respondents only control 25% of the turnover. This echoes the result of the last question, indicating that the larger contractors have systems for sub-contractor briefing, whilst the smaller contractors do not.

The principal contractor should establish at the outset what standards are required and ensure that they are stringently upheld (Harris and Mc Caffer, 1989).

The petroleum industry gives formal briefings to contractors, to explain the expected requirements prior to the project being awarded, in all cases.



Question B. 2. 4: Are the sub-contractors aware of the implication of sub-standard work, before being awarded the project?”

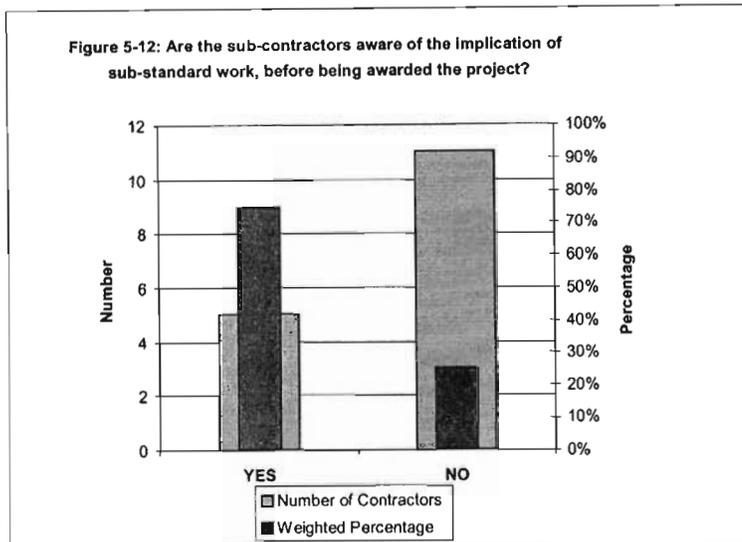
The purpose of this question was to establish whether the respondents believe that the sub-contractors understand what is required from them.

The results, as shown in Figure 5-12, show that eleven out of the sixteen respondents believe that the sub-contractors were unaware of the implication of sub-standard workmanship.

However, analysis on the basis of turnover weighting indicates that the eleven respondents only control 25% of the turnover. Some respondents explained that many sub-contractors did not want to take responsibility or ownership of the project, in an overall context. Sub-standard work causes delays during and after the project, often damaging other sub-contractors' work. The client loses faith with the entire construction team (Haupt, 1999).

This result reinforces the trend shown in the last two questions indicating that the larger contracting organisations have better systems for briefing sub-contractors than the smaller organisations.

The petroleum industry believes that all contractors need to take pride in their work and ensure that all the work is of an acceptable standard. This approach will not only ensure a successful project but also positively influence forthcoming projects with the same contractor or client (Engen Petroleum Limited, 2001).

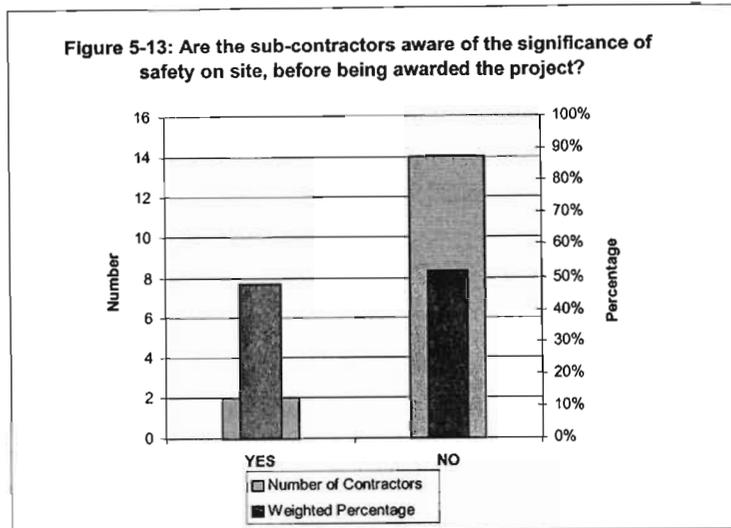


Question B. 2. 5: Are the sub-contractors aware of the significance of safety on site, before being awarded the project?

It is believed by Smallwood (2001) that safety is not taken seriously enough by all stakeholders in the South African construction industry. The purpose of this question was to establish whether the respondents believed the sub-contractors were safety conscious enough.

The results, as shown in figure 5-13, show that fourteen out of the sixteen respondents were not aware of the significance of safety on site. Analysis on the basis of turnover weighting indicates that although some of the larger contractors are dealing with the safety issue, there is still vast improvement required with regard to safety awareness on site.

Construction sites are extremely dangerous and carry a high accident record. For this reason all the petroleum industry ensure that all their contractors are completely aware of the safety requirements.



Question B. 2. 6: Are the sub-contractors aware of the importance of house keeping, before being awarded the project?

and

Question B. 2. 7: Are the sub-contractors aware of all the environmental issues, before being awarded the project?

Issues regarding safety, house keeping and the environment require the attention of all stakeholders in the South African construction industry (Smallwood, 1999). “To be globally competitive requires the integration of H&S and quality into all processes and strategies.” (Smallwood 1999, p. 36). The purposes of these questions are to establish whether the sub-contractors are carrying out these processes.

The results, as shown in Figure 5-14 and Figure 5-15 of the housekeeping and environmental issues echo the results of the awareness of safety on site.

Analysis on the basis of turnover weighting indicates that there is still vast improvement required with regard to housekeeping and environmental issues. The petroleum industry ensures that all these issues are discussed and demonstrated to all the potential contractors.

Environmental Management is still new to the construction industry; however the issues are fast becoming a reality to all role-players. “As more and more parts of the construction industry seek to avoid being accused of putting up buildings that send out the wrong environmental impact signals, so they will wish to be seen doing the right thing. At worst clients will have ‘the best possible solutions in the circumstances’ even in those instances where with commendable honesty ‘to make a profit’ is one of the deciding circumstances.” (Wild 1997, p. 106).

Figure 5-14: Are the sub-contractors aware of the importance of house keeping, before being awarded the project?

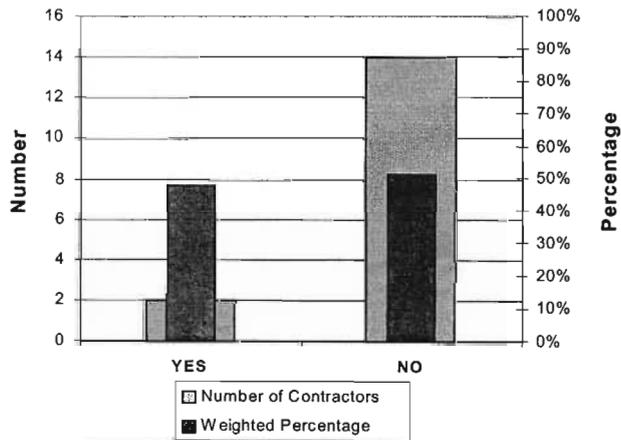
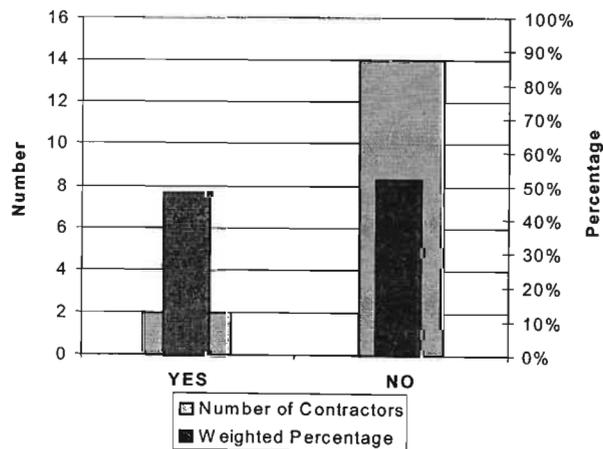


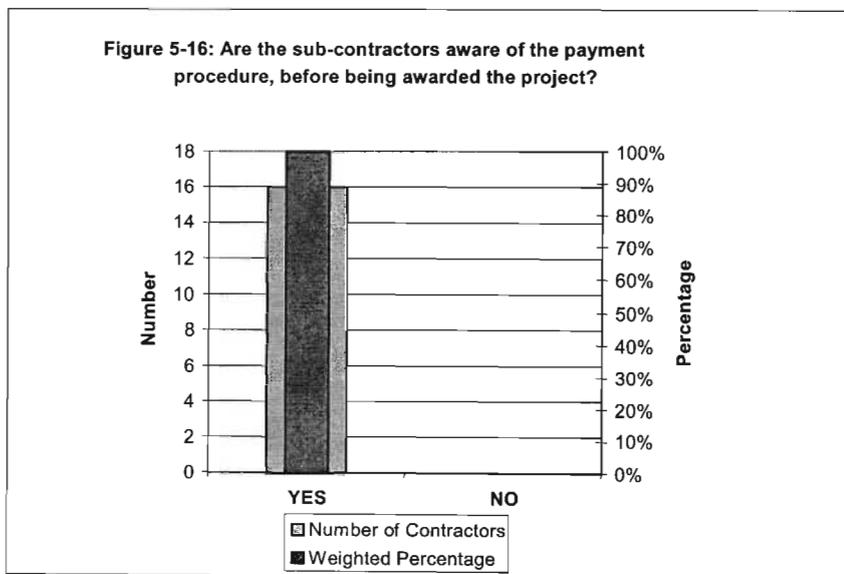
Figure 5-15: Are the sub-contractors aware of all the environmental issues, before being awarded the project?



Question B. 2. 8: Are the sub-contractors aware of the payment procedure, before being awarded the project?

The sub-contractors payment procedures are clearly stated in all of the sub-contract contract documents and sub-contractors are usually aware of the procedure (Stuart, 2000). The purpose of this question was to establish whether contractors believe that sub-contractors understand vital contract conditions such as those relating to payment.

The results, as shown in Figure 5-16, show that contractors believe that sub-contractors are aware of the payment procedure. The respondents added that sub-contractors made certain that they understood the process. All relevant information, relating to payment, was forwarded to the principal contractor as and when required. The contractors noted that they did not have to ‘chase’ the sub-contractor for information relating to payment.



Question B. 3. 1: Is the principal contractor aware of the existing workload of the sub-contractor, before the project is awarded?

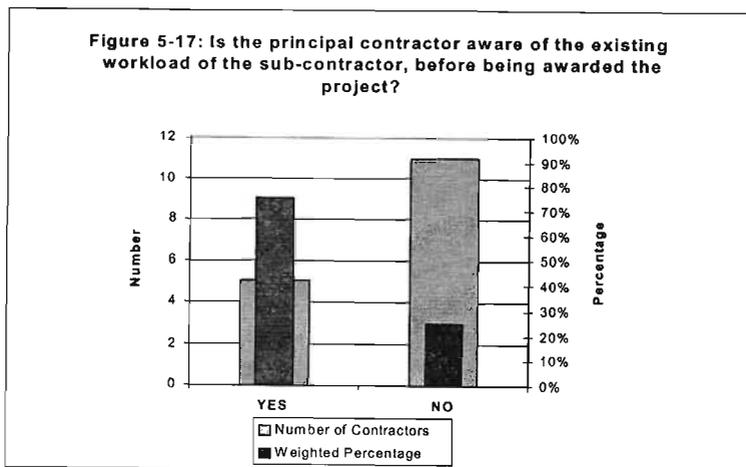
The purpose of this question was to establish whether the respondents were aware of critical information regarding their sub-contractors, prior to award of a sub-contract.

The results, as shown in Figure 5-17, shows that only five out of the sixteen construction companies were aware of the existing workload of the sub-contractor prior to the sub-contractor being awarded a project. The turnover analysis shows that these five respondents control 75% of activity indicating that the larger contractors are investigating these issues prior to sub-contract award.

This is a vitally important issue, as sub-contractors with large workloads will find it difficult to keep up with the required programme. Engen Petroleum Limited (2001) believes that contractors might accept too many projects at once, which could lead to problems such as:

- Poor workmanship.
- Not spending enough time on site due to other commitments.
- Working unsafely due to time constraints.
- Delaying other sub-contractors.

The petroleum industry believe that time spent, prior to awarding a contract, is money well spent to ensure that the sub-contractor can cope with the required project.



Question B. 3. 2: Is the principal contractor aware if the sub-contractor has qualified labour to perform the required task, before the project is awarded?

and

Question B. 3. 3: Is the principal contractor aware if the sub-contractor has sufficient supervision to perform the required task, before the project is awarded?

and

Question B. 3. 4: Is the principal contractor aware if the sub-contractor has sufficient experience to perform the required task, before the project is awarded?

The purpose of these questions above, are to establish whether the respondents had adequate information about sub-contractors prior to awarding a contract.

The petroleum industry believes that without this information, they could not make an accurate assessment of the contractor and therefore would not be in a position to select the contractor for the project.

The results, as shown in Figures 5-18, 5-19 and 5-20 respectively, showed that twelve out of the sixteen respondents believed that the sub-contractors have a competent and qualified labour force, that there is sufficient and reliable supervision and that they have enough experience to fulfil the required task.

It is clear that the respondents are confident that the sub-contractors have the manpower, supervision and experience required.

Figure 5-18: Is the principal contractor aware if the sub-contractor has qualified labour to perform the required task, before being awarded the project?

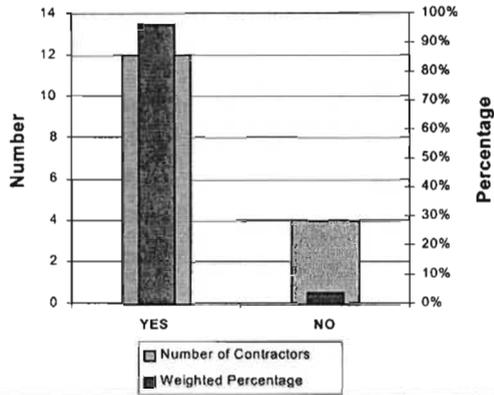


Figure 5-19: Is the principal contractor aware if the sub-contractor has sufficient supervision to perform the required task, before being awarded the project?

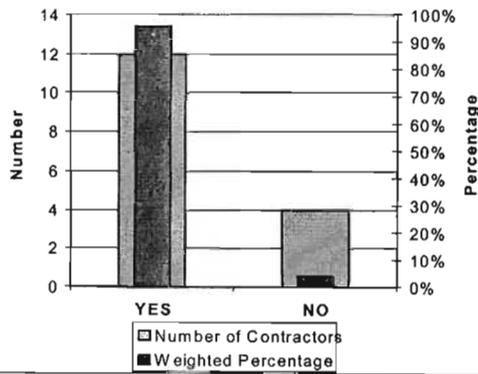
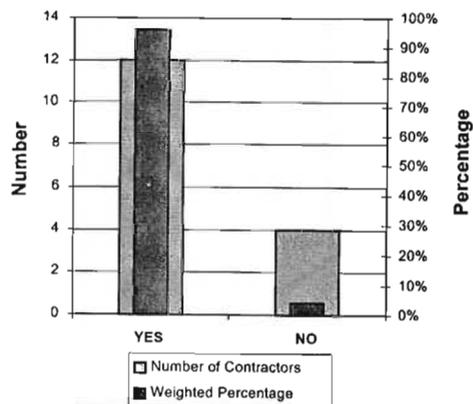


Figure 5-20: Is the principal contractor aware if the sub-contractor has sufficient experience to perform the required task, before being awarded the project?



5.4.4 Summary: Stage B

Stage B of the questionnaire establishes a more detailed view of the sub-contractor selection requirements prior to the sub-contractor being awarded a project.

The administrative documentation such as guarantees and schedule of liabilities seemed not to be an urgent priority. Most of the construction companies relied on trust and a relationship that was built up over time, allowing work to start prior to guarantees being furnished. This procedure echoes the approach of the petroleum industry but lacks the security achieved by formal adherence to systems.

Generally, the large contracting organisations felt that they had adequate systems for briefing sub-contractors whereas the smaller organisations did not.

Contractors indicated that some improvement is required in respect of sub-contractor performance and understanding safety, housekeeping and environmental issues. Many of the construction companies felt that the sub-contractors did not understand the long-term implication of attending to these matters.

Larger contracting organisations believe that they are aware of the critical performance criteria, such as labour force, supervision, etc before making an award.

Contractors are confident that sub-contractors are familiar with payment procedures.

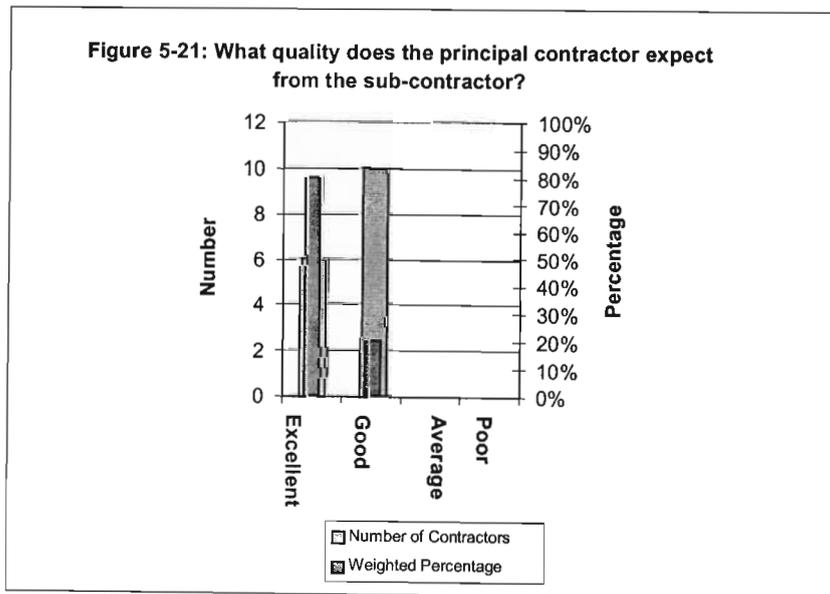
5.4.5 Stage C: (On-Site Staff -At Project Start)

The questions in Stage C were asked of site agents and on-site staff. The aim was to establish what information site agents had of the procured sub-contractors. Some site agents had worked with the sub-contractors on previous projects and some had met them for the first time on site. Having details of the sub-contractor before the sub-contractor starts a project is vitally important.

Question C. 1: What quality does the principal contractor expect from a sub-contractor?

Client satisfaction is the priority in any project. This needs to be achieved by all stakeholders on the project. The quality that is expected should be extremely high (Hindle, 1998). The purpose of this question was to establish what respondents expect from the sub-contractor that had been selected for the project.

The results, as shown in Figure 5-21, show that site agents have generally high expectations with regard to quality from sub-contractors. However, the turnover weighting indicates that this is less so in the case of the smaller contractors interviewed.



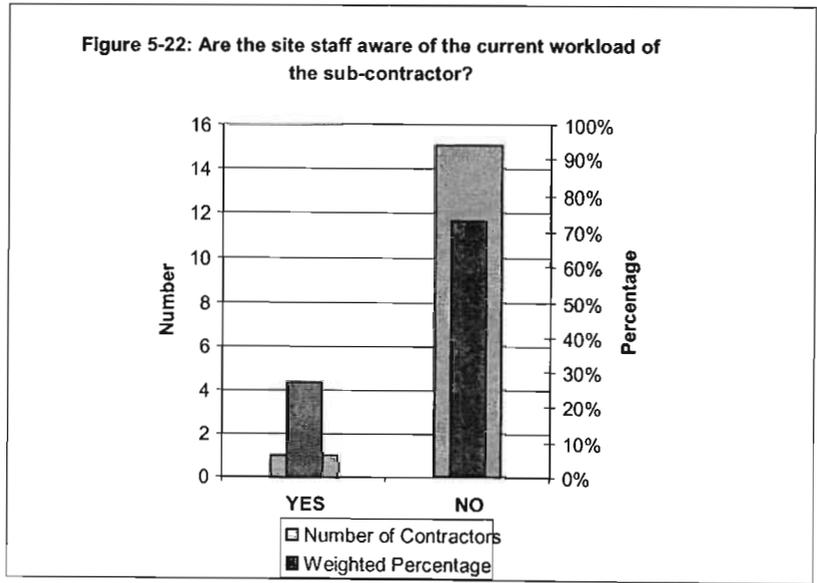
Question C. 2: Are the site staff aware of the current work load of the sub-contractor?

The purpose for this question was to establish whether the principle contractor's staff on site, have all the relevant information about the sub-contractor.

The results show that generally site staff have a poor understanding of the sub-contractors current work load. The results are shown in Figure 5-22.

The site agents added that they assumed that sub-contractors had sufficient capacity to undertake the work. Generally, there seemed to be very little communication between the sub-contractor selection divisions at the head office, and the site agents on site.

Due to the selection procedure of the sub-contractors in the petroleum industry, this result is the reverse i.e.: all staff are aware of the existing workload the sub-contractor. This is the result of good communication between all parties.



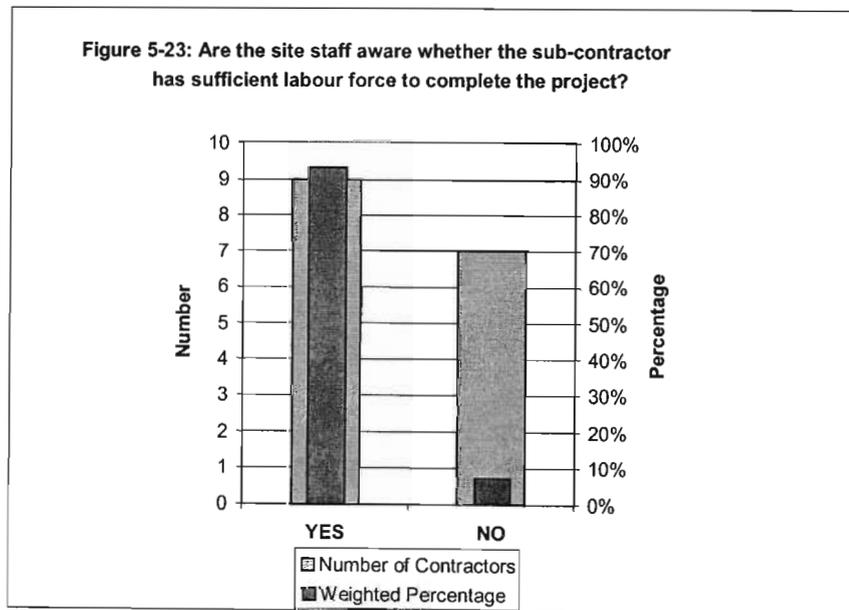
Question C. 3: Are the site staff aware whether the sub-contractor has sufficient labour force to complete the project?

The purpose of this question was to establish how much relevant information the site staff had on the sub-contractor.

The results show that generally respondents felt informed in respect of the sub-contractor's labour force. Many of the site agents felt that the sub-contractors were pro-active in the early stages of a project and displayed an enthusiastic approach.

Seven respondents did not believe that the sub-contractors had sufficient labour on site to complete the project. They felt strongly that the principal contractor will have to request more labour on-site in order to get a substantial start to the project. A high number of respondents indicated that more information was needed. Based on the turnover weighted analysis, these are mainly the smaller organisations. Figure 5-23 shows the results taken from the questionnaire.

The petroleum industry deals with this issue via the contractor database.

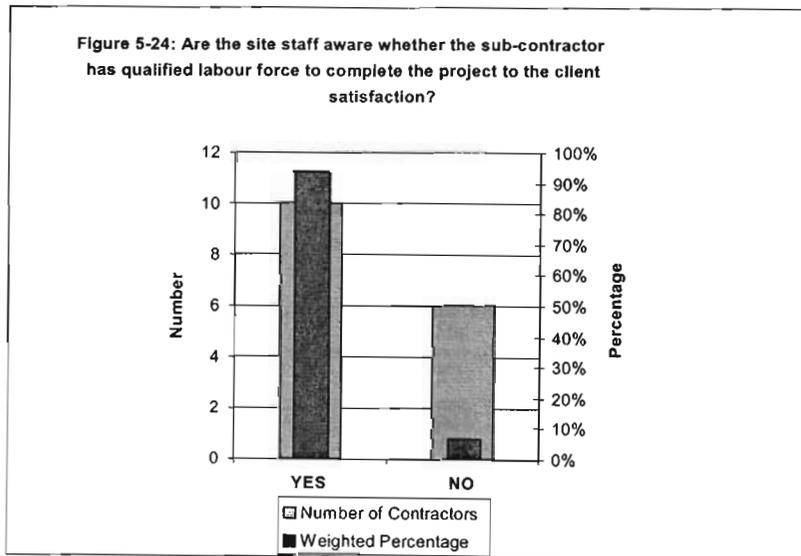


Question C. 4: Are the staff aware whether the sub-contractor has a qualified labour force to complete the project to the clients satisfaction?

The purpose of this question is to reinforce the issue of whether the respondents have all the required information regarding sub-contractors.

The results are similar to those for the previous question and thus reinforces the notion that the larger contractors feel that they are well informed in respect of sub-contractor resource issues.

Qualification proof needs to be implemented to ensure that the correct sub-contractors are assigned to the projects (Smallwood, 1998; Uff and Odams, 1995).



Question C. 5: Does the sub-contractor have enough experience to meet the requirements for the project?

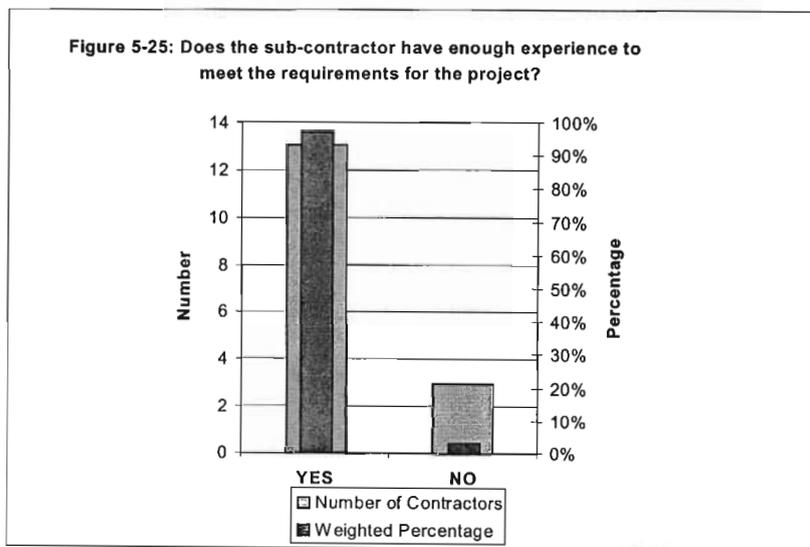
The purpose for this question is to establish whether the respondents have sufficient confidence in the sub-contractors.

The results indicate that contractors do have sufficient confidence in the sub-contractors appointed. The results are shown in Figure 5-25.

The respondents added that they believe that the sub-contractor selection division at the head office would not have selected a sub-contractor who does not have the experience required.

The results show that the site agents are relying on the sub-contractor selection division at the head office. However, if there are problems that arise later on during the project, it is left up to the site agents on site to deal with the situations.

Despite the view of the respondents, it is suggested that site agents should be part of the adjudication, as practised by the petroleum industry.



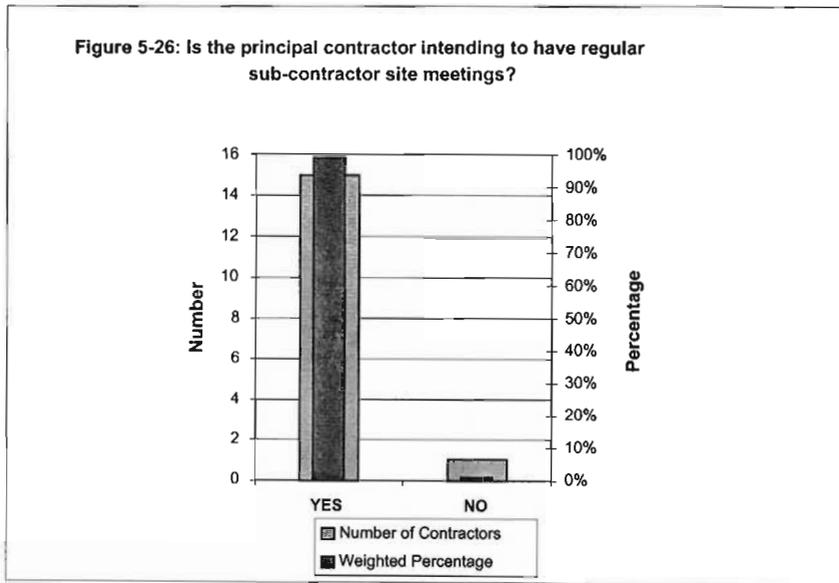
Question C. 6: Is the principal contractor intending to have regular sub-contractor site meetings?

Regular site meeting are a successful method of communicating to all stakeholders (Hindle, 1998). The purpose of this question was to establish whether this form of communication was used.

The results show that site meetings are the primary means of communication with sub-contractors..

It is extremely important to keep communication on site flowing. The petroleum industry believes that meetings are the most reliable form of communication with contractors, thus this view and approach is shared by both industries.

An important purpose of these sub-contractor meetings is to continually distinguish between the different responsibilities on site for all the sub-contractors. Where these responsibilities overlap or do not meet, the principal contractor has to ensure that all the responsibilities are attended to (Wild, 1997).



Question C. 7: Are you aware whether the sub-contractor has a safety representation on-site?

and

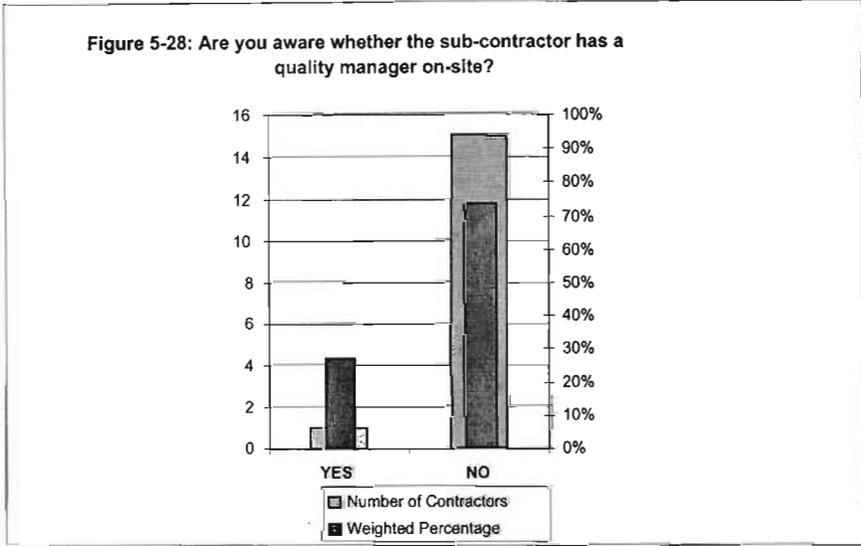
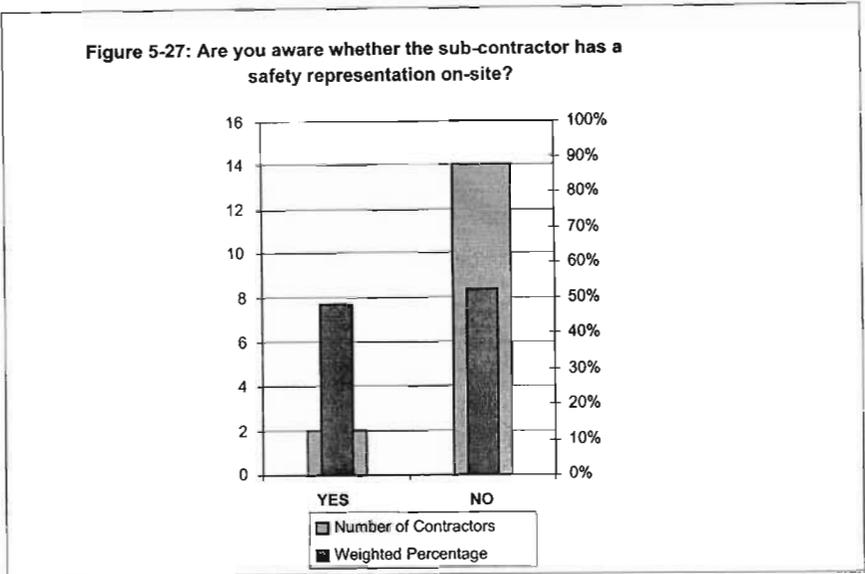
Question C. 8: Are you aware whether the sub-contractor has a quality manager on-site?

Safety in the South African construction industry is a critical requirement that needs more attention than it's receiving at the present moment. Quality forms part of safety, which leads to total client satisfaction. These issues need to be addressed as a matter of urgency (Hindle, 2001)

The purpose of these questions was to establish whether the contractors believed that sub-contractors were taking part in the process of increasing safety and quality procedures. The results, as shown in Figure's 5-27 and 5-28 respectively, show that a large number of the site agents are unaware of the sub-contractors commitment to quality or safety procedures. The turnover weighted analysis indicates the trend noted previously that there may be a divergence of opinion between small and large contractors.

Some site agents felt that many sub-contractors relied on the principal contractor in respect of safety and quality supervision and that a precedent had already been established.

Many sub-contractors have some form of quality and safety certificates. The site agents, as shown from the results of figures 5-27 and 5-28 respectively, believe that these certificates were not taken seriously enough. "Others attained the status but with an ambivalent attitude, waving the certificates wildly until the job was secured, its importance fading during the project." (Wild 1997, p. 77). The construction industry now demands that these issues become a reality and not just a certificate (Smallwood, 1999). South African construction companies need to benchmark from the petroleum industry and take cognisance of the few sub-contractors that do take these issues seriously and reward them for their efforts. This will better the construction industry from a holistic point of view (Harris and Mc Caffer, 1989).

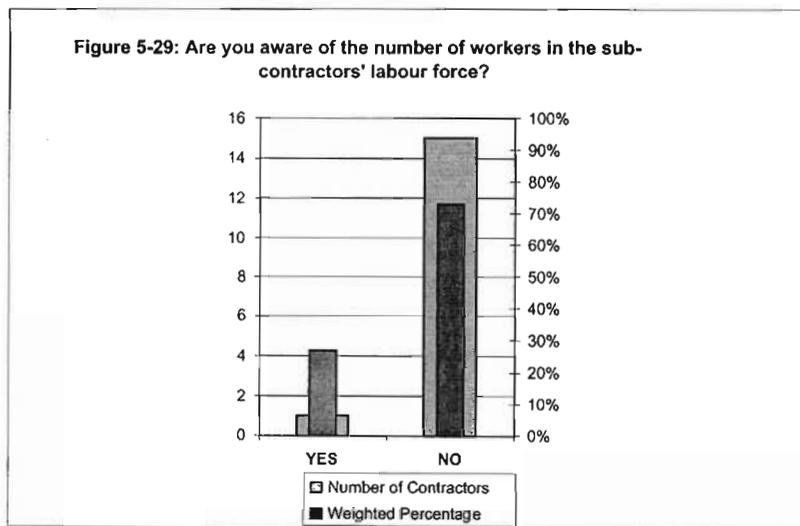


Question C. 9: Are you aware of the number of workers in the sub-contractor’s labour force?

The site agents plan, organize, coordinate and control all activities on site. These tasks carry large responsibilities. The site agents are accountable to the clients, the main construction companies and all sub-contractors. They therefore need to know how many people are on site, for safety and health reasons. General parking and site traffic has to be well planned and accommodated for. Access and storage facilities need to be established for all contractors (Wild, 1997). The purpose of this question is to establish whether the respondents are aware of the total persons on site.

The results, as shown in Figure 5-29, shows that generally site agents did not know the number of workers that made up the sub-contractor's labour force. It is clearly important for the site agents to be aware of this information, as they control the site.

The petroleum industry has security check points, which monitor all labour movements. The number of persons on site at any given time is always known. This information helps with the production flow and safety of the people on site.



Question C. 10: Are you aware if the sub-contractor is sub-contracting his work out?

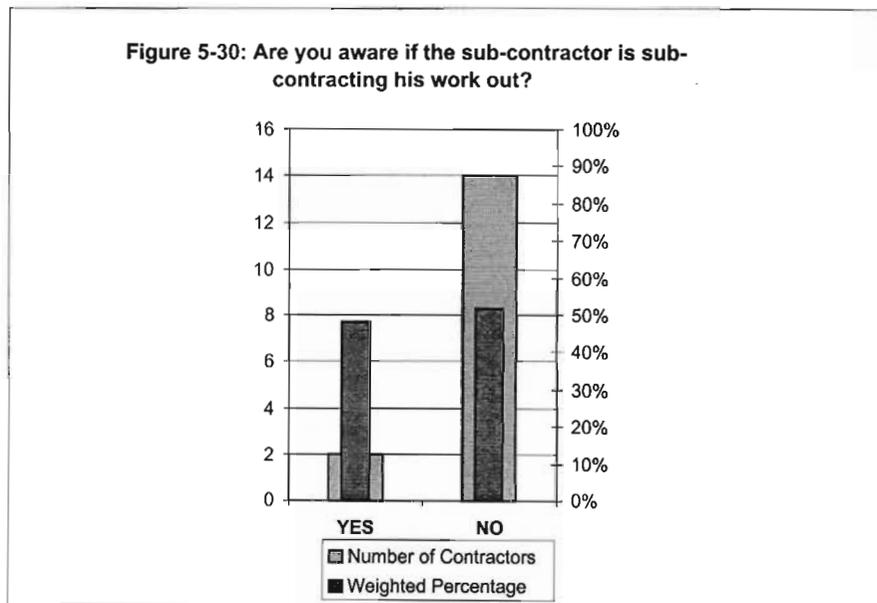
The purpose of this question is to establish whether the line of communication and responsibility is not too long.

The results, as shown in Figure 5-30, shows that generally respondents are unaware if the sub-contractors sub-contract their work out. Although this action can result in additional communication problems, the site agents did not seem concerned about this.

The divergence of opinion mentioned previously is again indicated in this question.

The petroleum industry does not allow sub-contracting of work by contractors unless specifically agreed.

Wild (1997) explains how the route of communicating instructions from the client's representative to the principal contractor, to all relative parties, is an involved process. Much paperwork is created in distributing these instructions to the relevant sub-contractors. These instructions seem to be passed down an endless path of stakeholders. If sub-contractors have sub-contracted their work out, the process of communication is lengthened.

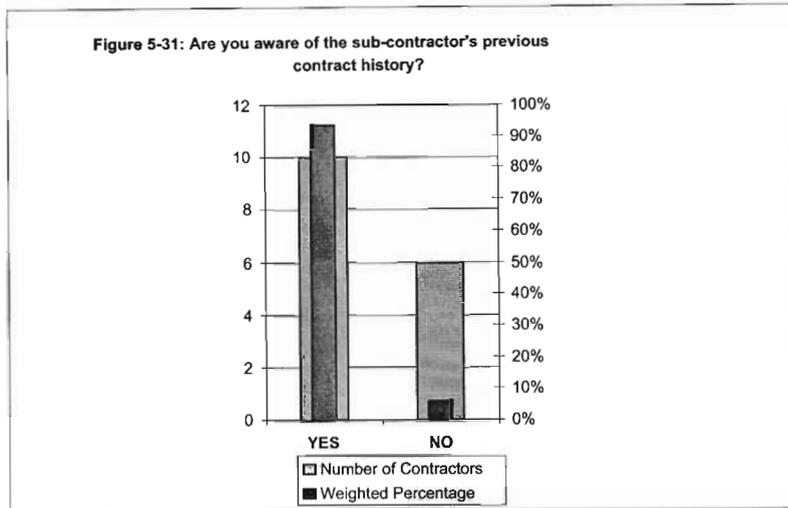


Question C. 11: Are you aware of the sub-contractor's previous contract history?

The purpose for this question is to establish the extent of knowledge about important information regarding sub-contractors.

The results, as shown in Figure 5-31, shows respondents are generally aware of the sub-contractors' previous project history.

The procurement industry also believe that they have a good understanding of the previous project history of contractors. This is achieved via the contractor database.



5.4.6 Summary: Stage C

Stage C establishes the views and information knowledge of site staff in respect of sub-contractor issues. The purpose of this section of the questions is to establish what expectations the site agents have of sub-contractors and how confident the site agents are about the sub-contractor completing the required workload.

The research indicates that site agents have high expectations in respect of sub-contractors performance.

Despite a perceived lack of knowledge in respect of the resource levels of contractors, site agents are generally confident in the appointments made by head office.

Site agents believed that existing precedents allowed sub-contractors to operate without safety and quality representatives on site. Site staff are generally poorly informed in respect of the number of workers and personnel on site and thus were unaware if sub-contractors were sub-contracting work to others.

5.4.7 Stage D: (On-Site Staff -At Project Completion)

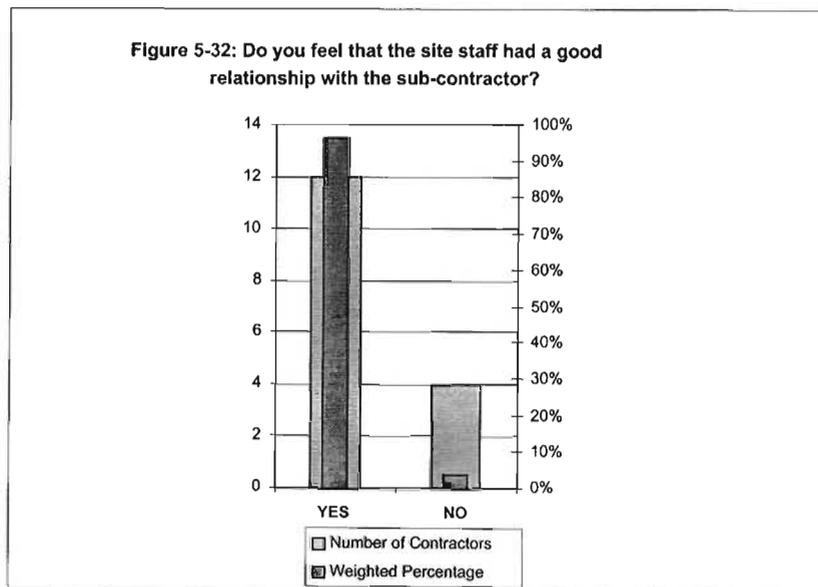
The questions in Stage D were asked to establish site agent's views in respect of sub-contractor performance.

This would establish if the existing sub-contractor selection methods in the construction industry are successfully procuring the right sub-contractor for the project.

Question D. 1: Do you feel that the site staff had a good relationship with the sub-contractor?

Good communication and relationships on site are the foundation for a successful project (Wylie, 2001). The purpose of this question was to establish how many respondents felt that they had a good relationship with the sub-contractor.

The results, as shown in Figure 5-32, indicate that generally contractors felt that good relationships exist.



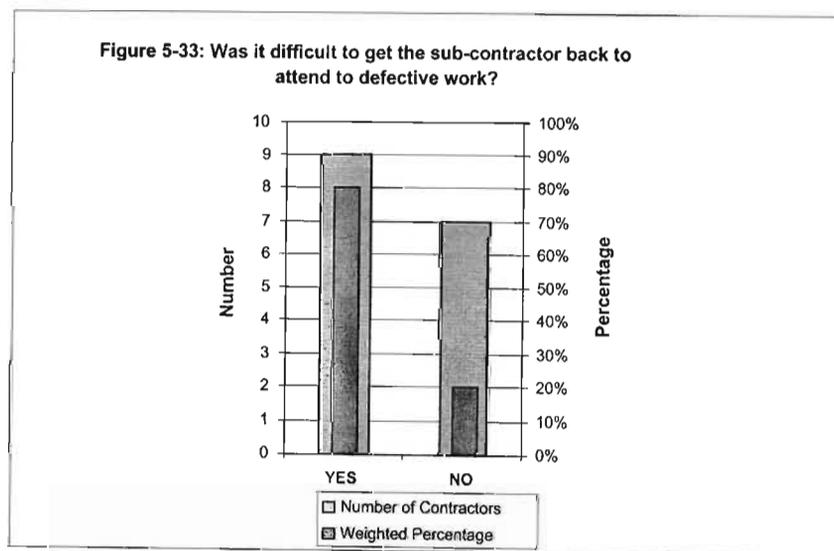
Question D. 2: Is it difficult to get sub-contractors back to attend to defective work?

Sub-contractors attending to defective workmanship should not pose a problem. Sub-contractors should honour their work in order to get another opportunity to tender for future projects. It is vitally important, for the longer-term success of any company or business, to immediately attend to their defective workmanship. The purpose of this question was to establish whether contractors that sub-contractors are willing attend to their defective workmanship timeously.

The results showed that generally respondents found it difficult to get sub-contractors to attend to their defective workmanship. The turnover weighted analysis indicates that this may be a more significant problem with larger contractors than with small.

Uncooperative sub-contractors lead to delays in completing the snags. This is not only a bad reflection on the sub-contractor but also on the principal contractor. Systems need to be implemented at the start of the project to ensure that the sub-contractors attend to their defects properly and promptly.

The petroleum industry has a ridged process, as shown in Chapter Three, which encourages sub-contractors to attend to all their defect workmanship.

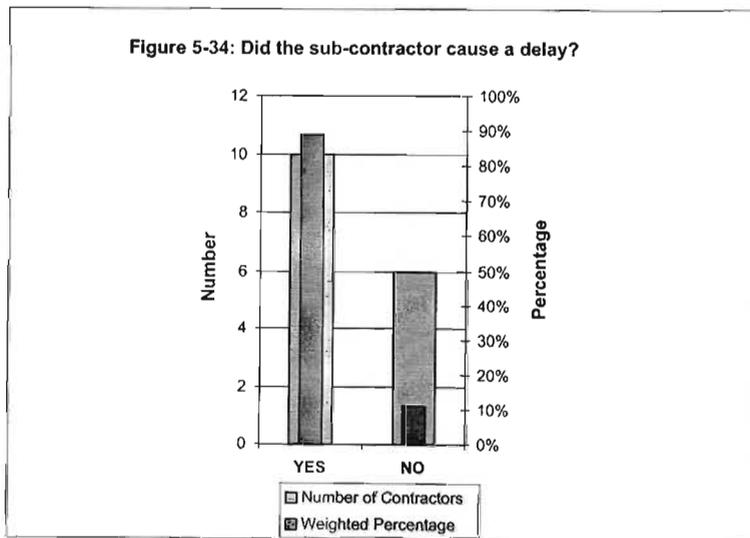


Question D. 3: Did the sub-contractor cause a delay?

The projects of today are requiring large quantities of production in a shorter space of time. The programmes are becoming more and more demanding for the principal contractors and sub-contractors. Coordinating the large number of sub-contractors has become an intricate task. Many sub-contractors can only start their particular activity on the completion of another sub-contractor. Many programmes do not allow for any 'lag' time due to the short duration allowed for each activity (Healy, 1999; Hindle, 1998).

The problems stem from a few sub-contractors extending their designated duration and causing all the remaining sub-contractors to be delayed. This scenario causes that entire project to be delayed. It is very difficult to make up for lost time when the programmes are already demanding (Levy, 1994). For this reason the question asked.

The results, as shown in Figure 5-34, show that the majority respondents believe that the sub-contractors cause project delays. As per the last question, this seems to be a more pertinent problem with the larger contractors.

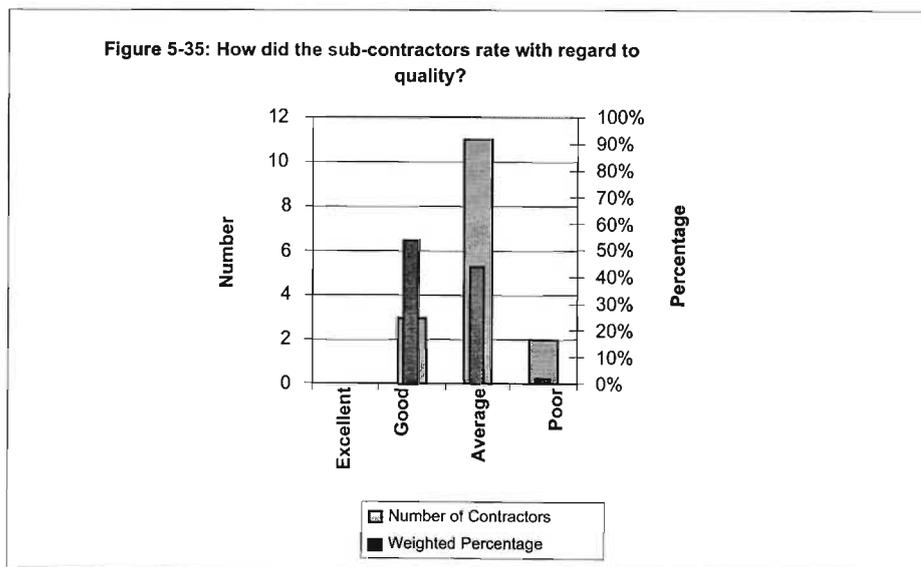


Question D. 4: How do the sub-contractors perform with regard to quality?

The purpose of this question is to establish whether the respondents attained the quality they expected at the start of the project.

The results, as shown in Figure 5-35, show that generally contractors felt the quality performance of sub-contractors was between good and average. Based on their expectations (question C1), there is a distinct difference between expectations and performance. Performance expectations are generally higher than actual performance levels.

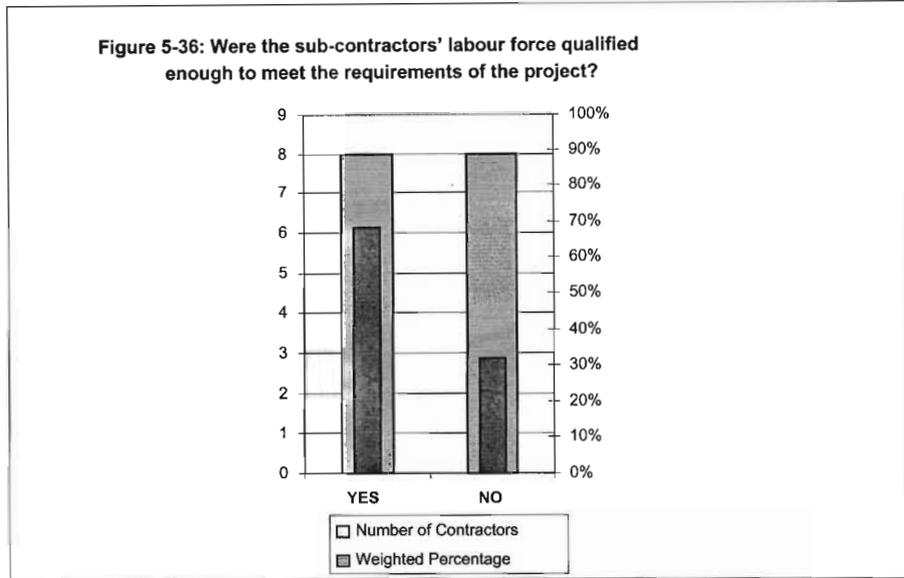
The petroleum industry believe that a controlled contractor selection processes will enable the principal contractor to select better-qualified sub-contractors with a 'need to succeed' attitude to produce better products for the clients. "In constructing a team all parties must want success" (Wild 1997, p. 70).



Question D. 5: Were the sub-contractor's labour force qualified enough to meet the requirements of the project?

The purpose of this question is to establish whether contractors believed that the sub-contractor labour force were responsible for not meeting expectations.

Numerically, the respondents were divided on this issue but the turnover weighted analysis indicates that the larger contractor believe that the sub-contractor labour force is not a significant problem. Clearly some problems are evident.



The results indicate that the sub-contractor selection divisions need to get more details about the sub-contractors in order to select sub-contractors with a better-qualified labour force.

All potential sub-contractors in the petroleum industry complete an in-depth questionnaire as part of the selection process, which help establish the structure of the sub-contractors. All qualifications are check before the sub-contractor in award the project.

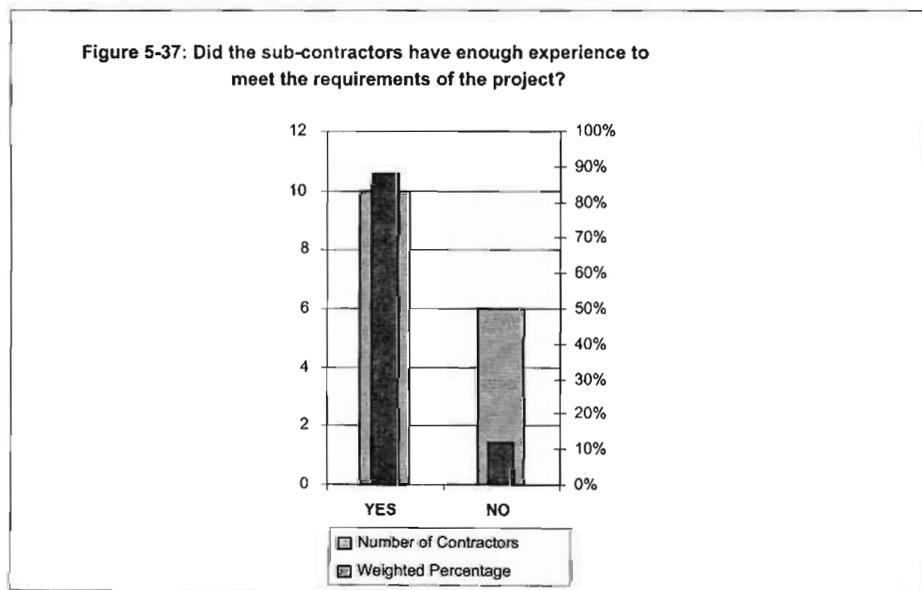
Question D. 6: Did the sub-contractors have enough experience to meet the requirements of the project?

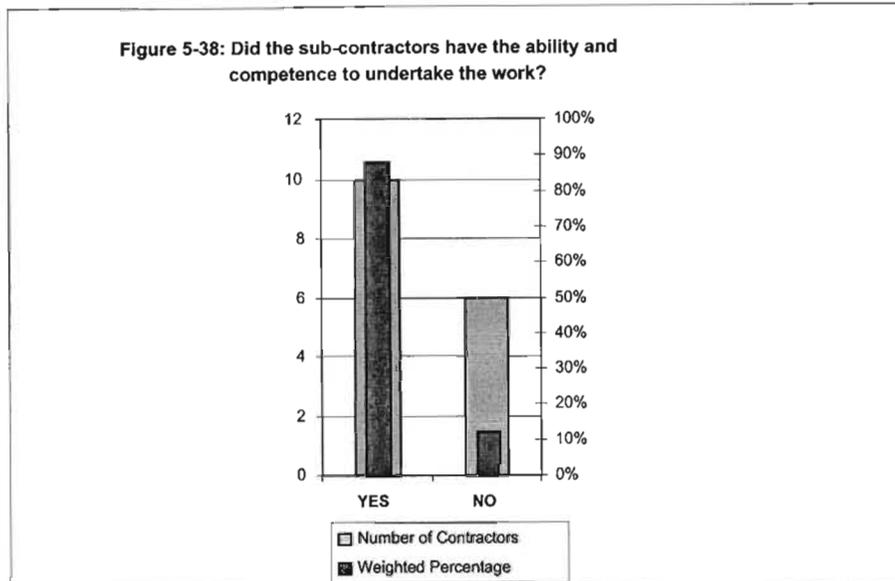
and

Question D. 7: Did the sub-contractors have the ability and competence to undertake the work?

The purpose of these questions was to establish the extent to which contractors believed that lack of experience or competence was the underlying factor for the difference between expectation and actual performance.

The results to both the questions, as shown in Figures 5-37 and 5-38 respectively, indicate that the respondents do not believe that experience or competence were significant reasons for lack of sub-contractor performance.



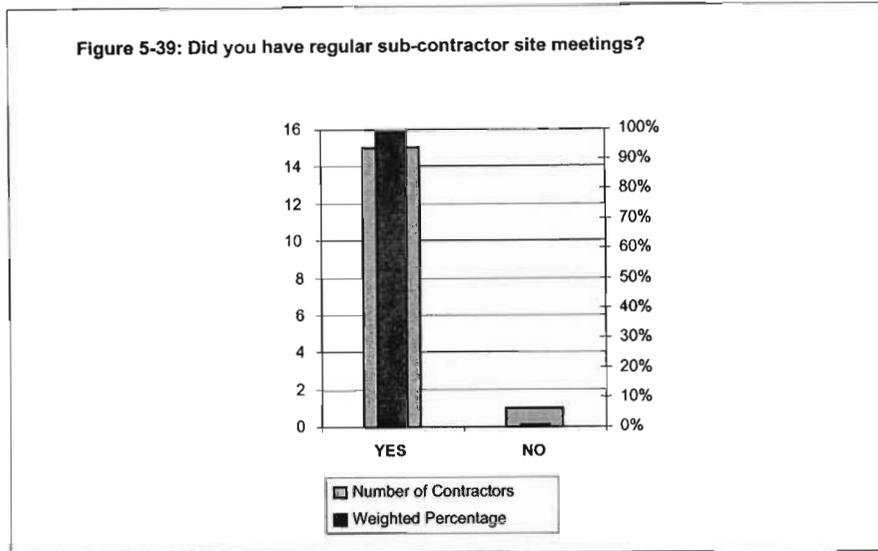


Question D. 8: Did you have regular sub-contractor site meetings?

This form of communication is vital and completely necessary. Bridging the gaps between all the stakeholders will help flow of the overall project (Hindle, 1998). All sub-contractors must attend, not only for their particular issues, but also to understand all the other sub-contractors’ problems. “Although the process of communicating is never more than the indispensable ‘tool’ of leadership or supervision, nevertheless the ability to convey message clearly, vividly and convincingly, by either speech or writing, is the key to the exercise of power among civilized people.” (Calvert, Bailey and Coles 1995, p. 37).

The purpose of this question was to establish whether the sub-contractors site meetings were held.

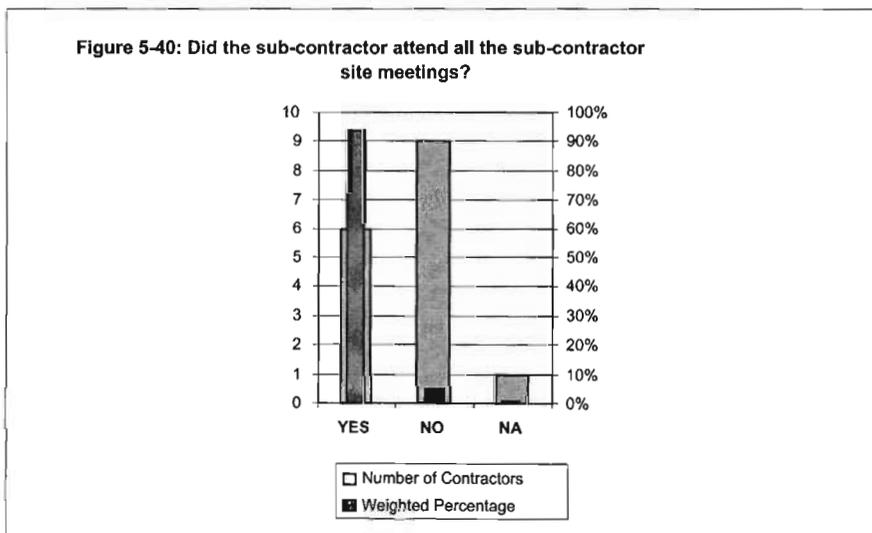
The results are shown in Figure 5-39. Clearly the use of sub-contractor meetings is both planned and implemented.



Question D. 9: Did the sub-contractors attend all the sub-contractor site meetings?

The purpose of this question was to establish whether the sub-contractors made the effort to participate.

The results, as shown in Figure 5-40, shows that the sub-contractor site meetings are generally well attended on larger projects. Only six out of the fifteen contractors believed that sub-contractors attended the site meetings., but these six represented 90% of the turnover. This trend is not unexpected, indicating that sub-contractors devote more management time to large contracts.

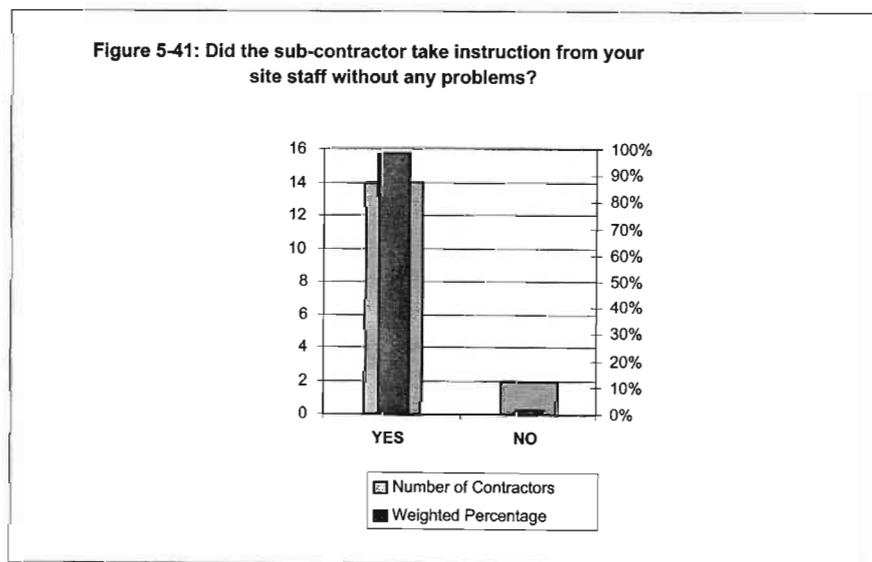


Question D. 10: Did the sub-contractor take instruction from your site staff without any problems?

The purpose of this question was to establish the effectiveness of the most basic and repeated form of communication between contractor and sub-contractor.

The results, as shown in Figure 5-41, indicates that contractor believe that site instructions remain an effective communication method.

“Instructions are the instruments of supervision ...” (Wild 1997, p. 159). “The site manager should set up a project procedure that ensures that the PC is informed of any communication received by the BS contractor or his sub traders from the external inspectorate.” (Wild 1997, p. 160).

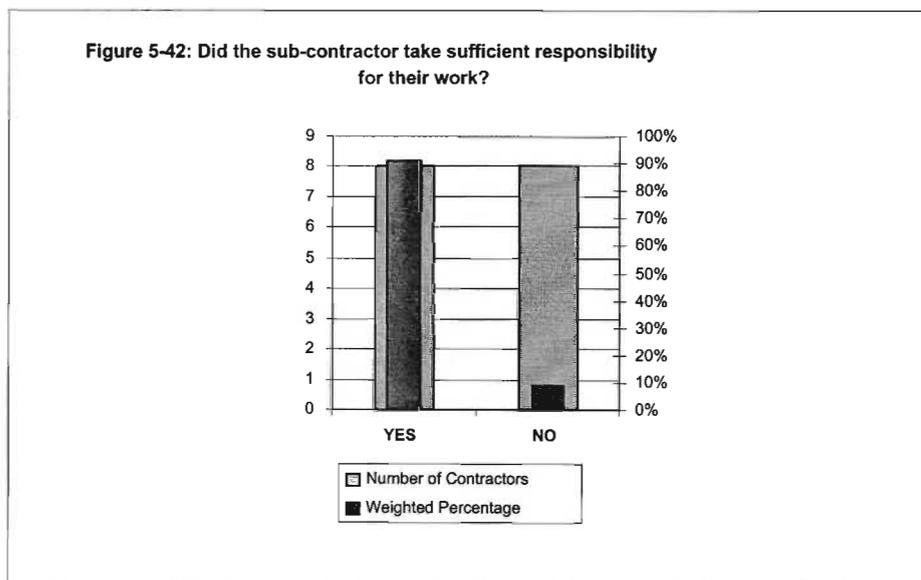


Question D. 11: Did the sub-contractor take sufficient responsibility for their work?

The purpose of this question was to establish whether the respondents believed that the sub-contractors were taking responsibility for the work. All stakeholders need to take responsibility for their input into the projects (Smallwood, 1999).

The results, as shown in Figure 5-42, show that the larger contractors believe that sub-contractors take sufficient responsibility for their work. Smaller contractors do not share this opinion.

“It is important to identify who will be responsible for what. One has to identify the persons or organisations (or what type of people and organisations) who will carry the main responsibility for each activity in the project sequence ...” (Healy 1999, p. 212).

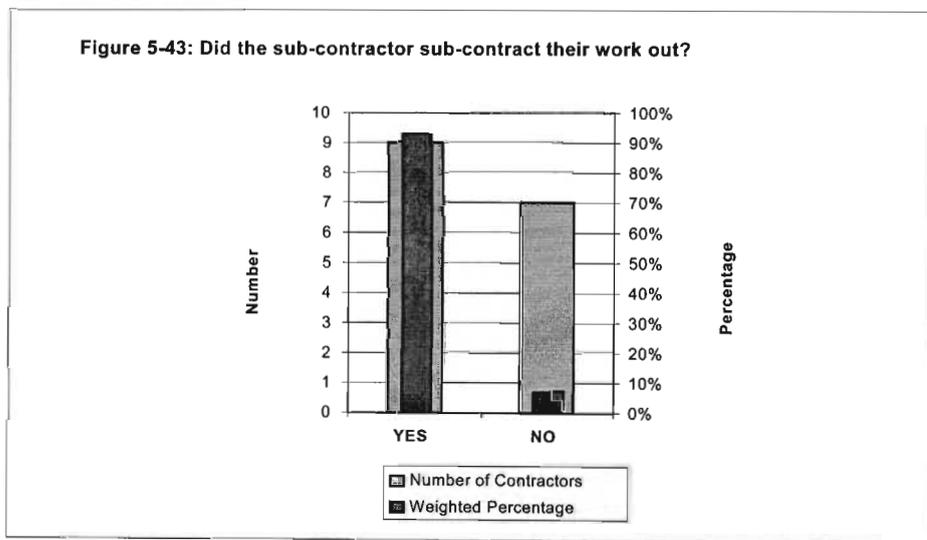


Question D. 12: Did the sub-contractor sub-contract their work out?

The purpose of this question was to establish whether the line of communication was becoming unnecessary long.

The results to the question, as shown in figure 5-43, indicates that the larger contractors believe that sub-contractors believe that sub-contractors do sub-contract their work to others. Smaller contractors do not believe that this is the case. This result is probably the result of the differing size of sub-contractor work packages between large and small projects.

Successful co-ordination requires direct personal contact with the sub-contractors. Co-ordinating becomes extremely difficult for the site agents when sub-contractors sub-contract their work out, because of the unavailability of the direct sub-contractors. The only personnel on site are the sub-contractors of the sub-contractors. Direct communication is the only process that can successfully complete the project (Calvert, 1986). "The contractor who employs sub-contractors to carry out part of the works must be totally responsible for their workmanship, performance and general behaviour on the contract." (Peters 1981, p. 29).



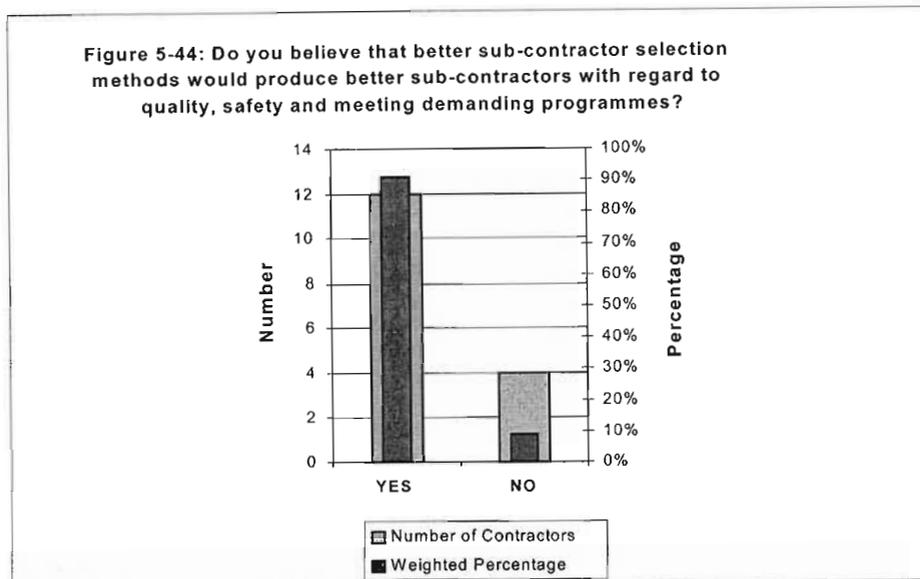
Question D. 13: Do you believe that better sub-contractor selection methods would produce better sub-contractors with regard to quality, safety and meeting demanding programmes?

The purpose of this question was to establish a general belief from the respondents with regard to the overall purpose of this questionnaire.

The results of from this question, as shown in Figure 5-44, shows generally construction companies believe that better sub-contractor selection methods would procure better sub-contractors.

Chapter Four reveals that most of the construction work is carried out by sub-contractors and controlled, co-ordinated and managed by the principal contractor.

As the construction projects get more and more complicated, the demands on the principal contractor and sub-contractor increase (Hindle, 1998; Levy, 1994). Effective management of sub-contractors by principal contractors is vital to the success or failure of the project. Time and money needs to be spent at the early stage of the project to eliminate long-term complications. Procuring the right sub-contractor “first time” is essential. This can only be achieved by using a detailed sub-contractor’s selection procedure.



5.4.8 Summary: Stage D

Stage D of the questionnaire established the views of contractors in respect of sub-contractor performance.

There is a distinct difference between the expected and actual performance of sub-contractors, the actual performance being lower than expected. The reason for this differential was not established save that smaller contractors believed some determinates, such as workforce competence, contributed to the problem.

Contractors believe that sub-contractor procurement methods should be improved to deal with programme delays and repair of defective work, although large and small contractors differed on what issues constituted poor performance.

The principal contractors need to compare what sub-contractors they **believe** they are procuring, to the sub-contractors that they **are** procuring. The site agents need to be involved in this process, in order to help procure the best possible sub-contractor for a particular project.

CHAPTER SIX

6. ANALYSIS OF FINDINGS

6.1 Introduction

This dissertation has established that there is a need to improve quality, safety, programme completions, health and environmental issues in the South African Construction Industry. In order to improve, the construction industry needs to identify the problems and find solutions to solve or improve these problems. The solution found in this dissertation was to benchmark against an industry that has had similar problems, yet found solutions.

A detailed study of the petroleum industry was conducted and found to have similar problems in similar environments. The petroleum industry exercised “best practice” procedures and maintained their status as a world leader. The construction industry needs to benchmark against the petroleum industry in an endeavour to achieve world-leading status.

6.2 The Two Industries

The petroleum industry has developed a well-structured contractor selection process with the objective of procuring the best possible contractor for a particular project. The petroleum industry is continually striving to achieve “best practice” which is a never-ending process. This process of striving for “best practice” is a synthesis of the following:

- Delivering the best possible quality achievable.
- Increasing the usage of information technology.
- Managing knowledge to facilitate collaboration.
- General ethics within the work place.

These four issues are synthesised into procuring the best possible contractor. Each of these four issues has an important function in the contractor selection process. Both industries develop work packages and appoint separate contractors (or sub-contractors) to

implement the work. In both industries, the majority of the work is executed by the appointed contractors or sub-contractors. Therefore it is important that these contractors are competent enough to complete the project on time, within budget, meeting the all required quality standards and adhering to all safety and environmental issues.

Chapter Three elaborates on the petroleum industry's contractor selection process. Chapter Four explores the construction industry's sub-contractors procurement process. The two industries have very similar tasks, which are to construct buildings (construction industry) and / or refineries (petroleum industry) as follows:

- for the best possible price,
- with the best possible quality,
- in the shortest possible duration,
- with the highest safety, health and environmental precautions.

Chapter five details the results of the field research carried out within the construction industry. An overall summary of the results of the research is as follows.

- A system of procuring sub-contractors exists within the industry, the larger contractors generally having a more sophisticated system than the smaller contractors.
- Contractors agree that the sub-contractor procurement system could benefit from improvement. The larger contractors believed that the systems used were generally adequate whereas the smaller contractors felt the existing systems were inadequate.
- Most sub-contractor selection takes place on the basis of the contractors previous experience with the sub-contractor, not price alone.
- Sub-contractor procurement takes place by office support staff and not the site staff responsible for the work.
- There is a clear differential between the performance expectations of the principal contractor and the actual performance standards achieved. Whilst this differential existed throughout the industry, the larger contractors seemed unsure of the reason for this whereas the smaller contractors felt it

was due issues such as inadequate sub-contractor briefing and poorly trained sub-contractor labour force.

- There is little, if any, feedback from site staff as to the actual performance of sub-contractors.

It has been established that the process of procuring and managing these contractors or sub-contractors is different. The construction industry needs to benchmark itself against a world leader that has similar tasks, issues and environment.

6.3 The Differences

There are many differences in all industries and the aim of this dissertation is to compare the South African petroleum industry's process of procuring contractors to the South African construction industry's process of procuring sub-contractors, to establish whether a basis for benchmarking exists. These processes are not to be copied but rather learnt from, adjusted to suit the construction industry, and used to better the construction industry as a whole.

6.3.1 The Procurement and Adjudication Methods

The petroleum industry has dedicated management teams who are responsible for collecting and analysing data on potential sub-contractors. They are also responsible for inspecting previous work and interviewing previous clients of the contractors. Each contractor is given a fair chance to be awarded a project in the petroleum industry as long as they conform to the requirements. The contractors who can conform to most of the requirements will stand the best chance of being awarded the project. This process encourages the contractors to conform. This process elevates the standard of contractors, which results in a high standard of quality and workmanship for the client.

All information is loaded onto a database for all users and stakeholders to view and pass comment on. This process exposes all possibilities, allowing all managers involved in the project to view their concerns or approvals. The

database is continually updated ensuring that the latest information is available. The petroleum industry's process involves all the stakeholders.

Some of the disadvantages of the petroleum industry's processes are:

- Time consuming.
- An expensive exercise.
- Process can be delayed by the time taken to review all the opinions.

The construction industry uses the estimating or tendering department to procure the sub-contractors. The process, as described in Chapter Four, is also based on the prior performance of the sub-contractor, but is less formal than that used in the petroleum industry. The construction industry's selection process does not involve many of the stakeholders i.e.: only one or two persons make the selection.

Some of the disadvantages of the construction industry's sub-contractor selection processes are:

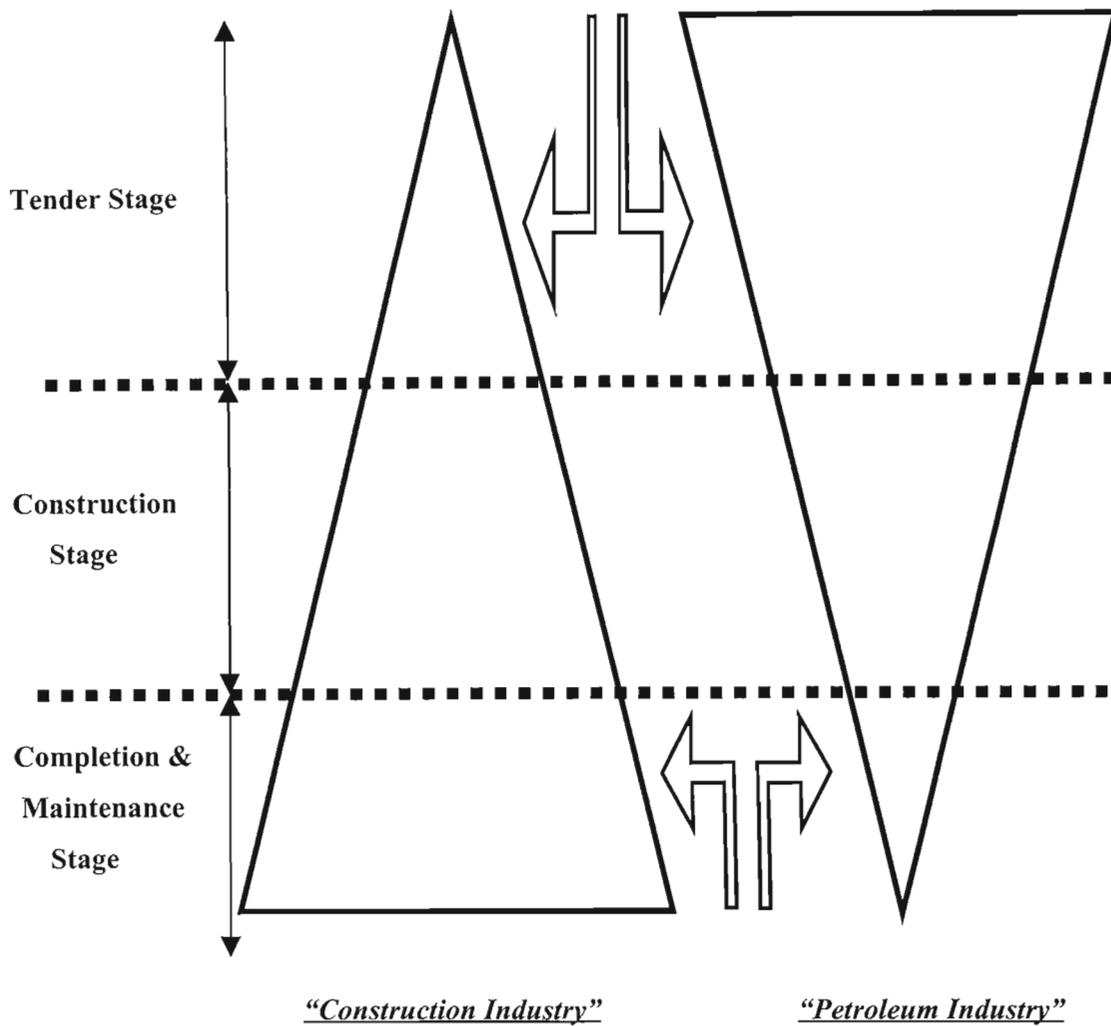
- Those responsible for the construction management are not involved in the sub-contractor selection process.
- Allows for favouritism between sub-contractor and estimating department.
- Performance history from previous contract relationships is not always available and therefore vetting on this basis is not always possible.
- Sub-contractors do not take sufficient responsibility for their own housekeeping on site.
- Quality requirements are only emphasized once on site.
- Safety requirements are only emphasized once on site.
- Health, Safety and Environmental requirements are only emphasized once on site.
- Sub-contractors' existing workload and related capacity is unknown

All these requirements need to be established prior to the sub-contractors being awarded the project, as seen in Figure 6-1. More time needs to be spent with sub-

contractors so that the best possible sub-contractor is selected for the project. More interviews need to be done with the sub-contractors before the selection is made. Communication plays an important role in this selection process (Hindle, 1998). This precludes sub-contractors from claiming that they were not informed and did not realize the extent of the project.

It is acknowledged that there are time constraints from project acceptance to project start. This short period does not allow the principal contractor time to procure and interview all the sub-contractors for the project. The petroleum industry procures, analyses and collects all data regarding the contractors prior to the project being awarded. This information is loaded onto the database for access by the entire project team. Once the project is awarded, the sub-contractors are selected from the pre-procured contractor database and notified of their acceptance for the particular project. This eliminates any delay in assigning the correct contractor to the project.

The petroleum industry has a contractor pre-qualification process, which involves, as detailed in Chapter Three, a requirement to qualify to apply. The contractor selection team does this check. This process allows the procurement team to quickly scan the potential contractor in order to establish if the contractor has the minimum requirements prior to completing the five sections of the application form



“Time and money spent on resolving unsatisfied clients at completion stage and during the maintenance period.”

Figure 6-1 “The Procurement and Adjudication Methods”

The applications are submitted and scrutinized by all stakeholders. All issues are discussed and all views considered prior to selection. The contractor selection team then selects the contractors that fulfil the necessary requirements. The

contractors are further categorized according to their qualifications, previous experience and workmanship.

This process eliminates many of the problems that the construction industry is currently experiencing. Spending more time and money at sub-contractor selection stage, will procure a more committed and responsible sub-contractor. The construction industry needs to procure better sub-contractors in order to become world leaders. The construction industry needs to benchmark against the petroleum industry with regard to their sub-contractor selection procedures. The petroleum industry has detailed stages of analysing contractors. This process ensures that once the contractor is selected and awarded the project, the contractor is sufficiently equipped in all respects to handle the project at hand (Hellard, 1993).

6.3.2 The On-Site Monitoring

The petroleum industry has a rigid monitor system, which entails part of the contractor selection team monitoring the contractors while on site. This ensures that all promises made by the contractor are kept and addressed. If these promises are not adhered to, the contractor is down graded to a lower category. The non-performances of these contractors are addressed and warnings are issued. If the contractor does not address these offences, the contractor is de-listed.

This process is strict and maintained, regardless of any previous relations with the sub-contractors. Contractors' poor performance is addressed with great seriousness in the petroleum industry. The reason for this discipline is to maintain a high standard of all contractors. Having all stakeholders involved in this process, ensures that no biased actions are taken. The ongoing assessment of the contractor's performance ensures that a high standard is maintained at all times.

If however, the contractors perform excellently with added value and complete commitment to the project; these contractors are up-graded to a higher category. Being in a higher category helps the contractor to procure more work within the petroleum industry.

This category system ensures that the best possible contractor is awarded the project using a number of adjudication criteria and a structured selection process. No one individual can select or de-list a sub-contractor because the process will not allow it. The selection process ensures that all contractors are given a fair chance to conform to the petroleum industry's requirements. This has been structured to help all stakeholders in the petroleum industry.

On completion of the project, the site staff have to submit a report, on the database, on each contractor highlighting all their strong and weak points. This information helps the next users accurately assess their previous performance on the database. Knowledge collaboration and networking play an important role in the contractor selection process.

The construction industry needs to benchmark these processes of networking information on the sub-contractors so that all managers can access from a database when required. The priority for the construction industry is to procure better sub-contractors to help the industry become a world leader.

Quality evolves from being responsible and proud of one's workmanship. In some cases this is regarded as a cost to the project (Smallwood, 2001). Many added value activities are paid back many times over. "Job cleaning helps maintain good safety practices and many of the job-related accidents that have occurred could have been prevented if better housekeeping measures had been in effect. Housekeeping has a direct effect on quality – a dirty site tends to create an atmosphere of lack of concern about the work under way, whereas a clean and tidy site creates an atmosphere of concern for neatness and quality" (Levy 1994, p. 101).

Each sub-contractor needs to be responsible for their own housekeeping activities. Penalties should be implemented if housekeeping requirements are not adhered to. The principal contractor needs to ensure that these requirements are achieved, for total project success (Smallwood, 1998).

All stakeholders need to change their way of thinking if they want to attain the best out of the construction industry (Ofori, 2001). Clients need to look at the option of paying more to receive a better product. In many cases the clients do not receive the quality that was expected because costs were cut and short cuts were taken to achieve the required budget. This only leaves the client unsatisfied for years to come (Egan, 1998; Hindle, 1998). Sub-contractors should be procured with great care and selected on more qualities than just the lowest price. "Price may not be the overriding factor." (Levy 1994, p. 106).

The construction industry needs to establish a process of checking that all sub-contractor employees are appropriately qualified for the required project (Healy, 1997). Benchmarking against the petroleum industry can establish this process. The process involves interviewing the sub-contractors while on other projects as well as checking their workmanship. Interviewing the sub-contractor's previous clients usually is an accurate indicator of the sub-contractors performances.

All relevant information, drawings, specifications and programmes need to be issued prior to the sub-contractor being awarded the project. This ensures that the sub-contractors understand exactly what is required for the project. The price then will incorporate all requirements. The results revealed in Chapter Five, show that many of the sub-contractors only received information, drawings, specifications and programmes once on site. This procedure allows inappropriate sub-contractors to be selected who are found to be incapable of completing the project as required.

Results from the field research revealed that sub-contractor's attitude towards defective workmanship were poor. This shows that there is no long-term commitment from the sub-contractors. The construction industry needs to procure sub-contractors that are prepared to commit to improving quality, safety, programme completions, health and environmental issues. These are the issues that are going to help improve the construction industry.

6.4 Summary

A comparison of the two industry's sub-contractors procurement process was made. The petroleum industry has a very structured process which analyses and scrutinizes the contractors before they are awarded a project. This process is time consuming and expensive, but procures the best-prepared contractor for a particular project.

The construction industry has a less structured sub-contractor selection process, which is less time consuming and less expensive but procures less prepared sub-contractors for particular projects. Not enough time is spent analysing the sub-contractor before they are awarded the project.

The construction industry needs to benchmark against an industry that is involved in similar activities under similar environments. The construction industry and the petroleum industry both have high percentages of contractors (or sub-contractors) active in their particular projects. The petroleum industry successfully procures contractors that are appropriately prepared to meet the requirements of the projects. This needs to be benchmarked by the construction industry.

CHAPTER SEVEN

7. CONCLUSION AND RECOMMENDATIONS

7.1 Research Objectives

The primary objectives of this research as stated in section 1.3 were:

1. *To establish the present state within the South African construction industry regarding quality management, specifically within the context of the sub-contractor selection process.*
2. *To investigate the contractor selection process within the petroleum industry and whether or not there is a clear indication that their systems achieve “best practice” status.*
3. *To establish whether the practices used within the petroleum industry can practically be applied to the sub-contractor selection process in the construction industry and whether such application is likely to improve the quality management process.*

The findings in relation to these primary objectives are discussed below.

This dissertation is based on the fundamental principle that improvement, in respect of quality, safety, programmes, health and environmental issues, is necessary in the South African construction industry. The literature review, as well as the field research, indicates that the need for improvement via change of approach is accepted by the industry as a whole.

The documented trend of increasing levels of sub-contracted work has been demonstrated via the field research. As much as 80% of construction work is sub-contracted making the procurement of sub-contractors by principle contractors a critical element in the success of a construction project. This need for improvement in sub-contractor procurement processes was described in Chapter one as “*the sub-*

contractor's selection process in the South African construction industry is considered to be unsatisfactory".

This trend together with the increasing complexity of construction projects demonstrates the need for adoption of "best practices" in respect of sub-contractor procurement methodology.

The petroleum industry shares many of the environmental problems experienced by the construction industry. Although the use of a principal contractor by the construction industry represents a difference in general procurement arrangements, the level of work contracted to specialist contractors by both industries create the basis for benchmarking of identified "best practices".

Field research indicated that the underlying approaches and requirements of the two industries are similar. Both seek high quality levels and accept that price cannot be used as the overriding selection criteria. The differences in procurement systems relate to the formality of the procurement methodology.

The contractor procurement system implemented in the petroleum industry has been investigated and found to represent a "best practice". This, therefore, represents a basis for benchmarking by the construction industry for use in sub-contractor procurement.

The primary research objectives have therefore been achieved.

7.2 The Hypothesis

This dissertation endeavours to prove the hypothesis that states, *"the method of contractor selection used by the South African Petroleum industry is a suitable benchmark model for adoption in the sub-contractor selection process used within the South African construction industry"*.

It has been established that due to the similarities in procurement requirements and environment, the contractor procurement methodology used in the petroleum industry

could be applied to the procurement of sub-contractors in the construction industry. The field research, conducted in the construction industry, indicated a differential between the expected and actual performance levels of sub-contractors. Sub-contractor procurement systems were found to be inadequate. It also demonstrated that procurement arrangements are not sophisticated enough to incorporate past performance into future procurement decisions. A comparison of the two procurement systems shows that many of the problems being experienced by the construction industry with sub-contractor performance would be alleviated by the adoption of the petroleum industry contractor procurement methods.

The petroleum industry has successfully used the objective of endeavouring to produce the best possible quality, maximizing the use of information technology, managing knowledge collaboration and maintaining a high regard for general ethics in the work place. The collaboration of these policies is used in the make-up of the contractor selection process.

The petroleum industry sub-contractor selection process can be utilised in the construction industry positively and thereby establish higher satisfaction levels for the clients. A functional benchmarking approach can be used by the construction industry in order to achieve better 'end products'. These 'end products' are achieved by using better sub-contractors

The hypothesis has therefore been proved.

7.3 Recommendations

7.3.1 Change

Change is inevitable, and it's how the construction industry adapts to the change that will determine the success or failure of the industry. All construction companies, their managers and their staff must deal with change, not only to survive but also to become world leaders. Construction companies can shape the changes to suit their needs and goals. This change involves changing people, their ways and attitudes. Change is on-going and always will be.

The attitude of sub-contractors being awarded contracts on the lowest price needs to change. This will not end competitive pricing but will end consistently accepting the lowest tender regardless of the quality management issues. Pre- contract audits with all sub-contractors need to be implemented to enable contractors to procure the best possible sub-contractor. This change involves all stakeholders in the construction industry. The stakeholders need to look more at the best overall value for money. This value for money will include the best quality at the best price in the best time period. The softer issues involving the construction industry are becoming harder and need to be addressed as a matter of urgency.

The general attitude change amongst clients, consultants, principal contractors and sub-contractors needs to be changed for the better. Teamwork and co-operation, not conflict and confrontation, should become a priority amongst all stakeholders. This new attitude is long overdue and needs addressing. The construction industry needs to forecast and plan accordingly. The aim is to become pro-active and manage change. If the construction industry develops before the change, their success for the future can only be positive.

7.3.2 Communication

Good communication is vital in any organization. Construction managers constantly use communication to get action. This communication in the construction industry is generally poor and has been a problem for quite some time. Very few companies that do have in-house training direct much of their time to better their staff communications.

Sub-contractors should document all procedures and events in order to share knowledge amongst each other. This will help achieve high standards and ensure continuous improvement.

It becomes necessary to use good channels of communication to ensure that all staff receives the information they require. In small companies it is common to use “word of mouth” around the office and to the sites. This system has proven less effective than an organized system to transfer information quickly and accurately.

Managing knowledge to facilitate collaboration has helped the petroleum industry procure the correct sub-contractor for the contract, for the correct reasons. The construction industry needs to benchmark against these systems in order to improve the existing sub-contractor selection methods.

7.3.3 Company Safety Programmes

The construction industry needs to enforce company safety programmes that extend not only to their direct employees, but also to their indirect employees i.e. sub-contractors. If the industry as a whole intends to grow and improve its safety, it needs to grow as a team with all stakeholders participating. The only way the construction industry can enforce sub-contractors to participate in safety procedure is by insisting on participation as a requirement in order to be accepted onto site.

Individuals that are careless or that are unaware of the dangers cause unsafe acts. One might argue that this is due to lack of training. In that case, training must be done on site prior to working on site. Education and training at all levels in all areas is essential for the construction industry to grow. All personnel must attend a general safety programme. A further specialized safety programme must be introduced for personnel that use particularly dangerous equipment. Company safety meetings should be held regularly to ensure continuity and to enforce the seriousness of the matter.

It is vitally important that safety regulations are enforced upon all sub-contractors. The principal contractor must lead by example by proudly fulfilling all the safety requirements. Safety procedures are in place to protect all sub-contractors. If sub-contractors believe and understand that it's for them, they will be more amenable to the procedure.

Sub-contractors may argue that the implementation of safety programmes and cost of safety facilities are costs they cannot afford. Most accidents can be avoided at little or no cost. In fact these safety costs can actually save the sub-contractor money by achieving no down time due to injury on site.

7.3.4 Quality for all Stakeholders

Total quality management needs to filter through to the sub-contractors not as 'added value' but as a requirement from all sub-contractors. The unending improvement of quality by sub-contractors needs to be monitored through quality auditing. Each sub-contractor needs to be empowered with the philosophy of seeking permanent improvement. The concept that there is no difference between 'customer satisfactions' and 'personal business goals' must be on all sub-contractor's agendas.

Sub-contractor's continued improvement must be regularly monitored through quality audits. The sub-contractor must be audited on the same level as the principal contractor. The sub-contractor must therefore be procured on the results displayed by the audit.

The construction industry needs to evolve from the existing methods of training workers to carry out tasks without looking further than what they are expected to do. All workers need to be shown the holistic view in order to understand the ultimate goal. If workers are shown why, when, and where they are in the entire picture of the project, this will allow teamwork to be the key to a smooth project.

7.4 Summary

This dissertation has researched only one aspect of the South African construction industry, the sub-contractor procurement process. With the increased involvement of the sub-contractor in the construction industry, the process of selecting sub-contractors is becoming more and more crucial. The construction industry is changing therefore the process and methods must change.

Benchmarking against other industries is something that should be looked upon as 'working smart, not hard'. Use what other industries have pioneered to the best possible gain for the construction industry. The construction industry needs to be proud of its progress in improving existing systems for the betterment of the entire industry.

The way forward is by endeavouring to find a solution for the construction industry's lack of world status. By attempting the recommendation presented in this dissertation, the construction industry can only go forward and get some positive attention from the world.

REFERENCES

- Armstrong, J. (1999) *The Decision Makers: Ethics for Engineers*. Telford, London.
- Barrett, P. (2001) A survey of construction clients' needs. *CIB World Building Congress Paper CLI, 15, APRIL*, pp. 1-10.
- Bendell, T., Boulter, L. and Goodstadt, P. (1998) *Benchmarking for Competitive Advantage: Second Edition*. Pitman Publishing, London.
- Bennett, J. (1985) *Construction Project Management*. Butterworths, London.
- Bogan, C.E. and English, M. J. (1997) *Benchmarking for Best Practices: Winning Through Innovative Adaptation*. McGraw-Hill, New York.
- Bureau for Economic Research. (2000) *Building and Construction*, 3rd Quarter.
- Calvert, R.E. (1986) *Introduction to Building Management: 5th Edition*. Butterworths, London.
- Calvert, R.E., Bailey, G. and Coles, D. (1995) *Introduction to Building Management: 6th Edition*. Butterworth – Heinemann Ltd, London.
- Capra, F. (1997) *The Web of Life: A New Understanding of Living Systems*. Doubleday, London.
- Chang, R.Y. and Kelly, K.P. (1995) *Improving Through Benchmarking. A Practical Guide to Achieving Peak Process Performance*. Kogan Page, London.
- Choppin, J. (1991) *Quality Through People. A Blueprint for Proactive Total Quality Management*. IFS Publications, UK.
- Clough, R.H. (1975) *Construction Contracting: 3rd Edition*. Kjohn Wiley & Sons, New York.

- Deacon, T. (1998) *Benchmarking – Adopting and Adapting Best Practices*. ProjectPro – The Journal for Project Professionals. Project Publishing cc. Vol 8 No.3, pp. 3 - 4.
- Earl, M.J. (1989) *Management Strategies for Information Technology*. Prentice Hall, London.
- Egan, J. (1998) *Construction Management. The Egan Report. The Report of the Construction Task Force: “Rethinking Construction”*. UK Department of the Environment, Transport and the Regions, London.
- Engen Petroleum Limited, South Africa (2001) *The Engen Code of Conduct and Ethics: “General Business Principles”*. Unpublished.
- Evans, J.R. and William, L. (1993) *The Management and Control of Quality*. West Publishing Company, Minneapolis.
- Feigenbaum, A.V. (2000) *Leaders: Total Quality*. General Systems Company, Inc., Pittsfield, Massachusetts.
- Fisher, J.G. (1996) *How to Improve Performance Through Benchmarking*. Kogan Page, Better Management Skills, London.
- Fletcher, A.C. and Sukes, R.M. *Why Implement ISO 9002 if You Don't Have To?* Unpublished.
- Franks, J. (1984) *Building Sub-Contract Management*. Construction Press, London.
- Fryer, B. (1985) *The Practice of Construction Management*. Collins Professional and Technical Books, London.
- Haupt, T.C. (1999) *Partnering for Safety*. ProjectPro – The Journal for Project Professionals. Project Publishing cc. Vol. 9 No.4, pp. 20 - 23.

- Harris, F. and Mc Caffer, R. (1989) *Modern Construction Management: Third Edition*. BSP Professional Books, London.
- Healy, P. (1997) *Project Management: Getting the job done on time and in Budget*. Butterworth – Heinemann Ltd, London.
- Hellard, R. B. (1993) *Total Quality in Construction Projects: Achieving Profitability with Customer Satisfaction*. Thomas Telford Services Ltd, London.
- Hibberd, P.H. (1987) *Sub-Contracts under the JCT Intermediate Form*. BSP Professional Books, London.
- Hindle, B. (2001) *Business process development in construction responding to change in the South African construction industry*. The Civil Engineering and Building Contractor, Brooke Patrick Publications, South Africa. Vol. 35, No. 4, pp 50 - 51.
- Hindle, B. (2001) *Declining demand and its impact on construction firms & consultants in South Africa*. The Civil Engineering and Building Contractor, Brooke Patrick Publications, South Africa. Vol. 35, No. 3, pp 54 - 55.
- Hindle, B. (1998) *What is wrong with the construction industry?* The Civil Engineering and Building Contractor, Brooke Patrick Publications, South Africa. Vol. 32, No. 8, pp 10 - 12.
- Hindle, B. (1998) *The professions ... following the path of the dinosaurs! (Part 2)* ProjectPro – The Journal for Project Professionals. Project Publishing cc. Vol 8 No.5, pp. 40 - 41.
- Hindle, B. (1998) *The professions ... following the path of the dinosaurs!* ProjectPro – The Journal for Project Professionals. Project Publishing cc. Vol 8 No.4, pp. 20 - 21.

- Horsley, D.M.C. and Parkinson, J.S. (1990) *Process Plant Commissioning*. Institution of Chemical Engineers, Chapter 2, pp. 5-9.
- Kerzner, H. (2001) *Project Management: A Systems Approach to Planning, Scheduling, and Controlling: Seventh Edition*. John Wiley & Sons, Inc., New York.
- Kilian, W. and Snyman, J. (1985) *On Containing Building Costs*. Juta's SA Journal of Property, Vol. 2, No. 4, pp 26-30.
- Langford, D. and Male, S. (2001) *Strategic Management in Construction: Second Edition*. Blackwell Science Ltd, London.
- Latham, M. (1994) *Constructing The Team. Final report of the government / industry review of procurement and contractual arrangements in the UK construction industry*. Her Majesty's Stationery Office, London.
- Lavender, S. (1996) *Management for the Construction Industry*. Addison Wesley Longman Limited, London.
- Leibfried, K.H.J. and Mc Nair, C.J. (1992) *Benchmarking: A Tool for Continuous Improvement*. Harper Collins.
- Levy, S.M. (1994) *Project Management in Construction: Second Edition*. Mc Graw-Hill, Inc, New York.
- McGeorge, W.D. and Palmer, A. (1997) *Construction Management: New Directions*. Blackwell, Oxford.
- Mohsini, R.A. and Davidson, C.H. (1991) *Building Procurement – Key to improved Performance*. BRI Journal, Vol.19, No. 2, pp. 106-113.
- Morgan, G. (1986) *Images of Organisations*. Sage, Beverly Hills, CA.

- Ofori, G. (2001) *Challenges facing construction industries in southern Africa*. The Civil Engineering and Building Contractor, Brooke Patrick Publications, South Africa. Vol. 35, No. 9, pp 40 – 49.
- Peale, N.V. and Blanchard, K. (1988) *The Power of Ethical Management*. William Morrow & Co., London.
- Peters, G. (1981) *Project Management and Construction Control*. Construction Press, London.
- Preller, S. (1998) *Diversify or die*. ProjectPro – The Journal for Project Professionals. Project Publishing cc. Vol 8 No.4, p. 43.
- Preller, S. (1998) *Moving with the times*. ProjectPro – The Journal for Project Professionals. Project Publishing cc. Vol 8 No.3, p. 51.
- Rampsey, J. and Roberts, H. (1992) *Perspective on Total Quality Forum IV*. Cincinnati, Ohio.
- Robinson, I. (2001) *Need to intensify fight against AIDS*. The Civil Engineering and Building Contractor, Brooke Patrick Publications, South Africa. Vol. 35, No. 4, pp 10 – 11.
- Robson, C. (1993) *Real World Research: A Source for Social Scientists and Practitioner – Researchers*. Blackwell, Oxford.
- Rothnie, D. (1995) *The Quick and the Dead. International Operations, Issue 1, September, 1995*.
- Rounds, J.L. (1985) *Total quality management for construction*. *Journal of Construction Engineering and Management*, **111**, 117-127.
- Rwelamila, P.D. and Hall, K.A. (1995) *Construction Management and Economics, Total systems intervention: an integrated approach to time, cost and quality management*. Department of Construction Economics and Management,

University of Cape Town. 13, pp. 253-241.

Schwenke, S. (2000) *The Moral Critique: Corruption in Developing Countries*.
Journal of Public and International Affairs, pp. 137-156.

Smallwood, J. (2001) *Construction health and safety: can the media contribute?*
The Civil Engineering and Building Contractor, Brooke Patrick
Publications, South Africa. Vol. 35, No. 5, pp 28 – 31.

Smallwood, J. (1999) *Health, Safety, Productivity and Quality Improvement in the
African Renaissance*. ProjectPro – The Journal for Project Professionals.
Project Publishing cc. Vol 9 No.6, pp. 33 - 36.

Smallwood, J. (1998) *Large scale construction accidents is there a trend?*
ProjectPro – The Journal for Project Professionals. Project Publishing cc.
Vol 8 No.5, p. 39.

Smallwood, J. (1998) *Construction Management – How do we really rate?*
ProjectPro – The Journal for Project Professionals. Project Publishing cc.
Vol 8 No.4, p. 45.

Stuart, D. (2000) *Proof of Payment – Domestic Subcontractors' Dilemma*.
ProjectPro – The Journal for Project Professionals. Project Publishing cc.
Vol 10 No.2, p. 26.

Sudman, S. and Bradburn, N.M. (1982) *Asking Questions: A Practical Guide to
Questionnaire Design*. Jossey – Bass Publishers, California.

Tinker, G. (2001) *A case for structural change using a systems approach*. The Civil
Engineering and Building Contractor, Brooke Patrick Publications, South
Africa .Vol. 35, No. 3, pp 50 – 53.

Tookey, J. E. and Betts, J. (1999) Department of Building and Surveying, Glasgow
Caledonian University, *Concurrent engineering issues in the aerospace
industry – lessons to be learned for construction?* pp. 1-12.

Uff, J. and Odams, A.M. (1995) *Risk, Management and Procurement in Construction*. Centre of Construction Law and Management, King's College, London.

Verster, J.J.P. (1998) *Towards Quality Projects – Identifying the principles of project success*. ProjectPro – The Journal for Project Professionals. Project Publishing cc. Vol 8 No.3, pp. 32 - 34.

Vincent, K.O. and Joel, E.R. (1995) *Principles of Total Quality*. Kogan Page, London.

Wild, J. (1997) *Site Management of Building Services Contractors*. E & FN Spon, London.

Wylie, M. (2001) *WBHO – from strength to strength*. The Civil Engineering and Building Contractor, Brooke Patrick Publications, South Africa .Vol. 35, No. 9, pp 15 – 16.

INTERNET REFERENCES

Best Practices, LLC. (2000) *Manage Knowledge to Facilitate Collaboration: Part 1*.
[Online], Available:
http://www.bestpracticdatabase.com/subjects/knowledge_management.htm
[2001, November 16].

BIBLIOGRAPHY

- The Aqua Group. (1990) *Contract Administration for the Building Team: Seventh Edition*. BSP Professional Books, London.
- Bowen, P.A., Cattell, K.S., Hall, K.A., Pearl, R.G., Edwards, P.J. (2001) *Group dynamics in building procurement teams: do we work well together in the client's best interests?*. The Civil Engineering and Building Contractor, Brooke Patrick Publications, South Africa. Vol. 35, No. 4, pp 40 – 49.
- Bowen, P.A., Cattell, K.S., Pearl, R.G., Edwards, P.J. (2001) *Procurement method selection in South Africa: food for thought*. The Civil Engineering and Building Contractor, Brooke Patrick Publications, South Africa. Vol. 35, No. 5, pp 40 – 46.
- Bowen, P.A., Cattell, K.S., Hall, K.A., Edwards, P.J., Pearl, R.G. (2000) *Building procurement team selection: a game of roulette?* The Civil Engineering and Building Contractor, Brooke Patrick Publications, South Africa. Vol. 35, No. 2, pp 29 – 39.
- Bowen, P.A., Pearl, R.G., Edwards, P.J. (2000) *Client briefing in South Africa: an effective communication process?* The Civil Engineering and Building Contractor, Brooke Patrick Publications, South Africa. Vol. 35, No. 1, pp 37 – 43.
- CCPS (Center for Chemical Process Safety) of the AIChE (American Institute of Chemical Engineers), (1992). *Plant Guidelines for Technical Management of Chemical Process Safety*, pp. 47-50.
- Cole, R. J. (2000) 18. *Building environmental assessment methods: assessing construction practices*. School of Architecture, University of British Columbia, Vancouver, Canada. pp. 949-957.

- Cole, R. J. (1998) 26(1) *Emerging trends in building environmental assessment methods*. School of Architecture, University of British Columbia, Vancouver, Canada. pp. 3-16.
- Engineering, Construction and Architectural Management (2001) editor Ronald McCaffer, Vol. No. 8/3, June 2001.
- Garnett, N. and Pickrell, S. (2000) *Construction Management and Economics* 18, *Benchmarking for construction: theory and practice*. pp 55-63.
- Goldhaber, S., JHA, C.K. and Macedo, M. C. Jr. (1977) *Construction Management: Principles and Practices*. John Wiley & Sons, Inc., USA.
- Green, S.D. (2001) CIB World Building Congress, *Towards a critical research agenda in construction management*. Paper NOV 23, pp. 1-11.
- Higgin, G. and Jessop, N. (1965) *Communications in the Building Industry: The Report of a Pilot Study*. Travistock Publications, London.
- Horsley, D.M.C. and Parkinson, J.S. (1990) *Process Plant Commissioning*. Institution of Chemical Engineers, Chapter 2, pp 5-9.
- Kagioglou, M., Cooper, R. and Aouad, G. (1999) *Construction Process Re-Engineering, Re-engineering the UK construction industry: The process protocol*. pp. 425-436.
- Kavanagh, T.C., Muller, F. and O'Brien, J. (1978) *Construction Management: A Professional Approach*. Mc Graw-Hill Book Company, USA.
- Kibert, C. J., Chini, A. R. and Languell, J. (2001) *Deconstruction as an essential component of sustainable construction*. CIB World Building Congress, Wellington, New Zealand. Paper: NOV 54, pp 1-11.

- Male, S., Kelly, J., Fernie, S., Gronqvist, M. and Bowles, G. (1998) Value Management, *The value management benchmarking: A good practice framework for clients and practitioners*. Published by Thomas Telford Publishing.
- Mel, S. and Goddard, W. (1996) *Research Methodology: "An Introduction for Science and Engineering Students"*.
- Millett, S.J., Dainty, A. R. J., Briscoe, G. H. and Neale, R. H. (2001) CIB World Building Congress, *The relationship between client's primary business functions & the implementation of supply chain management in construction*. Paper CLI 28, pp. 1-10.
- Raimond, P. (1993) *Management Projects: Design, Research and Presentation*. Chapman & Hall, London.
- Rose, J.C., Wells, G.L. and Yeats, B.H. (1978) *A Guide to Project Procedure*. The Institution of Chemical Engineers.
- Rowlinson, S. and McDermott, B. (1999) *Procurement Systems: A Guide to Best Practice in Construction*. E & FN Spon, London.

APPENDIX: No. 1.

“Sub-contract Query Sheet”

LETTER HEAD

P.O.BOX 1234
DURBAN
4001

TELEPHONE: 031 – 555-5678
FAX: 031 – 555 - 2468

TO :

COMPANY:

FROM:

DATE :

RE:

- **Conditions of Contract**
- **Locality**
- **Contract Duration**
- **Tender Closing Date**
- **Price Required By**
- **Subject to Escalation**
- **Fixed Price Contract**
- **Priced Bill**
- **Plan and Specification**
- **Lump Sum Price**
- **Drawings Issued**
- **Additional Information**

Note: All prices are to include Value Added Tax.
A copy of all contract documents and drawings are available on request.

APPENDIX: No. 2.

“Sub-contractors Letter of Intent”

LETTER HEAD

PAINTERS
10 Address Street
Durban
4001

15th July 2002

ATTENTION: Mr. Painter

Dear Sir / Madam,

Re: THE OFFICE PARK

It is our intention to enter into a sub-contract agreement with your company for the **painting** works on the above contract, in the sum of **R 60 000-00** (including V.A.T.)

Your sub-contract reference number for this contractor is **007/ABC/PAINTING**. The following requirements need to be met within 10days of the date of this letter:

1. The sub-contract agreement that shall form the basis of this contract is the JBCC 2000 Domestic Sub-Contract Agreement.
2. We require with 10 days, a Sub-Contract Construction Guarantee. This guarantee is to be on the unaltered form and made in favour of ABC Builders. Please contact us if this unattainable.
3. Proof of Public Liability Insurance.
4. Current proof of compliance with the Compensation for Occupational Injuries & Diseases Act. This should be in the form of a certificate from the Commissioner, or alternatively a copy of your latest receipted assessment.
5. A resolution of the Directors/Member, authorising the responsible person to sign and undertake this agreement is to be forwarded to ABC Builders.

In order that payments can be made on time, it is necessary for all applications for payment and the submission of Tax Invoices to be submitted on or before the 25th of each month. This will ensure payment to yourselves by the end of the following month.

No payment will be made unless the original Tax Invoice has been received by the Contractor.

We are presently preparing the formal contract documentation for signature, and this will be forwarded shortly.

We welcome you as a Sub-Contractor and look forward to a mutually beneficial contact.

Yours faithfully,

ABC Builders

APPENDIX: No. 3.

“Sub-contractor Take on Form”

~~LETTER HEAD~~

SUB-CONTRACTOR TAKE-ON FORM

CONTRACT NAME:

ORDER No. :

CONTRACT No. :

SUB-CONTRACTORS NAME:

ADDRESS :

.....

PHONE No. :

FAX No. :

IS SUB-CONTRACTOR A VAT REGISTERED VENDOR? YES NO

IF YES, PROOF OF REGISTRATION MUST BE ATTACHED.

IS SUB-CONTRACTOR REGISTERED FOR WORKMANS COMPENSATION ACT?

YES NO

IF YES, PROOF OF REGISTRATION MUST BE ATTACHED.

NAME OF BANKING INSTITUTE:

BRANCH NAME: :

BRANCH CODE :

ACCOUNT No. :

TRADE :

DURATION OF PROJECT:

VALUE OF WORK R:

APPENDIX: No. 4.

“Interview questionnaire”

INTERVIEW QUESTIONNAIRE

A. GENERAL (OFF SITE STAFF)

A.1. Company Name

A.2. Project Values

A.3. Capacity

A.4. What percentage of your work do you estimate to be sub-contracted out?

A.4.1. Between 0% and 10%

A.4.2. Between 11% and 20%

A.4.3. Between 21% and 30%

A.4.4. Between 31% and 40%

A.4.5. Between 41% and 50%

A.4.6. Between 51% and 60%

A.4.7. Between 61% and 70%

A.4.8. Between 71% and 80%

A.4.9. Between 81% and 90%

A.4.10. Between 91% and 100%

A.5. Does your company have a system for selecting sub-contractors?

INTERVIEW QUESTIONNAIRE

A.6. How do you rate your method of selecting sub-contractors?

A.6.1. Needs no improvement. It works perfectly as it is.

A.6.2. Needs some adjustment.

A.6.3. Needs a lot of adjustment.

A.6.4. Needs a complete new method.

A.7. On average, are sub-contractors awarded the contract on:

A.7.1. Lowest Price?

A.7.2. Best Quality?

A.7.3. Previous Experience or Working Relationship?

A.7.4. Ability to Meet the Programme?

A.8. Do all the sub-contractors have to be ISO certified?

A.9. Are delays caused by a sub-contractors a constant problem?

A.10. Are you generally satisfied with your sub-contractor's quality and commitment to the project?

B. SUB-CONTRACTOR PROCUREMENT STAGE (OFF-SITE STAFF)

B.1. Do all sub-contractor's guarantees need to be in place for the contract to be awarded?

B.1.1. Depending on the sub-contractor's value of work.

B.1.2. Depending on previous experience with principal contractor.

B.1.3. Always.

B.1.4. Never.

B.2. Do you feel that the sub-contractor fully understands the following before starting the contract:

Y N

B.2.1. The implications for not keeping to the programme.

B.2.2. The extent and duration of their work.

B.2.3. The quality expected by the principal contractor and client.

B.2.4. The implications of sub-standard work.

B.2.5. The significance of safety on site.

B.2.6. The importance of "housekeeping".

B.2.7. All environmental issues.

B.2.8. Payment procedure.

B.3. Do you know the following about the sub-contractor:

Y N

B.3.1. The current workload of the sub-contractor.

B.3.2. If the sub-contractor has the required qualified labour.

B.3.3. The sub-contractor has the required supervision.

B.3.4. The sub-contractor has enough experience.

INTERVIEW QUESTIONNAIRE

C. THE BEGINNING STAGE OF THE CONTRACT (ON-SITE STAFF)

C.1. What do you expect the quality of your sub-contractor to be?

- | | |
|-------------------|--------------------------|
| C.1.1. Excellent. | <input type="checkbox"/> |
| C.1.2. Good. | <input type="checkbox"/> |
| C.1.3. Average. | <input type="checkbox"/> |
| C.1.4. Poor. | <input type="checkbox"/> |
| C.1.5. Very poor. | <input type="checkbox"/> |

C.2. Do you know the sub-contractor's current workload prior to starting the project?

C.3. Do you know if the sub-contractor has the required labour force and manpower to complete the project?

C.4. Do you know if the sub-contractor's labour force is qualified enough to complete the project to meet the requirements of the principal contract and the client?

C.5. Do you know if the sub-contractor has enough experience with the task at hand?

C.6. Are you intending to have regular sub-contractor site meetings during the project?

C.7. Do you know if the sub-contractor has any safety representatives on site?

C.8. Do you know if the sub-contractor has any quality managers on site?

C.9. Do you know the number of workers representing the sub-contractor?

C.10. Do you know if the sub-contractor is sub-contracting his work to another sub-contractor?

C.11. Do you know the history (previous contracts completed) of the sub-contractor?

D. THE COMPLETION STAGE OF THE CONTRACT (ON-SITE STAFF)

D.1. Did you feel that you and the other employees of the principal contractor had a good relationship with the sub-contractor?

D.2. Did you have problems getting the sub-contractor back to attend to defects that might have occurred after contract completion?

D.3. Did the sub-contractor cause a delay?

D.4. How do you rate the quality of your sub-contractor after the project is complete?

D.4.1. Excellent.

D.4.2. Good.

D.4.3. Average.

D.4.4. Poor.

D.4.5. Very poor.

D.5. Were the sub-contractor's labour force qualified enough to complete the project to meet the requirements of the principal contractor and the client?

D.6. Did the sub-contractor have enough experience for the task at hand?

D.7. Did the sub-contractor prove to have the ability and competence to undertake the work?

D.8. Did you have regular sub-contractor site meetings during the project?

D.9. If so, did the sub-contractor attend all these meetings?

D.10. Did the sub-contractor take instructions from you or other representatives of principal contractor without any problem?

D.11. Did you feel that the sub-contractor took sufficient responsibility for their work?

D.12. Did the sub-contractor sub-contract his work to another sub-contractor?

D.13. Do you believe better procuring methods will produce better sub-contractors with regard to quality, safety and meeting demanding programmes?
