THE APPLICATION OF COST ACCOUNTING METHODS BY THE GENERAL ENGINEERING COMPANIES IN SOUTHERN GAUTENG

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DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

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STATEMENT 1

This dissertation is being submitted in fulfillment of the requirements for the degree of Magister Technologiae: Cost and Management Accounting

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The dissertation is the result of my own independent work/ investigation, except where otherwise stated. Other sources are acknowledged by giving explicit references. A bibliography is appended.

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DEDICATION

This work is dedicated to:

My daughter, Jessica Danielle Fouché, who shares my passion for productivity, innovation and efficiency.

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ABSTRACT

General engineering is characterised by its ability to manufacture and service a number of diverse products. Companies that manufacture various products can only measure costs accurately by using a job-order costing system whereby costs such as material, labour and overheads can be recorded. General engineering companies in Southern Gauteng supply precision manufactured components and services to the petrochemical, mining and steel manufacturing industries.

When submitting a tender to a prospective client, companies often rely on informal methods such as "hearsay benchmarking". Traditional costing methods are often ignored. Due to the competitive environment as well as to ensure sustainability, companies have to ensure that their pricing structures are efficient.

The review of literature and research seem to indicate that companies often neglect cost accounting and often use methods that are obsolete and no longer relevant to the changing manufacturing environment.

The main objective of this study was to explore the extent to which general engineering companies in Southern Gauteng are employing cost accounting methods. The study focused on the current methods and their relevance and effectiveness in providing the information required by the users to maintain a competitive edge in the market and still conduct a sustainable business.

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The research was conducted on the general engineering companies within Gauteng South.

A literature study on cost accounting methods was undertaken, focusing primarily on cost accounting methods used by engineering companies involved in the manufacturing and servicing of diverse products.

The empirical study was carried out in two phases:

- A case study on a reputable general engineering company.
- A survey was done on the cost accounting methods used by other general engineering companies.

The study adopted a quantitative approach. The case study was used as a benchmark to draw up the structured questionnaire that was used to survey 91 general engineering companies that were selected using purposive sampling. The questionnaire embodied four sections; A, B, C and D. Section A requested general information and the demographic profile of the respondents. Section B invited views on cost accounting methods applicable to the general engineering environment. Section C gathered information regarding cost accounting methods currently used in the company. Section D examined the relevance and effectiveness of costing methods in decision making. Questionnaires were delivered by hand to owners and managers who are responsible for the costing methods at the designated general engineering companies.

The study found that the respondents had a good understanding of the costing methods applicable to the general engineering environment. Although respondents had a good understanding of costing methods, the implementation thereof at their organisations was still wanting in some areas. Significant differences between companies' views on costing methods their relevance and effectiveness and the methods they currently use were found. When companies were categorised according to their turnover it was evident that turnover did play role in the companies' views on costing methods and their relevance and effectiveness in decision making. Those with a higher turnover had relatively more costing methods and systems in place.

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INTRODUCTION AND SCOPE OF THE RESEARCH PROJECT

1.1 INTRODUCTION

General engineering is characterised by its ability to manufacture and service a number of diverse products. According to Atrill and McLaney (2007:92) companies that manufacture various products can only measure costs accurately by using a job-order costing system whereby costs such as material, labour and overheads can be recorded. General engineering companies in Southern Gauteng supply precision manufactured components and services to the petrochemical, mining, construction and steel manufacturing industries.

Generally, such industries would follow a tender process when procuring services and components from the various engineering companies, who would have to compete for business on the basis of the best price, quality of service and speed of delivery. Such competition takes place amid forces such as the tight labour market insofar as the supply of artisans is concerned (Cromberge, 2008:15; Nxumalo, 2007:8) as well as forces related to globalisation, particularly since the 1990s. (Correia, Langfield-Smith, Thorne & Hilton, 2008:4; Roberts, 2006:4; Waweru, Hoque & Uliana, 2004:675).

In order for the various engineering companies to operate successfully in this competitive environment, they would require information that would assist managers to make the correct informed business decisions. The manner in which information is generated is critical for the organisation if such information is to be trustworthy. One such information system is the cost accounting system.

A cost accounting system is an information structure that provides the information required by an organisation to manage resources, to create monetary value and to furnish a basis for decision making and planning. Cost accounting information can be supplied on a regular basis, and can include estimates of the costs of producing goods and services, information for planning and controlling operations and information for measuring performance. The information provided will satisfy the short- and long term decision-making needs of management (Correia *et al*., 2008:7; Drury, 2008:19; Seal, Garrison & Noreen, 2006:2).

One major benefit of cost accounting research is that it helps to unravel managerial processes and problems which could be analysed to generate recommendations for improvements to business operations. (Dick-Forde, Burnett & Devonish, 2007:51). Cost accounting provides an important competitive advantage for an organisation, and provides an integrating perspective to the strategic, operational and financial decisions of management (Mehra, Inman & Tuit, 2005:329). Cost accounting also provides information from its environment to management in order to facilitate decision-making (Islam & Kantore, 2005:708).

The inability to keep proper control over costs can result in large financial losses, damage to reputation, and possibly even to organisational failure (Merchant & Van der Stede, 2007:3) According to Ahlström and Karlsson (1996:43) the cost accounting system consists of all the information that is officially gathered to assess the performance of the organisation, and to guide future actions. Furthermore, the cost accounting system is not confined to monetary measures, it also includes non-financial measures, such as quality and manufacturing throughput times (Ahlström & Karlsson, 1996:43).

Fouché (2008) states that when submitting a tender to a prospective client, companies often rely on informal methods such as "hearsay benchmarking". Cost accounting methods such as job costing, budgets, standard costing, variance analysis and activity based costing are often ignored. Due to the prevailing competitive environment, companies have to ensure that their pricing structures are efficient.

Being able to tender the best price for a contract is what increases the chances of receiving the order for the job. Organisational success will depend on the value it can deliver to the customers (Engelbrecht, 2004:1; Drury, 2008:13). It is imperative for these companies to have some form of a cost accounting system to keep track of the cost of the products they deliver to their clients. Not having a proper costing system in place can result in lost orders and opportunities (Rodan & Dale, 2001:389).

The review of literature and research seems to indicate that companies often neglect cost accounting and often use methods that are obsolete and no longer relevant to the changing manufacturing environment (Atrill & McLaney, 2007:20; De Zoysa & Herath, 2007:272; Sulaiman, Ahmnad & Alwi, 2004:493; Brierly, Cowton & Drury, 2001:202). Although considerable progress has been made in modifying and implementing new cost accounting techniques (Drury, 2008:23), and despite the many strides the profession has made over the years, cost accounting practices have not taken as strong a hold

in companies as they should have (Mersereau, 2007:10; Ziemerink, 2002:244; Engelbrecht, 2004:42). This study will investigate cost accounting methods used by general engineering companies in Southern Gauteng.

1.2 PROBLEM STATEMENT

Previous research indicates that cost accounting can assist management to make appropriate strategic decisions (Chan & Lee, 2003: 89; Islam & Kantor, 2005:708). Companies are still not making good use of cost accounting systems as an aid to better decision making, planning and control (Brierly, Cowton & Drury, 2001:202).

There is no available evidence of research conducted to specifically determine the extent to which general engineering companies in Southern Gauteng employs cost accounting systems, this study will attempt to explore this question.

1.3 OBJECTIVES AND PURPOSE OF THE STUDY

1.3.1 Primary (main) objective

The main objective of this study is to explore the extent to which general engineering companies in Southern Gauteng employ cost accounting methods. The study will focus on the current methods adopted and their relevance and effectiveness in providing the information required by the users to maintain a competitive edge in the market.

The following empirical objectives are formulated:

- to determine the profile of general engineering companies in Southern Gauteng;
- to determine the views of general engineering companies in Southern Gauteng on cost accounting methods and systems;
- to explore the cost accounting systems and methods employed by these general engineering companies;

- to determine the extent to which such cost accounting systems and methods are effective and relevant in planning and decision making.

1.3.2 Theoretical objectives

In order to achieve the primary objective, the following theoretical objectives have been formulated for this study:

- To conduct an in-depth literature study will be conducted on the current and latest cost accounting systems and methods;
- to carry out a literature review on the effect of cost accounting systems and methods on planning, decision making and control in companies;
- to do an extensive literature study on the cost accounting systems generally employed by the general engineering companies worldwide.

1.4 HYPOTHESIS

Based on the literature study the following hypotheses are set for the study:

Since the implementation of costing systems requires significant investment of resources such as time and money, the expectation is that differences in the respondent firm's profile such as turnover, play a role in the way respondents perceive costing methods. The first two null-hypotheses are stated in this regard:

H1: There is no mean difference between companies regarding their views on cost accounting methods when categorised according to their turnover.

H2: There is no mean difference between companies regarding effectiveness and relevancy of costing methods in planning and decision making when categorised according to their turnover.

Since the views and perceptions of the companies on cost accounting methods should be reflected in what they actually do in practice a third hypothesis is stated in this regard:

H3: There is no mean difference between the views and perceptions of companies on costing methods and what they actually do in practice.

1.5 SCOPE OF THE STUDY

The research will be conducted on general engineering companies within Southern Gauteng. The Southern Gauteng region includes Heidelberg, Meyerton, Vereeniging and Vanderbijlpark.

1.6 METHOD OF INVESTIGATION AND RESEARCH DESIGN

Two methods of research will be undertaken, namely a literature review, and an empirical study.

1.6.1 Literature review

A literature study on cost accounting methods will be undertaken for the purpose of establishing a theoretical paradigm. Sources will include textbooks, theses and dissertations on cost accounting, journals, magazines, newspaper articles and the Internet. (Mouton, 2003:88). The literature study will primarily focus on cost accounting methods used by engineering companies involved in the manufacturing and servicing of diverse products.

1.6.2 Empirical study

The empirical study will be carried out in two phases.

1.6.2.1 Phase One

Permission has been obtained to do a case study on a general engineering company situated in Southern Gauteng that has been using cost accounting methods in its daily decision making and the running of the company for the past 40 years. Bromley, as quoted by Maree 2008:75, states that case study research is a systematic inquiry into an event or a set of related events which aims to describe the phenomenon of interest. According to Creswell, as stated by Strydom, Fouche and Delport (2002:275), a case study can be regarded as an exploration or in-depth analyses of a "bounded system" (bounded by

time and/or place), or a single case or multiple cases, over a period of time. The case being studied can refer to a process, activity, event or program.

The exploration and description of the case takes place through detailed, in-depth data collection methods, involving multiple sources of information that are rich in context. These can include interviews, documents, observations or archival records. The researcher must have access to, and the confidence of the participant (Strydom *et al.,* 2002:275). For the purposes of this case study the set of related events will be cost accounting reports and jobs completed in the financial years ending June 2006, 2007 and 2008. Structured interviews will also be conducted with management and users of the system. The outcome of the case study will be used as a benchmark to draw up the questionnaire to be used in the second phase.

1.6.2.2 Phase Two

During phase two a survey will be done on the cost accounting methods used by other general engineering companies in Southern Gauteng.

1.6.2.3 The sampling design procedure for phase two

The following steps, as outlined by Malhotra (2003:329), will be used in developing the sampling procedure:

1.6.2.4 Target population

The target population will comprise of all the general engineering companies in Southern Gauteng which are registered with the Steel and Engineering Industries Federation of South Africa (SEIFSA).

1.6.2.5 Identification of the sampling frame

A sampling frame is a complete list in which each unit of analysis is mentioned only once (Welman *et al*., 2002:57). Only general engineering companies registered with the Metal and Engineering

Industries Bargaining Council within Southern Gauteng will be included in the sampling frame. These appear on a list obtained from the Steel and Engineering Industries Federation of South Africa.

1.6.2.6 Sampling technique

Purposive sampling will be used in this study. Purposive sampling is used in situations where sampling is done with a specific purpose in mind (Maree, 2008:178). The sample is based on the judgment of the researcher, in that the sample is composed of elements that contain the most characteristic, representative or typical attributes of the population (Strydom *et al.,* 2002:207).

1.6.2.7 Sample size

Roscoe (1975), as quoted by Sekaran (2006:97), states that a sample greater than 30 and smaller than 500 units of analysis is suitable for most types of research no matter what the size of the population may be. These figures are consistent with studies undertaken by Strydom *et al.,* (2002:201) and Welman *et al.* (2005:71). There are 118 members of the Steel and Engineering Industries Federation of South Africa (SEIFSA) in Southern Gauteng, according to a list obtained from them (Van Hyussteen, 2009). A sample of 91 respondents was deemed appropriate (Raosoft 2012).

1.6.2.8 Measuring instrument

Primary data will be collected by means of a questionnaire that takes into account cost accounting methods in small and medium sized general engineering manufacturers. The findings of the case study during phase one will be used to set up the questionnaire.

1.6.2.9 Method of data collection

The survey method will be used. Questionnaires will be delivered by hand to owners and managers who are responsible for the costing methods at the general engineering companies. This method was chosen because it is feasible and response rates can be increased by follow up. (Strydom *et al.* 2002:174).

1.6.2.10 Statistical analysis

Descriptive statistics will be used for the purposes of this investigation. In this type of research one or more variables, apart from the independent variable in question (cost accounting methods used), could be the actual source of observed variation in the dependent variable(s). In addition, measures of central tendency cross tabulations and pie charts and bar charts will be used to analyse the composition of the data and to make comparisons. Analysis of variance (ANOVA) and paired samples t-test will be used to examine the relationship between variables. The IBM (International Business Machines Corporation), SPSS (Statistical Package for Social Sciences), version 20.0 for Windows will be used in analysing the data.

1.7 CHAPTER CLASSIFICATION

Chapter one will comprise of the background and scope of the study focusing on cost accounting methods in small and medium sized general engineering manufacturers and their possible influence on decision making. The research methodology is also outlined in this chapter.

Chapter two will provide an overview on cost accounting methods used by general engineering companies such as: standard costing, variance analyses, job costing, total quality management (TQM), benchmarking absorption costing and activity based costing (ABC).

Chapter three will concentrate on the design, research, data collection method, data analysis and statistical techniques used and applied to test the problem statement.

Chapter four will concentrate on the research findings, their analysis and sub conclusions to test the problem statement.

Chapter five will consist of an overview of the study, together with conclusions, recommendations, limitations and implications for future use.

1.8 REFERENCE TECHNIQUE

The Harvard referencing method will be used.

1.9 CONCLUSION

The reader was introduced to the study in this chapter. The problem statement, research objectives and the demarcation of the study was highlighted. The significance and research methodology of the study was developed and described.

In chapter two the various costing methods applicable to the general engineering industry worldwide will be discussed.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The focus of this chapter will be on cost accounting systems and methods applicable to the general engineering industry worldwide. How these systems function and their effects on planning, decision making and control will be discussed.

"Suppose one of you wants to build a tower. Will he not first sit down and estimate the cost to see if he has enough money to complete it?" (Luke 14:28-30 Bible 1985. New International Version)

Cost accounting methods and techniques were first developed in the early 1800's. As organisations increased in size, the need for measuring, monitoring, and motivating performance intensified. By the mid 1800's, cost accounting processes were well developed. One of the earliest detailed costing systems was developed for Andrew Carnegie's steel mills, for which material and labour cost information was recorded on a daily basis. In the early 1900's organisations were required to provide reports for external users such as financial statements and tax returns. The cost of keeping two sets of books in those days was very high, therefore organisations concentrated mainly on recording costing information for financial statements and taxation purposes. From the early 1900's until the mid-1970's, cost accounting processes hardly changed. As the business environment became globalised, competition increased, and demand grew for more refined cost accounting information (Eldendenburg & Wolcott, 2005:8).

In a highly competitive business environment quality merchandise produced at the lowest possible cost, as well as timely deliveries to clients, is what keeps companies in business. An effective cost accounting system should provide prompt high quality information to management to enable them to make competitive bids to their clients (Roos, 2011:5).Cost accounting is focused on the future impacts

of current or proposed decisions. It is important to organisations because it is more than just measuring and reporting costs that have occurred.

Cost accounting can be described as follows:
A philosophy - it promotes the idea of continually finding ways in which to assist organisations in decision making and creating customer value at lower cost.
An attitude – it represents a proactive attitude that all costs of products and operations result from management decisions. In other words, costs do not just happen. Cost-management analysts are active in management decisions to develop and improve products and efficiency.

A set of reliable techniques exists to create more value at lower cost using diverse performance measures to assess the impact of decisions. These techniques may be used individually to support a specific decision or together to support the overall management of the organisation. A cost-management system is a set of cost-management techniques that function together to support the organisation's goals and activities. (Hilton, Maher & Selto, 2008:5).

2.2 COST ACCOUNTING METHODS

2.2.1 Manufacturing cost classification

Manufacturing costs can be separated into three broad categories: direct materials, direct labour and manufacturing overheads as illustrated by the following diagram, Figure 2.1.:

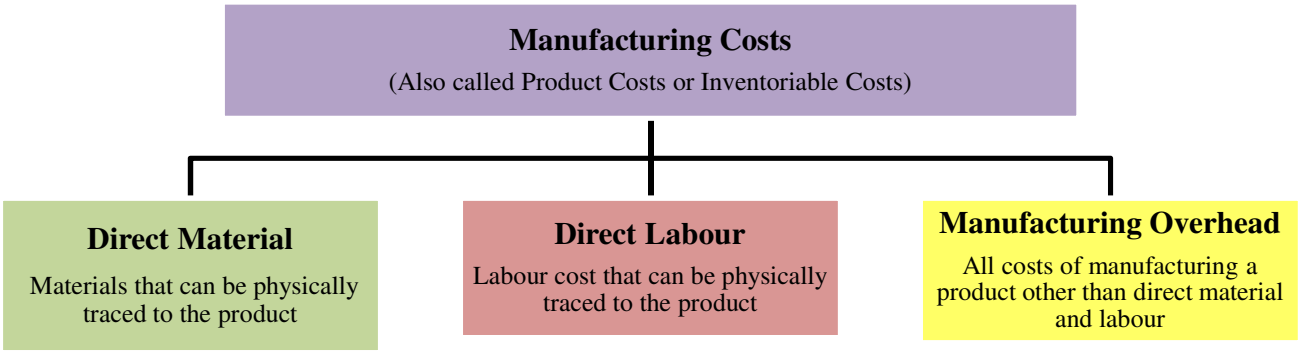


Figure 2.1: Classification of manufacturing costs

Source: Adapted from Noreen, Brewer and Garrison (2008:44).

2.2.2 Non-manufacturing cost classification

Non-manufacturing costs are classified into two categories; marketing and administrative costs illustrated by the following diagram, Figure 2.2.:

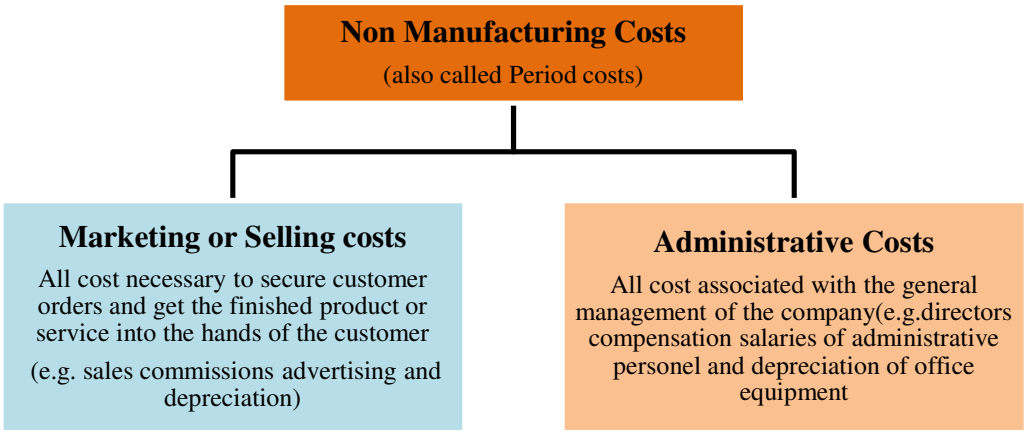


Figure2.2: Classification of non-manufacturing costs

Source: Adapted from Seal, Garrison and Noreen (2006:26).

2.2.3 Standard costing

Standard costing was developed in the early decades of the twentieth century, but it was only in the late 1950s and early 1960s that responsibility accounting developed rapidly, in the vanguard of advances in management accounting (Edwards, Boyns & Matthews, 2002:12).

A standard is a benchmark or norm for measuring performance (Ambe, Evangelou, Govender, Koortzen, Van Rensburg & Ziemerink, 2008:16). They represent the expected or desired future cost of a product, process, or sub-component (which may further be deemed to earn a standard price). Standards are widely used in cost accounting where they relate to the quantity and cost (or acquisition price) of inputs for manufacturing goods or providing services. Standard costing is a system that analyses performance in detail, quantity and cost standards are set for each major input such as raw materials and labour time. Quantity standards specify how much of an input should be used to manufacture a product or provide a service. A standard is a performance target against which actual costs are compared. This means that the target can be set to varying levels depending on management

involvement and employee aspiration levels. For a standard costing system to be successful, individual standards must be both meaningful and achievable. Standard prices are usually forecast at the beginning of each year and are part of the annual planning assumptions in the company's budgeting process. Standard costing is still used today.

There are basically two methods of determining standard costs. The first method involves the analysis of historical data; the standard cost then represents what has been achieved in the past, adjusted for expected changes in efficiency and external economic factors such as wage and material cost inflation. The second method involves work measurement designed to assess scientifically the appropriate labour and material content of each product and to cost it accordingly; the standard cost here represents a carefully assessed standard of attainment based on work study measurements. Once standards are set, managers can gauge performance by comparing actual operating results against the standards (Emmanuel, Otley & Merchant, 2004:166).

A standard cost is the product of a standard quantity or usage and a standard price. Standard quantities are usually defined by the technical characteristics of the production process and are often estimated by industrial engineering studies that examine how long a particular manufacturing process takes or how much raw material is required to produce the product. Standard prices are usually forecast at the beginning of the year and are part of the annual planning assumptions in the company's budgeting process. Standard material costs are estimated in manufacturing by taking the bill of materials (the list of all the materials required for the product) and forecasting how much of each material is required for the product and the expected price for each. The standard price per unit for direct material should reflect the final, delivered cost of the materials, net of any discounts taken. Standard quantity multiplied by standard price is the standard material cost of the product. Routing sheets contain information about how much labour time is required in each department to produce each product. The expected labour time from industrial engineering estimates and the expected wages for each labour process are used to calculate the standard labour cost for the product. The standard rate per hour for direct labour should include wages, employment taxes, and fringe benefits, using wage records in consultation with the production manager (Zimmerman, 2008:579; Noreen, Brewer & Garrison, 2008:349). As with direct labour, the price and quantity standards for variable manufacturing overheads are usually expressed in terms of rate and hours. The rate represents the variable portion of the predetermined overhead rate; the hours relate to the activity base that is used to apply overhead to units of product (usually machine-

hours or direct labour hours). The standard cost per unit as a variable manufacturing overhead is calculated the same way as for direct materials or direct labour, the standard quantity allowed per unit of the output is multiplied by the standard price (Noreen *et al.*, 2008:350; Eldendenburg & Wolcott, 2005:419). Figure 2.3 on (p. 16) illustrates the typical cost standards for manufacturing.

2.2.3.1 Variance Analysis

The amount by which actual and standard costs differ is the standard cost variance. Variances provide useful information for senior management in gauging whether the production system is under control. Variances are an important part of the decision control process as they are attention getters; they alert senior managers that something is wrong. Variances also provide information for performance evaluation. In addition to their role in control, standard costs are useful in making decisions on product pricing, outsourcing, and resource allocation (Vigario, 2009:328; Noreen *et al*., 2008:345; Zimmerman, 2009:577). Variance analysis can be used whether or not an organisation uses a standard costing system. The process requires only the ability to compare actual results with some type of benchmark, which might be standard costs. Variances are calculated for two purposes: monitoring and bookkeeping. Variances calculated for bookkeeping purposes do not need to be analysed, but variances used to monitor performance need to be analysed. Variance analysis is the process of calculating variances and then investigating the reasons they occurred. Differences between actual results and what was expected will almost always occur. Variance analysis and performance reports are important elements of management by exception, which is an approach that emphasises focusing on those areas of responsibility where goals and expectations are not being met. If actual results do not conform to standards, the performance reporting system sends a signal to managers that an "exception" has occurred. This signal is in the form of a variance from the standard. However all variances are not worth investigating. One of the approaches management could use to decide whether a variance should be investigated or not is to look at the size of the variance and the monetary impact. Once significant variances are identified this information is then used to improve future operating plans (Vigario, 2009:328; Noreen *et al*., 2008:362; Eldendenburg & Wolcott, 2005:421).

2.2.3.2 Advantages of standard costing

- Standard costs provide a good basis for sensible cost comparisons.
- The determination of standard costs and cost variances enables managers to use management by exception which allows them to concentrate on significant variances.
- Variances can provide a convenient basis for performance evaluation and determining incentives for employees.
- Allowing employees to participate in the setting of standards, assigning responsibility for certain variances and the use of variances for performance evaluation can be a source of motivation.
- The use of standard costs in product costing results in more stable product costs. Actual costs often fluctuate erratically, whereas standard costs are changed only periodically (Correia, Langfield-Smith, Thorne & Hilton, 2008:538; Hilton, 2009:420).

2.2.3.3 Criticisms of standard costing systems:

- Like any tool, a standard-costing system can be misused. When employees are criticized for every cost variance, the positive motivational effects will quickly vanish.
- If standards are not revised often enough, they will become outdated, and the benefits of cost benchmarks and product costing will disappear.
- Variances are too aggregate and concentrate on the consequences rather than the causes of problems. Conventional standard costing systems are based on the cost categories of direct material, direct labour and overhead. This can make it difficult to determine the cause of cost variances.
- Standard costing systems tend to focus too heavily on cost minimisation. Standard cost variances are reported along responsibility accounting lines and this may provide incentives or decrease costs, but some actions taken to minimise costs may adversely affect other areas of strategic importance (such as product quality or customer service).
- One of the most important conditions for the successful use of standard costing is a stable production process. Yet the introduction of flexible manufacturing systems has reduced this stability, with frequent switching among a variety of products on the same production line.
- Shorter product life cycles mean that standards are relevant for only a short time. When new products are introduced, new standards must be developed.

- Traditional standard costs are not defined broadly enough to capture various important aspects of performance. For example, the standard direct material price does not capture all of the costs of ownership. In addition to the purchase price and transportation costs, the cost of ownership includes the costs of ordering, paying bills, scheduling delivery, receiving, inspecting, handling and storing, and any production-line disruptions resulting from untimely or incorrect delivery.

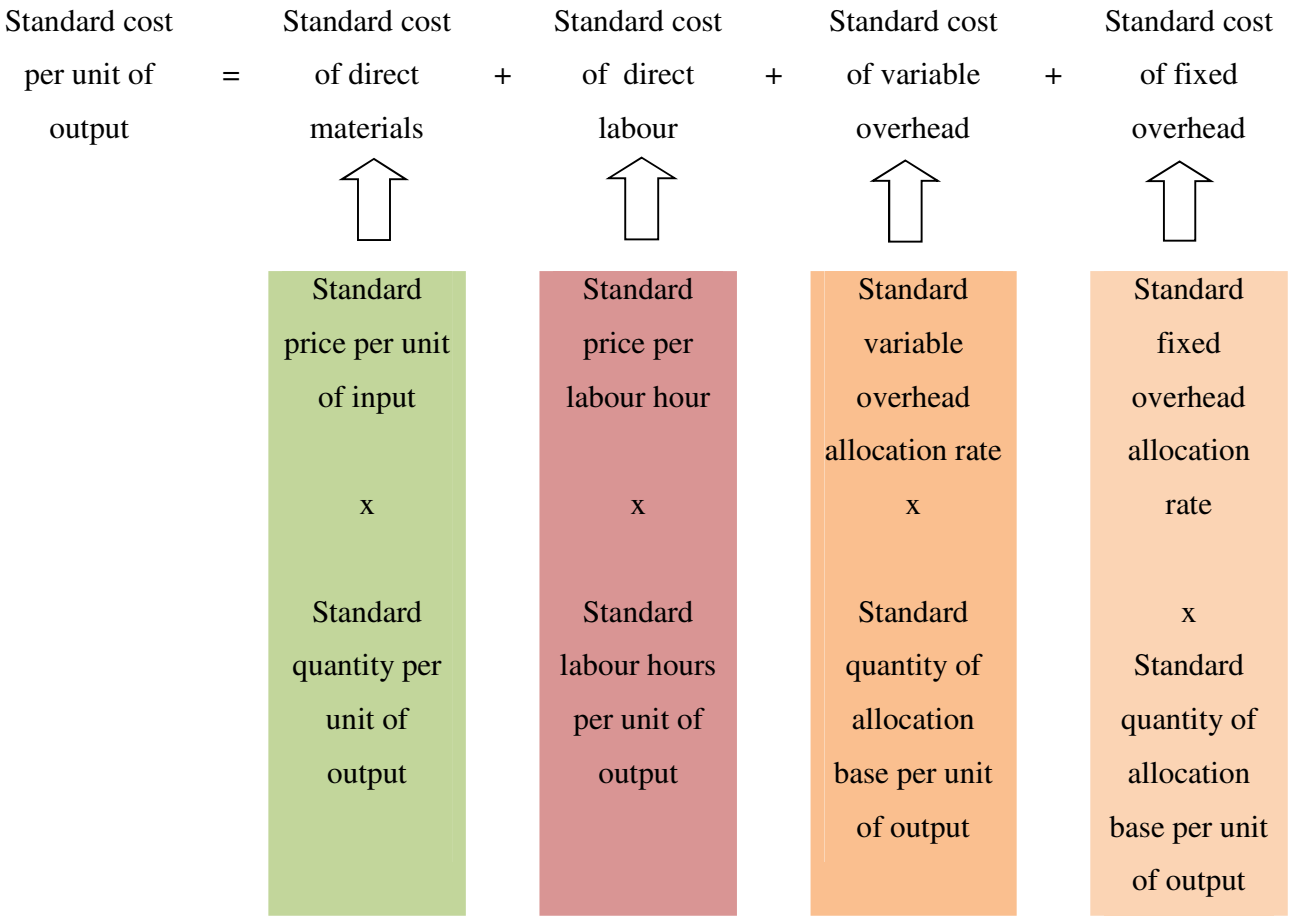


Figure 2.3: Typical cost standards for manufacturing

Source: Adapted from Eldenburg and Wolcott (2005:417).

Despite these criticisms standard costing systems are still used by many South African companies (Correia *et al.*, 2008:536; Hilton, 2009:421). In an empirical study conducted in Malaysia it was found that standard costing was still being used by a large majority of firms. Malaysian companies use standard costing for cost control and performance evaluation. Their overall standards as well as material and labour were based on average past costs. Their standards are reviewed once per year.

Material price and usage variances are the two most important variances for control purposes. The Malaysians study concluded that the basic principles of standard costing are still sound. Prior research in developed and developing countries found similar results (Sulaiman, Ahmad &Alwen, 2005:120)

2.2.4 Job Costing

Job Costing is an order-specific costing technique, used in situations where each job is different and is performed to the customer's specifications. Each product or service is considered a separate job (Reeve & Warren, 2008:751). This happens when the customers define their requirements as unique. This could occur with reference to a manufactured item, a project or professional services. Job costing systems gather cost information for direct material, direct labour, and indirect costs based on the actual job being performed. Business owners need to understand the cost of their product or service. This enables them keep an accurate account of how much each job costs.Job Costing allows the business owner to spot escalating prices and seek alternatives for those components. Job Costing allows the business owner to price his product or service high enough to cover his cost and still make a profit. Costing also allows the business owner to identify high cost components and evaluate options for reducing that cost. A job costing system is designed to handle the calculation of the cost of jobs each of which is unique, requiring an input of differing quantities of materials labour and allocated overhead cost (Hopper, Northcott & Scapens, 2007:198; Hansen & Mowen, 2003:128).

2.2.4.1 The Job costing system

In the 1870’s, Andrew Carnegie built the Edgar Thompson Steel Works in Pittsburgh, which later became the U.S. Steel, one of Carnegie's many management innovations. He was obsessed with a detailed cost accounting system. Each department in the steel works listed the amount and cost of labour and materials used by each job as it passed through the department. Carnegie received daily reports showing the direct costs of the products produced. Carnegie’s costing philosophy was, "Watch the costs and the profits will take care of themselves”.

Carnegie's cost sheets were called a marvel of ingenuity and careful accounting. He required his people to explain even minute changes in unit costs. Carnegie and his managers used this data to evaluate the performance of his people, maintain the quality and mix of raw material, evaluate improvements in

process and product, and price products. New orders would not be accepted until costs had been carefully checked (Chandler, 1977:267).

The record-keeping and cost assignment problems are more complex when a company sells many different products and services, than when it has only a single product. Since the products are different, the costs are typically different. Consequently, cost records must be maintained for each distinct product or Job. A job-costing system enables the manufacturer to determine the estimated costs for the job, determine the cost of sales, budget for future jobs, and exercise control over deviations of actual costs from budget. Each job costing system has some common features, including: the ability to record costs of materials and labour attributed to the job, dates started, completed, shipped or finalised and reporting and, comparing planned to actual costs and profit margins.

Once an order has been received from the customer with instructions to manufacture a specific component, the Accounting Department prepares a job cost sheet. Figure 2.5 (p.24) The job cost sheets forms a subsidiary ledger to the Work in Progress account. They are detailed records for the jobs in process that add up to the balance in Work in Progress. A job cost sheet as shown in Figure 2.4 (p.23) is a form prepared for each separate job that records the costs charged to the job. In addition to serving as a means for charging costs to jobs, the job cost sheet also serves as a key part of a firm's accounting records (Seal *et al.,* 2006:68; Barfield, Raiborn & Kinney, 1998:288).

The costs involved in a job that need to be recorded are those relating to, direct material, direct labour and overheads. These costs can be allocated to jobs in a number of ways:

Materials, ordered as they are required, are allocated at actual cost as recorded on the purchase invoice. This may include the delivery charges as well as customs and clearing charges when materials are imported, but excludes value added tax (VAT). When material is ordered in bulk and kept in storage to be issued to different jobs at a later stage, the cost at which they are issued can be according to the weighted average method or the first-in-first-out (FIFO) method. Some organisations use standard costing and issue materials at a predetermined standard cost. On completion of the job actual costs are then compared to the standard costs and the variances are then determined (Horngren, Srikant, Datar, Foster, Rajan & Ittner, 2009:127; Seal *et al.,* 2006:69).

Employees use job cards or time sheets to record their hours worked on each job and task. A completed time ticket is an hour-by-hour summary of the employee's activities throughout the day. When working on a specific job the employee enters the job number on the time ticket and notes the amount of time spent on that job. When not assigned to a particular job, the employee records the nature of the indirect labour task (such as clean up and maintenance) and the amount of time spent on the task. At the end of the day, the time tickets are gathered and the Accounting Department enters the direct labour-hours and costs on individual job cost sheets. The daily labour costs are allocated to jobs at a predetermined standard rate and budgeted labour hours. It is not feasible to use actual direct labour costs. At the end of the job actual hours are compared to budgeted hours. The standard labour rate should include the following: The basic salary of employee, the company's contributions to pension funds, unemployment fund, workmen compensation fund, medical aid contributions and other levies. Where activity-based costing is used the allocation of these costs can be done by using cost drivers. Although employees are paid for periods of leave and sick leave, only the productive hours are taken into consideration for budget purposes. There may also be times when employees are idle due to machine break downs, strike actions, waiting for materials, waiting for cranes or when there is no work. Idle time is recorded and written off as period costs. Because only the direct labourhours apply to the job, the time during which no work is being done should be excluded. Not all labour costs can be directly traced to a job. These labour costs are referred to as indirect labour and are debited to the overhead costs (Seal *et al.,* 2006:70; Roos, 2008:204). The system just described is a manual method for recording and posting labour costs. Many companies now rely on computerised systems and no longer record labour time by hand on sheets of paper. One computerised approach uses bar codes to enter the basic data into the computer. Each employee and each job has a unique bar code. When an employee begins work on a job, he or she scans three bar codes using a handheld device much like the bar code readers at a supermarket check-out. The first bar code indicates that a job is being started; the second is the unique bar code on his or her identity badge; and the third is the unique bar code of the job itself. This information is fed automatically via an electronic network to a computer that notes the time and then records all of the data. When the employee completes the task, he or she scans a bar code indicating that the task is complete, the bar code on his or her identity badge, and the bar code attached to the job. This information is relayed to the computer that again notes the time, and a time ticket is automatically prepared. Since the entire source data is already in computer files, the labour costs can be automatically posted to job cost sheets (or their electronic equivalents). Computers, coupled with technology such as

bar codes, can eliminate much of the drudgery involved in routine bookkeeping activities while at the same time increasing timeliness and accuracy (Noreen *et al.*, 2008:86; Seal *et al.*, 2006:71).

The cost of each job includes an allocated overhead cost. Overhead costs consist of a variable component and a fixed component. Fixed overheads are costs that do not change within a specific period. Variable overheads include indirect labour and indirect materials which may vary in relation to the volume of jobs worked on, but cannot be traced directly to the individual jobs. In a mechanical engineering environment fixed overhead costs are the costs of maintaining the workshop infrastructure, rent, rates and taxes, depreciation of machinery, insurance, supervisory and administrative staff. Fixed overhead costs are costs that do not change within a specified period (Roos, 2008:205; Hansen & Mowen, 2003:80).

To apply fixed overhead costs some mechanism has to be used to allocate fixed overhead costs to individual jobs, to ensure that the total cost of each job carries its equitable share of the cost. In a job-costing system, the cost driver often used for this purpose is either direct labour or in relation to the labour cost charged to each job. The budgeted overhead cost and the estimated number of cost-driver units (hours of direct labour, for example) during a particular period are used to set the overhead allocation rates, as the actual cost and the actual activity level will be known only after the end of the period. It is unlikely that the actual cost incurred during the period will be exactly the same as the budget or the standard set, and the variances between the actual cost and the budgeted or standard cost will have to be disposed of for financial accounting purposes. The estimated and the actual capacity level would also differ, and this would give rise to an under- or over recovery of fixed overhead costs, which would also have to be disposed of for financial accounting purposes (Noreen, *et al.,* 2008:84; Zimmerman, 2009:426).

According to Zimmerman (2009: 429) manufacturing overheads have to be applied with direct materials and direct labour on the job cost sheet since the manufacturing overhead cost is also a product cost. However, assigning manufacturing overhead costs to units of product can be a difficult task. There are three reasons for this:

- Manufacturing overhead costs are indirect costs. This means that it is either impossible or difficult to trace these costs to a particular product or job.

- Manufacturing overhead costs consist of many different items ranging from the grease used in machines to the annual salary of the production manager.
- Although output may fluctuate due to seasonal or other factors, manufacturing overhead costs tend to remain relatively constant due to the presence of fixed costs.

Given these problems, the only reasonable way to assign overhead costs to products is to use an allocation process. This allocation of overhead costs is accomplished by selecting an allocation base that is common to all of the company's products and services. An allocation base is a measure such as direct labour-hours (DLH) or machine-hours (MH) that is used to assign overhead costs to products and services. The most widely used allocation bases are direct labour-hours and direct labour costs with machine-hours and even units of product (where a company has only a single product) also used to some extent. The allocation base used to compute the predetermined overhead rate appears in the following formula:

$$\text{Predetermined overhead rate} = \frac{\text{Estimated total manufacturing overhead cost}}{\text{Estimated total manufacturing overhead cost}}$$

The overhead may be applied as direct labour-hours are charged to jobs, or all of the overhead can be applied at once when the job is completed. The choice would depend upon the approach and requirements of the particular company. If a job is not completed at year-end, however, the overhead should be applied to value the work in progress stock.

The need to calculate a predetermined rate, instead of waiting until the end of the accounting period to compute an actual overhead rate is of utmost importance for the following reasons:

- Before the end of the accounting period, managers would like to know the accounting system's valuation of completed jobs.
- If actual overhead rates are computed frequently, seasonal factors in overhead costs or in the allocation base can produce fluctuations in the overhead rates. Managers generally feel that such fluctuations in overhead rates serve no useful purpose and are misleading.

- The use of a predetermined overhead rate simplifies record keeping. According to Noreen et al (2008:85) most companies use predetermined overhead rates rather than actual overhead rates in their cost accounting systems.

According to Noreen *et al*. (2008:85) most companies use predetermined overhead rates than actual overhead rates in their cost accounting systems.

An allocation base should be used, that is a cost driver of overhead cost. A cost driver is a factor, such as machine-hours, direct labour hours, that causes overhead costs. If a base is used to compute overhead rates that do not drive overhead costs, then the result will be inaccurate overhead rates and distorted product costs. For example, if direct labour-hours are used to allocate overhead rate, but in reality overhead rate has little to do with direct labour-hours, then products with high labour-hour requirements will shoulder an unrealistic burden of overhead and the costs will be inflated. Most companies use direct labour-hours or direct labour cost as the allocators for manufacturing overhead. However, according to Seal *et al.* (2006:74), major shifts are taking place in the structure of costs in many industries. In the past, direct labour accounted for up to 60 per cent of the cost of many products, with overhead cost making up only a portion of the remainder. This situation has been changing for two reasons. Firstly, sophisticated automated equipment has taken over functions that used to be performed by direct labour workers. Since the costs of acquiring and maintaining such equipment are classified as overhead, this increases overhead while decreasing direct labour. Secondly, products are themselves becoming more sophisticated and complex and change more frequently. This increases the need for highly skilled indirect workers such as engineers. As a result of these two trends, direct labour is becoming less of a factor and overhead is becoming more of a factor in the cost of products in many industries. In companies where direct labour and overhead costs have been moving in opposite directions, it would be difficult to argue that direct labour drives overhead costs. Accordingly, in recent years, managers in some companies have used activity based costing (ABC) principles to redesign their cost accounting systems.

JOB COST SHEET

Job Number	2B47	Date Initiated	2 March 2010
Department	Milling	Date Completed	8 March 2010
Item	Coupling	Units Completed	2

Direct Materials			Direct Labour			Manufacturing Overhead	
Req.No.	Amount	Ticket	Hours	Amount	Hours	Rate	Amount
14873	R 660	843	5	R45	27	R8/DLH	R216
14875	506	846	8	60			
14912	238	850	4	21			
	R1,404	851	10	54			
			27	R180			

Cost Summary		Units Shipped		
Direct Materials	R1404	Date	Number	Balance
Direct Labour	R180	March 8	-	2
Manufacturing Overhead	R216			
Total Product Cost	R1800			
Unit Product cost	R900			

Figure 2.4: Example of a manual job cost sheet

Source: Adapted from Brewer *et al.,* (2005:85)

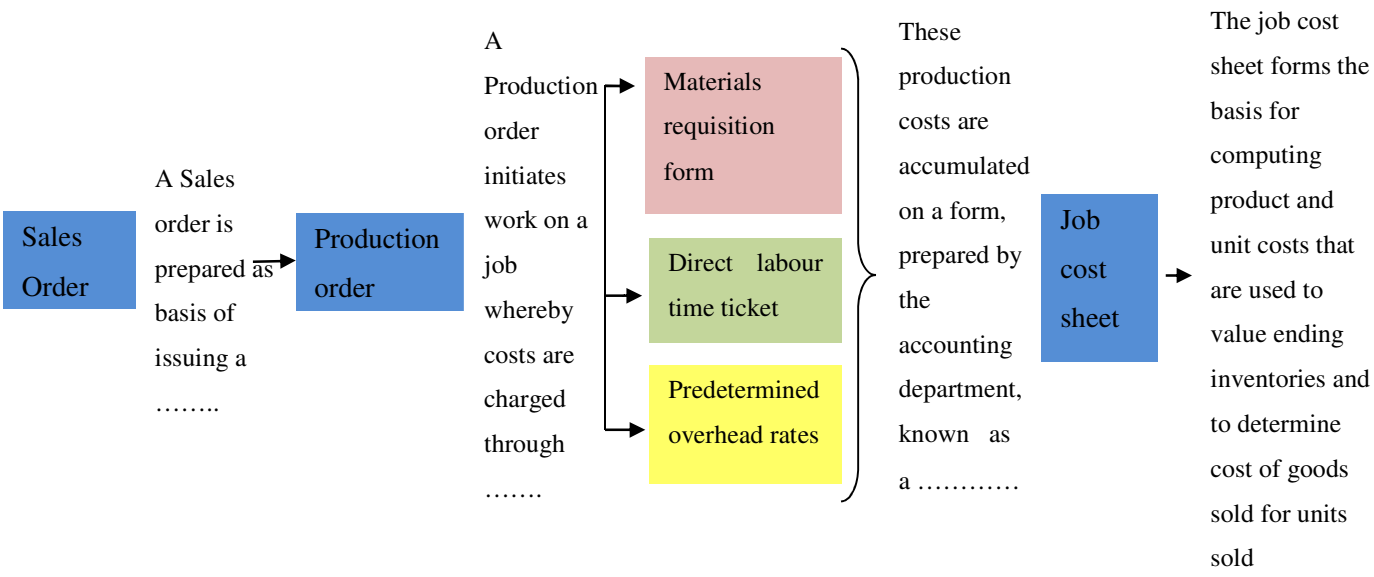


Figure 2.5: Job costing – the flow of costs and documents

Source: Adapted from *Seal et al.* (2006:75)

2.2.5 Absorption Costing

Absorption costing is a product costing approach that treats both variable and fixed manufacturing costs as product costs. Fixed manufacturing overheads are allocated to the product by using a predetermined fixed overhead rate and are only expensed when the product is sold. The overhead absorption rate is based on the normal level of production for the period. If actual production varies from the normal level of production there may be an under or over absorption of fixed production costs for the period. This amount is written off against the absorption costing profit for the period (CIMA 2011:162; Lucey 2009:107)

IAS 2 (Accounting Standard 2) is the accounting standard that regulates inventories. Paragraph 10 of this standard defines the cost of standard governing inventories. Paragraph 10 of this standard defines the cost of inventories as including all costs of purchase, costs of conversion and other costs incurred in bringing the inventories to their present location and condition. The costs of conversion are further explained in paragraph 12 to include a systematic allocation of fixed and variable production overheads that are incurred in converting materials into finished goods. From this paragraph, three key principles emerge:

- Fixed overheads must be included in the cost of inventories.
- Only overheads that are incurred in converting materials into finished goods are relevant.
- Fixed overheads must be split between manufacturing and non-manufacturing, and only the manufacturing component must be included in the cost of inventories.

Depreciation on factory machinery, fixed electricity costs in the factory and salaries of factory staff are examples of fixed manufacturing overheads. Depreciation on administration office equipment, electricity costs of the administration department and salaries of the administration staff are examples of non-manufacturing fixed overheads (Roos, 2011:27).

2.2.5.1 Principles of absorption costing

- Fixed production costs are part of the production costs of a product and should be absorbed into the product costs.
- Inventories are valued at their full production cost which includes absorbed fix production costs (CIMA 2011:162).

2.2.5.2 The strengths of absorption costing

- Closing inventory values include a share of fixed production overhead as is required by the international accounting standard for inventory (IAS 2).
- Because it is based on a global standard it ensures consistency and comparability of financial information.
- Absorption costing takes into account that fixed costs are a real cost and absorbs overheads into production.
- Absorption costing is consistent with the accruals concept as a portion of the costs of production are carried forward to be offset against future sales.
- Fixed production costs are incurred in order to produce. Therefore it is fair to charge production with a share of these costs.
- When absorption costing is used the contribution earned by each product can be calculated. This enables an enterprise to ascertain whether the product earns enough contribution to cover fixed costs.

- Not using absorption costing would mean that a large portion of expenditure is not accounted for in unit costs. This is specially the case when fixed production overheads are a large portion of total production costs (Roos, 2011:121).

2.2.6 Activity Based Costing (ABC)

By the 1980s, the standard cost systems designed during the scientific management movement seventy-five years earlier no longer reflected the current economic reality. This lead to the introduction of ABC, and the correction of serious deficiencies in traditional standard-cost systems. ABC may be used in common idiom to indicate a degree of simplicity, but as a short form for activity-based costing, it introduces some of the most revolutionary and fundamental changes in management accounting theory and practice. What originally appeared to be simply a new method of tracing costs to products has led to the development of an entirely new philosophy. As the direct labour content of products decreased, through automation and industrial engineering-driven efficiencies, the percentage of total costs represented by the somewhat arbitrary allocations of overhead had continually increased during the twentieth century. In addition, many companies had shifted from mass-production strategies to those that offered customers more variety, features, and options (Kaplan & Anderson, 2007:5; Glad & Becker, 1994:2)

ABC seemingly solved the inaccurate allocation of overhead costs from standard cost systems by tracing these indirect and support costs first to the activities performed by the organisation's shared resources, and then assigning the activity costs down to orders, products, and customers on the basis of the quantity of each organisational activity consumed. Managers used the more accurate ABC and profitability information to make better decisions about process improvements, order acceptance and rejection, pricing, and customer relationships. The decisions led to future and sustainable improvements in product and customer profitability because ABC recognises that low-volume products require a higher proportion of manufacturing support costs such as machine set-up costs, inspection, packaging, ordering, selling etc., than high-volume products do. As a result there has been a significant shift away from direct variable costs of manufacturing to indirect fixed costs (Kaplan & Anderson, 2007:6; Vigario, 2007:171).

Another significant change in the modern-day production process is the shift away from single product manufacturing to multi-product manufacturing. While manufacturing companies could generally trace

the labour and materials used by their individual products, their cost systems allocated the indirect and support costs to the "overhead" with measures already being recorded, such as direct labour hours and direct labour costs. The system of activity-based costing analyses costs in order to reflect the higher manufacturing costs of low-volume products, in comparison to the traditional method that would simply smooth over all overhead costs on an equal basis to all products manufactured. The result is that low-volume products tend to be under-costed, while high-volume products are over-costed. A direct consequence of allocating overheads evenly to all product lines is that a company quoting on a cost-plus basis may out-price itself on the high-volume products and sell low-volume products that make a loss. Empirical evidence suggests that companies require accurate product costing information and full costing systems to arrive at product costs for decision-making purposes. ABC is a more sophisticated technique than the traditional absorption costing system (Vigario, 2007:172; Kaplan & Anderson, 2007:7).

ABC takes the view that all costs are variable in the long-term and links the activity that causes the variability to the cost. Traditional costing systems allocate overhead costs to products via a two stage allocation process:

Firstly assign overhead costs to cost centres (production divisions), based on appropriate measures (e.g. indirect salaries pro rata to number of employees in each cost centre, rent pro rata to floor space occupied and depreciation pro rata to value of machines and other equipment).

Secondly allocate overhead costs from cost centres to the products. As a rule this allocation is based on labour hours or labour cost or if the manufacturing process is fairly mechanised (Hicks, 1995:51). Although labour-related cost allocations might have been appropriate in the past when direct labour constituted a major part of the manufacturing, cost of products, this premise is generally no longer applicable in present day manufacturing operations.

Currently direct labour cost represents a small fraction of corporate costs - it very often does not exceed ten percent of the total cost of a product - whereas overhead costs generally account for approximately 40 percent of the cost of sales and are still increasing. Because of an irrelevant cost relationship, cost allocations based on labour hours or labour cost can be totally unreasonable and result in product costs being incorrectly recorded. Consequently, substantial cross-subsidisation among the different products

can take place. The utilisation of machine hours as a basis of allocation can also be misleading. Machine hours do not necessarily bear a fair relationship to the total resources consumed by the respective products (Glad & Becker, 1994:21).

ABC recognises that the forces behind overhead costs are the cost drivers (Cooper & Kaplan, 1999:214; Blank & Tarquin, 2005:513). There are many activities or cost-drivers' causing costs to be incurred. Cost drivers are the contributory factors (such as a business policy) that cause costs of an activity to change. An output measure is simply the measurement of the output of an activity. The following are examples of cost drivers:

- The number of purchase orders drives the costs of the purchasing department.
- The number of goods received notes drives the costs of the receiving department.
- The number of items in stock drives the costs of warehousing.
- The number of sales invoices drives the costs of the sales department, the dispatch department and the debtors department.

The above cost drivers may differ from business to business, depending on which causal factor is the most significant in each instance (Chan & Suk –Yee Lee, 2003:82; Glad & Becker, 1994:20).
ABC involves two stages:

- Overhead costs are pooled according to the activities which cause the costs.
- Each cost activity is then linked by a cost driver to the product output.

Overheads are allocated to products by dividing the activity cost by the period cost driver volume and then multiplying the determined rate by the units of activity used by a product. A typical ABC cost system will involve the following steps:

- Determine the activities that relate to the overheads.
- Quantify the activity cost.
- Determine the cost drivers associated with the activity.
- Determine the cost driver rates by dividing the activity cost by the cost driver volume.
- Apply the rates determined in step 4 to a product.

ABC treats the volume-related overheads in the same way as a conventional absorption costing system but differs in the treatment of non-volume-related overheads. Benefits will therefore only be derived where the non-volume-related overheads are high. While it can be said that there is similarity between the conventional absorption costing and ABC systems, ABC is superior as the cost allocation to the underlying products is more pertinent (Langfield-Smith, 2008:204; Vigario, 2007:173). Figure 2.6 illustrates how overhead costs are allocated to products, using conventional absoption costing, and Figure 2.7 illustrates overhead allocation using ABC.

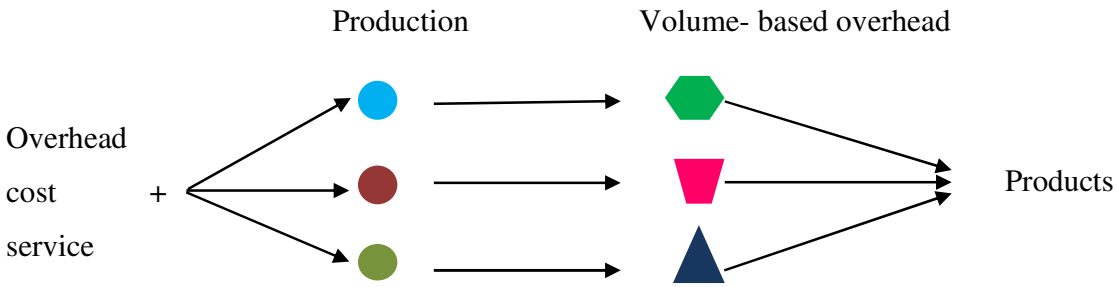


Figure 2.6: Conventional absorption costing

Source: Adapted from Vigario (2007:173).

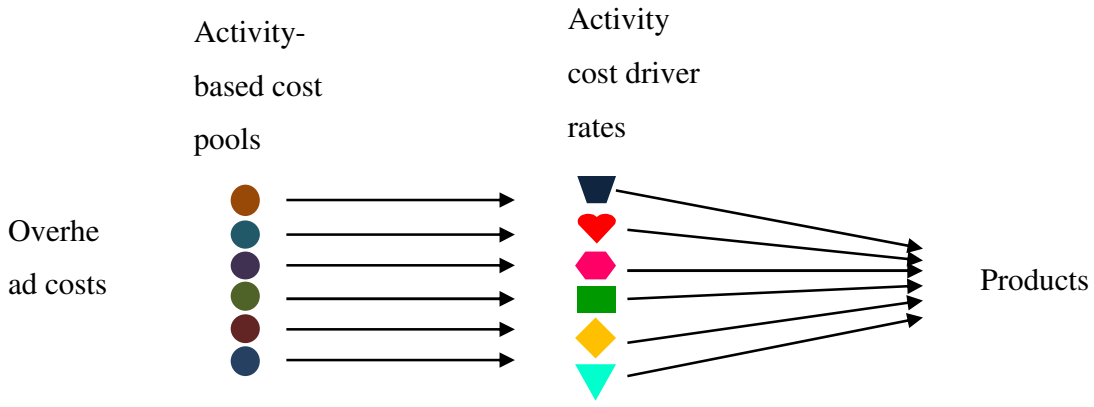


Figure 2.7: Activity-based costing

Source: Adapted from Vigario (2007:173).

2.2.6.1 Benefits and limitations of ABC

Many of the real and perceived benefits of ABC stem from the historical business environment and the inability of historical accounting systems to control the activities of companies which operate in an advanced manufacturing environment. The main criticisms of accounting and management accounting systems that may be addressed by implementing ABC are:

- Conventional accounting systems do not address the modern competitive business environment.
- Absorption costing systems provide inaccurate information for decision-making.
- Management accounting is simply accommodating and becoming the slave of financial accounting.

Supporters of ABC claim that the following benefits are derived from its implementation:

- When a high proportion of overhead costs are non-volume-related, and a company produces a variety of products, the resultant product cost is more precise than those achieved using traditional methods.
- The flexibility of ABC allows cost analysis to extend to areas such as customer costing and internal management costs.
- Product costs reveal the long-run variable product cost, which is important for strategic decision making.
- ABC improves cost estimation, as cost conduct understanding is improved.
- ABC improves strategic decision-making in the pricing of products improving the product range by discontinuing old products and promoting new ones, and assists in the costing of new products. (Vigario, 2007:190; Roos, 2008:156).

Vigario (2007:190) states the following limitations of ABC:

- ABC requires an activity whose cost is measurable and can be related to a product. Some costs such as general advertising, audit fees, finance costs, and goodwill have no meaningful cost driver and cannot be linked to a specific product.

- ABC assumes that a single cost driver within a cost pool fully explains the cost behaviour of the pool. It is doubtful whether a detailed segregation of costs achieves perfect homogeneity within a cost pool.
- There is no real evidence that ABC improves company profits.
- Costs such as rent, rates, depreciation, power, insurance still have to be apportioned.
- ABC is based on absorption costing techniques, which are only valid at a single historical level of production.
- ABC is historic and lacks relevance for future strategic decisions.
- The selection of cost drivers is difficult and in some instances has little relevance to activity.

According to Kaplan and Anderson (2007:6) the implementation of ABC brought about the following problems:

- The process of interviewing and surveying is time-consuming and costly.
- The data model is subjective and difficult to validate.
- The data is expensive to store, process, and report.
- The ABC model cannot be easily updated to accommodate changing circumstances.
- The model is theoretically incorrect as it ignores the potential for unused capacity.

The most favourable benefits of ABC have been in the areas of improvement in the management of business operations, and the motivation to improve business methods. By breaking down the production operation into the many activities that are to be utilised, ABC forces management to look at the products being manufactured in the light of the overheads being incurred. It also makes management look at better methods for improving the manufacturing process and business efficiency. In addition, it improves cost awareness and in many instances results in cost reduction and improved methods of buying, setting-up, manufacturing and selling (Drury, 2011:236; Vigario, 2007:192). Another ABC related technique that has gained popularity is benchmarking the continuous process of comparing products, services, and activities to the best industry standards (Horngren, Sundem & Stratton, 2005:147).

2.2.7 Benchmarking

The practice of benchmarking dates back to 607AD, when Japan sent teams to China to learn the best practices in business, government, and education. Today, most large firms routinely conduct benchmarking studies to discover the business practices and then implement them in their own firms. Benchmarking is a technique that is increasingly being adopted as a mechanism for achieving continuous improvement. It can be described as a process of continuously comparing and measuring an organisation's business processing against business leaders anywhere in the world to gain information which will help the organisation take action to improve its performance. According to Zimmerman (2009:10), Economic Darwinism predicts that successful firm practices will be imitated. Benchmarking is the practice of imitating successful business practices. It is a continuous process of measuring a firm's products, services or activities against the other best performing organisations, either internal or external to the firm. A generic benchmarking process is illustrated in Figure 2.8 (p.33). The objective is to ascertain how the processes and activities can be improved. Ideally, benchmarking should involve an external focus on the latest developments, best practice and model examples that can be incorporated within various operations of business organisations. It therefore represents the ideal way of moving forward and achieving high competitive standards (Drury, 2004:15). Drew, as quoted by Carpinetti and Melo (2002:250), states that different companies have adopted different models to benchmarking, and most of these models generally conform to the same process comprising five basic steps:

- Decide what area of activity to benchmark (e.g. customer services, business processes in particular departments, quality of employees, standard of training).
- Select a competitor who is reputedly the best in the area of activity to be benchmarked. Major companies in one country may target an international competitor rather than a domestic company. In some benchmarking situations the competitor rather than a domestic company benefits from the exchange.
- Decide on the appropriate measurements to be used in defining performance levels.
- Determine the competitor's strengths and compare these with the company's own record.
- Use the information collected as the basis for an action plan. To be effective, this action plan must involve all grades of employees working in the area of activity (Weetman, 2006:638; Carpinetti & Melo, 2002:245).

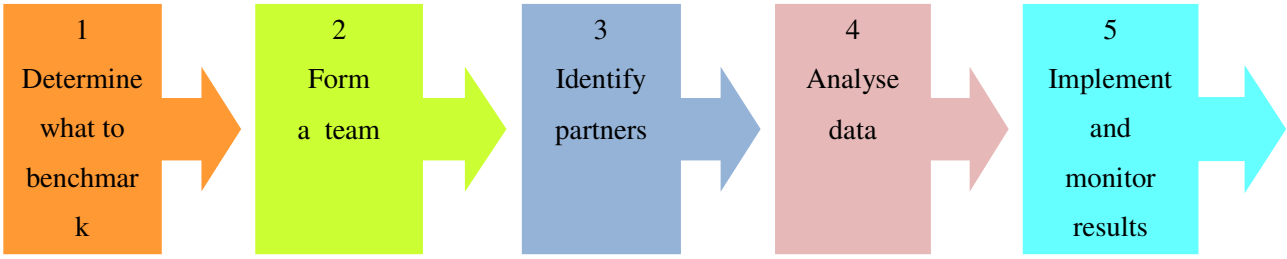


Figure 2.8: Generic benchmarking process

Source: Carpinetti & Melo (2002:246)

Camp, as quoted by Carpinetti and Melo (2002:246), states that benchmarking practices can be classified according to the nature of the object of study of benchmarking and the partners against whom comparisons are made. In terms of object of study, benchmarking can be classified as:

- Process benchmarking: used to compare operations, work practices and business processes.
- Product benchmarking: used to compare products and services.
- Strategic benchmarking: used to compare organisational structures, management practices and business strategies. In a sense, it possesses some similarities to process benchmarking.

Camp, as quoted by Carpinetti and Melo (2002:246), further found that classifications of benchmarking are mainly based on the type of partner, as follows:

- Internal benchmarking, by comparing performance of units or departments within one organisation. Comparison can also be made of similar products or services of similar business units.
- Competitive benchmarking by comparing performance with the direct product competitor. In this case, comparison can be made of products or services and business processes. Reverse engineering is a term more appropriate for product benchmarking.
- Functional benchmarking is specific function comparison with best practice. It is an application of process benchmarking that compares a particular business function in two or more organisations in the same industry.
- Generic benchmarking is a search for the best practice irrespective of industry. It is similar to functional benchmarking but the aim is to compare with the best in class without regard to industry (Roos, 2008:499).

The decision on what needs to be benchmarked can be organised into a sequence of steps as illustrated in Figure 2.9 (p.35):

- Product and market analysis: Collect information on product characteristics, target customers and markets, competitive priorities, manufacturing and financial strategies and general areas for improvements. This will help to understand what dimensions and activities are most crucial to competitiveness.
- Critical dimensions: Gather information on customer expectations and perceived quality for different categories of customers or products and rank relative importance of requisites for most important customers; also, gather information on performance against competitors in attending customer expectations. This helps to recognise dimensions most in need of improvement.
- Critical processes: Map all the processes and activities belonging to, or supporting the value adding chain and understand their relationship with the dimensions most in need of improvement. This may be helped by constructing a matrix relating processes to dimensions. It will help to focus the attention on the processes and activities that most impact performance on prioritised competitive dimensions.
- Performance assessment: Conduct a qualitative or quantitative assessment of performance of the critical processes and activities. A diagnosis of the current situation is of fundamental importance to realising what areas or activities are the weak points and need to be addressed. Quantitative information, if available, can reveal areas and dimensions in need of improvement.
- Improvement priorities: After performing the analysis, the dimensions and activities most in need of improvements become evident. From this point onwards, the benchmarking project itself can start for those subjects for which a benchmarking application is considered to be adequate. (Carpinetti & Melo, 2002:251).

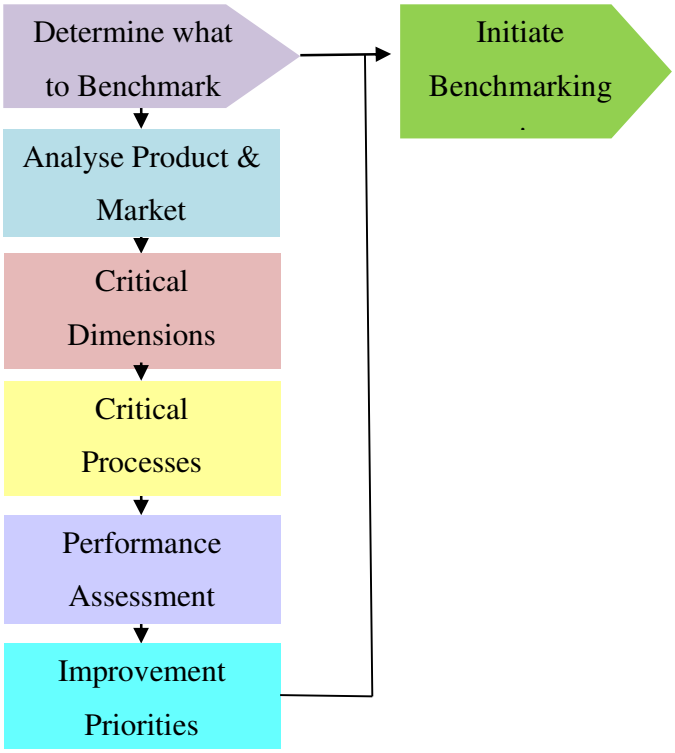


Figure 2.9: Steps for defining the object of study of benchmarking

Source: Carpinetti and Melo (2002:250)

Many companies, in their attempts to adopt world class management practices rapidly, such as benchmarking, tend to adopt a strong, operational view of improvement, devoting little or no attention at all to the alignment of such practices with market demands and strategic objectives. This is especially true for medium to small size companies, where strategic thinking and positioning is part of the culture of the organisation. Although benchmarking in business organisations is a relatively new concept and practice, it has rapidly gained acceptance worldwide as an instrument of continuous improvement in the context of total quality management (TQM) (Carpinetti & Melo, 2002:254).

2.2.8 Total quality management (TQM)

Total quality management (TQM l) is a customer-centric approach based on the principle of "get it right first time". TQM is the unyielding and continuous effort expended by everyone in the organisation to understand, meet and exceed the expectations of customers. It emphasises preventative measures. The aim is therefore to design and build quality in rather than to inspect units in order to assess quality by focusing on the causes rather than the symptoms of poor quality. In the quest for TQM, quality-related costs are identified and reduced (Correia, 2007:792; Drury, 2004:958).

Roos (2008:513) defines quality as the extent to which a product or service meets customer expectations by conforming to the required design or specifications at the price customers are willing to pay. The definition and measures of quality come from the market and not from boardrooms. If organisations are to provide quality products and services, it is not the organisations themselves that judge whether the quality is acceptable or not. Quality should therefore be regarded as an external measure of the attributes of products and services. In a global economic environment the survival of an organisation depends on, its ability to make quality products or provide quality services. In the global village there exists no trade barriers, information is readily-available about competing products and services, potential customers have a wide variety of products and services to choose from (Drury, 2011:548). This leads to customers increasingly demanding their money's worth from products and services. It has brought to the fore the need to produce quality products and services, and has resulted in the application of total quality management as a technique. Quality is not a one-dimensional measure of the degree of acceptability of a product or service. It is a combined measure of a number of attributes that customers desire and demand in a product or service (Drury, 2004:956).
The dimensions of quality can be categorised as follows:

- Performance: How well and consistently a product or service functions.
- Fitness of use: The suitability of the product to carry out its advertised functions.
- Reliability: The probability of a product performing its intended function for a specified length of time.
- Aesthetics: The appearance of a physical product, that is, how appealing it is in the eyes of the customer.
- Serviceability: How easily a product can be maintained or repaired.
- Features: The characteristics of a product that differentiate it from functionally similar products.
- Durability: The length of time that the product functions in the hands of the customer.
- Conformance: How well a product meets the specifications set during the development stage.

(Hoque, as quoted by Roos, 2008:514)

The elements aimed at producing and delivering quality products and services to customers at the lowest cost possible include the following:

- Encouraging operators to maintain their own equipment, and to detect, record, and solve their own problems.
- Streamlining production flow.
- Reducing inventories, lead times and defects.
- Eliminating or reducing non-value-adding activities such as setting up machines and ordering materials.
- Co-operating with suppliers and synchronising production plans with supplier delivery schedules.
- Increasing flexibility and productivity of the workforce.

For TQM to be successful, it should be regarded as a culture that permeates every structure, process and activity performed in the organisation. For organisations to benefit from TQM, it is necessary to set targets for continuous quality improvement and cost reduction. Such targets are supposed to be in the context of a well-understood quality improvement programme, the aim of which is to better the previous period's quality level. It needs to be improved all the time if organisations are to sustain their competitive advantage. Consequently, continuous improvement involves setting new targets that push the frontiers of quality levels to new heights (Hopper *et al.,* 2005:10; Roos, 2008: 515).

Cost of quality is the sum of the costs that arise from activities associated with prevention, identification, repair, and rectification of poor quality and opportunity costs from lost production time and lost sales as a result of poor quality (Blocher *et al.,* as quoted by Roos, 2008:515).
The costs of quality are generally classified into four broad categories as follows:

- Prevention costs.

These costs arise from initiatives aimed at preventing the production of defective products. The principle behind initiatives that give rise to these costs is "prevention is better than cure". Prevention costs occur before production in order to eliminate or reduce the chances of producing defective products. Product design and quality training are examples of prevention activities that give rise to prevention costs.

- Appraisal costs.

Appraisal costs arise from activities that are performed to detect measure and analyse data to ensure that products and services conform to specifications. These costs occur during production but before products are delivered to the customers. Examples of activities undertaken to detect quality problems include inspection and quality audits.

- Internal failure costs.

The appraisal function generates useful feedback about the quality-related problems that exist despite the preventive measures put in place. Activities aimed at the rectification of defective products and services gives rise to internal failure costs. These costs are called internal failure costs because they occur before the product leaves the premises of the organisation. Examples of activities that incur internal failure costs include re-work and re-inspection of products.

- External failure costs.

The measures put in place to prevent, detect and rectify defective products and services sometimes fail to eliminate the production and delivery of unacceptable products and service to end-use customers.

When that happens, the defects in the products and services are detected and experienced by customers. In other words, in the case of external failure costs, the quality problems are detected outside the boundaries of the organisation. Examples of external failure costs include the cost of repairing units already delivered, replacement costs, and product recall. A very expensive (although difficult to quantify in practice) external failure cost is the opportunity cost of sales lost as a result of a damaged reputation (Atrill & Mc Laney, 2007:143).

A cost of quality report shows the various categories of quality costs expressed as a percentage of sales or turnover as follows:

- Prevention costs: quality engineering, quality training programmes, quality planning, product design, quality circles or cells, and supplier selection and evaluation.
- Appraisal costs: raw materials inspection and testing, work-in-progress inspection, finished goods inspection, packaging inspection and test equipment (acquisition, maintenance, salaries and wages).
- Internal failure costs: rework, scrap, loss as a result of downgrades, re-inspection, retesting, loss due to interruptions and design changes.
- External failure costs: cost of recalls, sales returns and allowances due to quality deficiency, repairs, product liability, warranty costs and contribution lost (from cancelled orders owing to poor quality and to perceived poor quality) (Brewer *et al.,* 2005:58; Roden & Dale, 2001:394).

In figure 2.10 (p.40) the total critical success factors of quality management are identifies.

The cost of quality increases as one moves down the order of prevention, appraisal, internal failure and external failure costs. The total cost of quality is minimised when more emphasis is placed on the earlier categories. This implies that more money is spent early on, aspects such as on designing a quality product and purchasing quality materials. Organisations that achieve and sustain competitive advantage using TQM therefore focus on prevention and appraisal in order to eliminate internal and especially external failure (Roos, 2008:515).

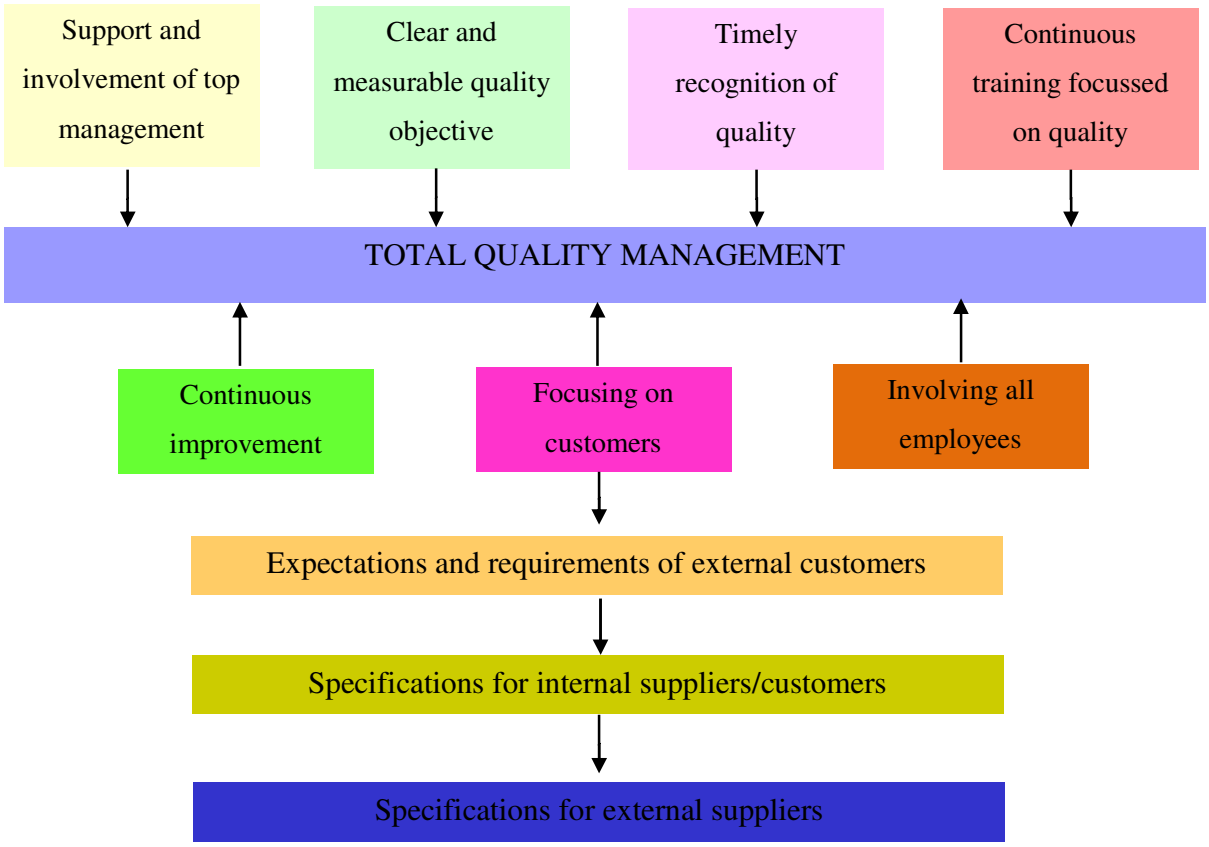


Figure 2.10: Critical total quality management success factors

Source: Roos (2008:515)

2.3 SUMMARY

In this chapter cost classification, traditional costing methods and contemporary costing methods applicable to general engineering were discussed. This included their features, application, advantages and disadvantages.

In Chapter 3 the Research Methodology followed and used in this study will be highlighted. Focus will be placed on the research method and design and, the development and distribution of the questionnaire. Various statistical methods and techniques, used and applied during the scope of the study, will be discussed. The population, sampling frame and sampling procedures will also be presented. The reliability and validity of the study as well as the importance thereof will be explored.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

Decision errors made due to poor cost information have become more probable and costly in today's competitive environment. Customers will buy the product with the lowest price, all other things being equal. Keeping costs low and being cost efficient provides an organisation with a strong competitive advantage. When the costing system is unreliable it results in distorted product costs. Over-costed products will lead to higher bid prices and business lost to competitors who are able to quote lower prices because their cost systems produce more accurate information. There is also a danger of under-costing resulting in the acceptance of unprofitable orders. These developments have made many companies aware of the need to improve their cost systems so that they can produce more accurate cost information to determine the cost of their products, pinpoint loss-making activities and analyse profits with reference to products, segments, customers and markets (Rodan & Dale, 2001:389; Drury, 2008:13).

The framework for the empirical research was provided in chapter two which incorporated the literature study for the research. In this chapter the focus will be on the research instruments used to gather the data for the research study. This will include a discussion on the research design and research methodology including qualitative instruments such as case studies, structured interviews and questionnaires as qualitative instruments. The determination of the sample and how the questionnaires were distributed will be outlined. The construction of the questionnaire will be provided as well as the format of the final questionnaire.

The objective of this research study as indicated in Chapter one (p.3) was to explore the extent to which general engineering companies in Southern Gauteng employ cost accounting methods. The research study will focus on the current methods and, their relevance and effectiveness in providing the information required by the users to maintain a competitive edge in the market.

The purpose of this chapter is to identify the most appropriate research methodology to address the research problem: Cost accounting can assist management to make such appropriate strategic decisions (Chan & Lee, 2003:89; Islam & Kantor, 2005:708). Companies are still not making good use of cost accounting systems as an aid to better decision making, planning and control (Brierly, Cowton & Drury, 2001:202). This examination will be conducted by discussing the research process, design, methodology, population and sampling techniques. In the next section the process, methodology and design for this research study will be discussed.

3.2 THE RESEARCH PROCESS

Mouton (2003:46) argues that all empirical (social) research conforms to standard logic as illustrated in figure 3.1. All empirical projects conform to this logic irrespective of the kind of study and independent of the methodology used.

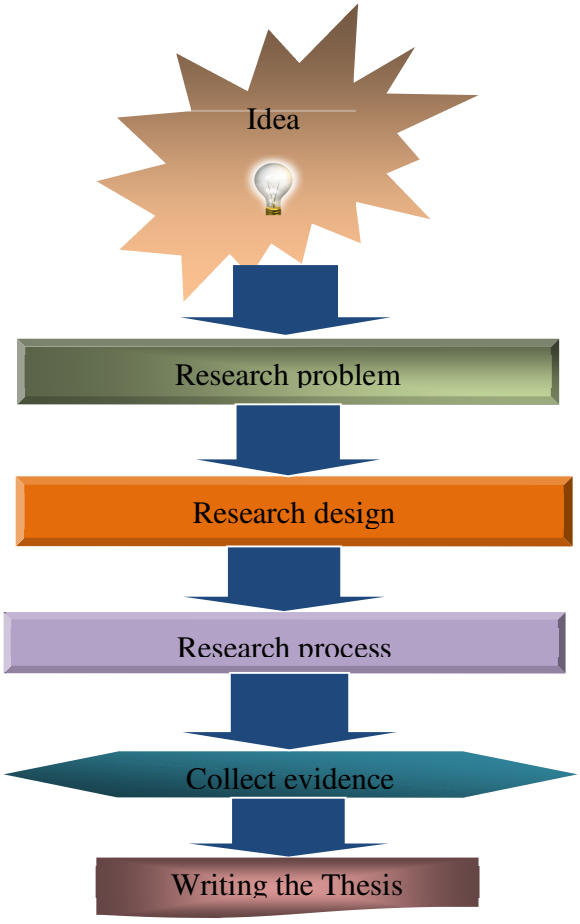


Figure 3.1: The logic of the research process

Source: adapted from Mouton (2003:47)

The management of the research process requires extensive planning to minimize obstacles in the future. The successful completion of the project is dependant on effective and efficient management of the research process.

3.3 DIFFERENCES BETWEEN RESEARCH DESIGN AND RESEARCH METHODOLOGY

Research design refers to the strategy to incorporate the different components of the research project in a cohesive and coherent way. Bless and Higson-Smith, as quoted by Maree (2008:290) provide the following definition of a research design: "The plan of how to proceed in determining the nature of the relationship between variables is called a research design." According to Mouton research design is often confused with the research methodology. The author explains the difference by creating a metaphor as illustrated in figure 3.2.

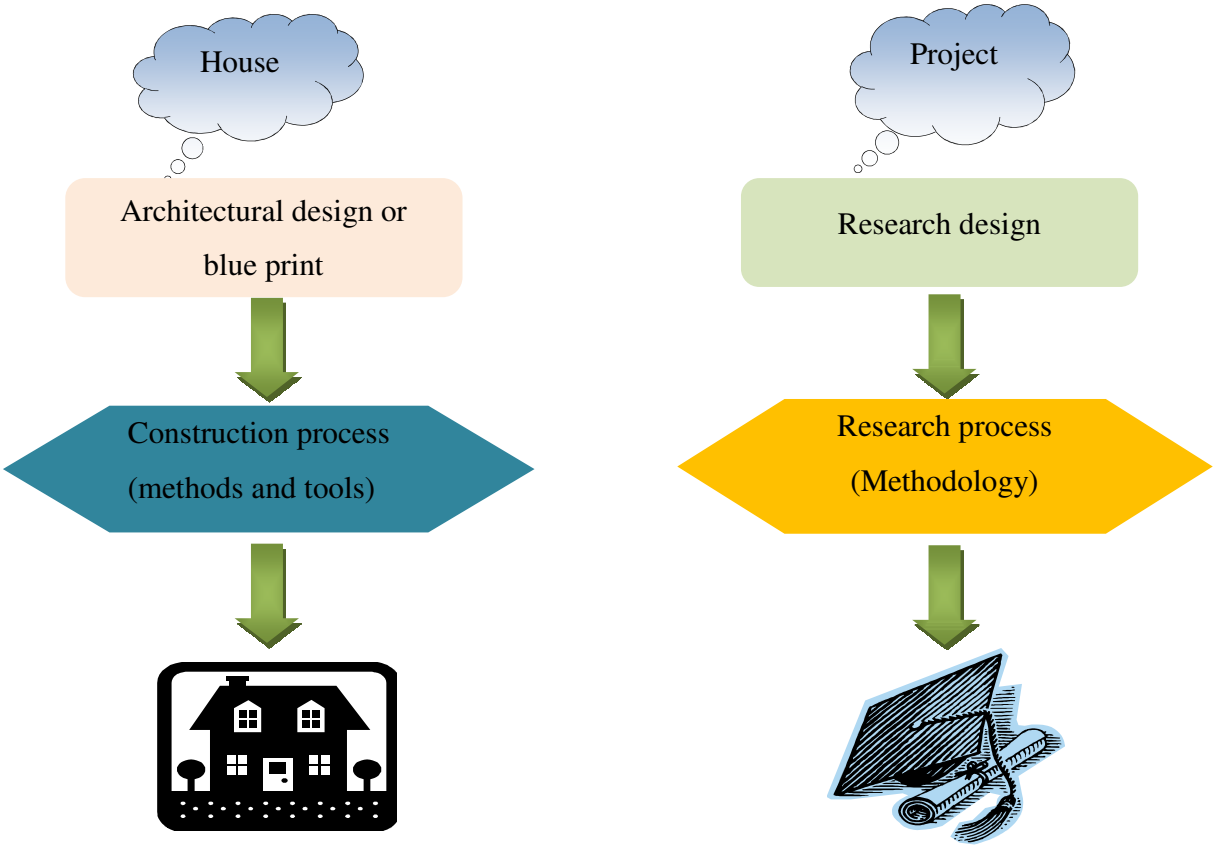


Figure 3.2: A metaphor of research methodology

Source: adapted from Mouton (2003:56)

The techniques, instruments and scientific actions employed in the execution of the research project are referred to as the research methodology. The research methodologies most used are quantitative and qualitative research approaches (De Vos, 2002:202).

Table 3.1 illustrates the differences between research design and research methodology

Research design	Research methodology
Focuses on the end product: What kind of study is being planned and what kind of result is aimed at?	Focuses on the research process and the kind of tools and procedures to be used.
Point of departure = Research problem or question.	Point of departure = Specific tasks (data collection or sampling) at hand.
Focuses on the logic of research: What kind of evidence is required to address the research question adequately?	Focuses on the individual (not linear) steps in the research process and the most "objective" (unbiased) procedures to be employed.

Table 3.1: Differences between research design and research methodology
Source: Mouton (2003:56)

Research design types can be classified as empirical or non-empirical. Figure 3.3 (p. 45) provides a summary of the research design types. This research study can be classified as an empirical study.

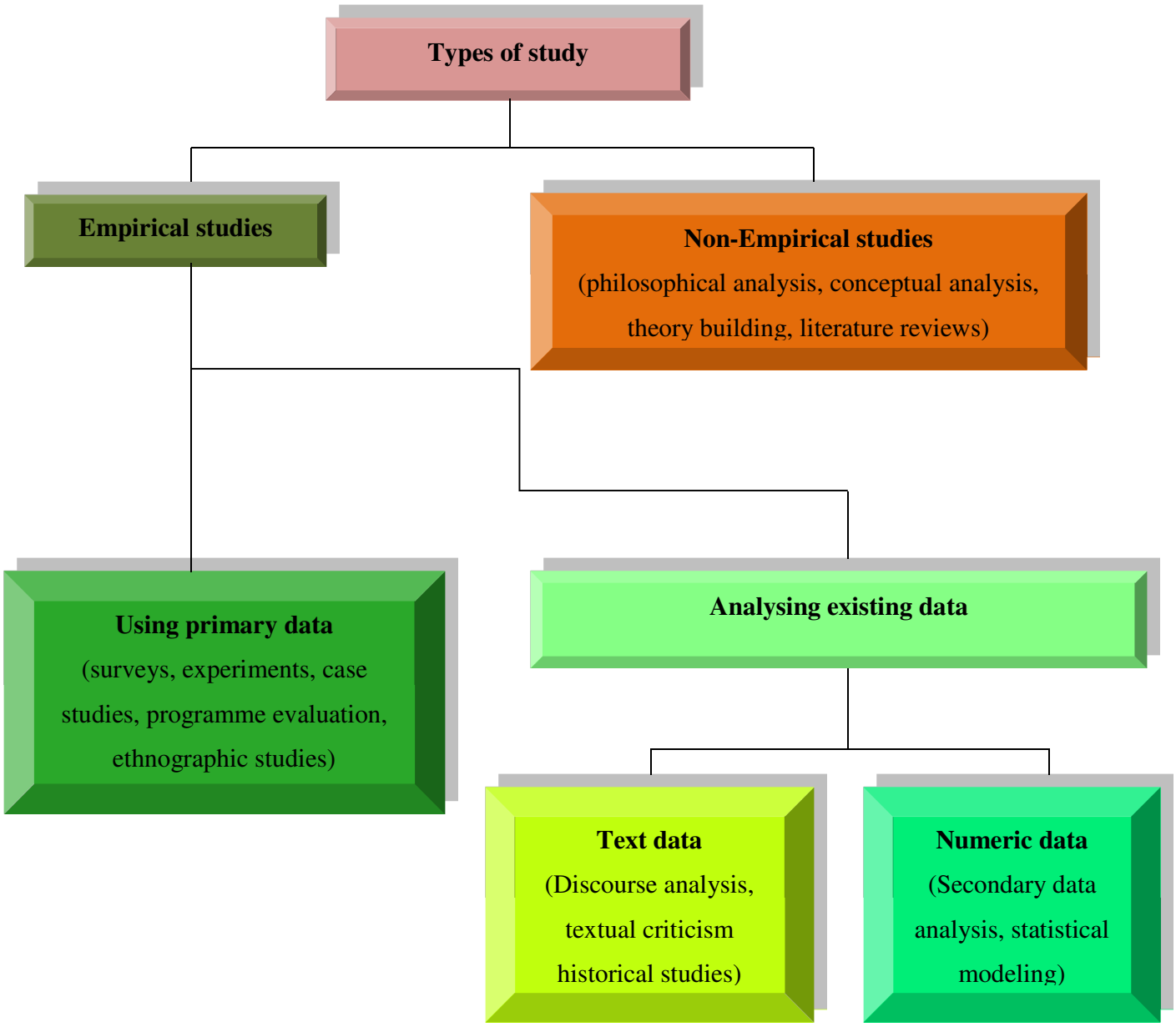


Figure 3.3: Classification of research design types

Source: Mouton (2003:57)

3.4 THE DIFFERENT RESEARCH METHODOLOGY PARADIGMS

Two main research paradigms, have been identified namely the positivistic paradigm which signifies quantitative research method and the phenomenological paradigm which signifies the qualitative method. The positivistic approach attempts to explain social phenomena by establishing a relation between variables which reflect information converted into numbers. The phenomenological paradigm suggests that social reality lies within the unit of research, and that the act of investigating the reality has an effect on that reality, this paradigm pays considerable regard to the subjective state of the individual (Welmann *et al.,* 2009:6; Collis & Hussey, 2003:84).

3.4.1 Qualitative methodology

Qualitative methodology refers to research that produces descriptive data generally the participant's own written or spoken words, pertaining to their experience or perception. No numbers or counts are assigned to these observations. The essential condition or qualification for qualitative methodology is a commitment to perceiving the world from the point of view of the participant. Differently put the researcher is concerned with understanding, rather than explaining. The qualitative methodology is also known as the phenomenological approach. (De Vos *et al.,* 2002: 79).

The following research methods are commonly used in qualitative research:

- case studies
- in-depth interviewing of key informants
- participant observation
- questionnaires and
- perusal of personal documents.

Qualitative research is inductive rather than deductive. Qualitative researchers develop their understanding in the course of the research process; they do not collect data in order to support preconceived hypotheses or theories (Brynard & Hanekom, 2010:38). The most frequently used techniques of data collection are:

- Textual analysis
- Interviews
- Observation

During phase one of this research study a phenomenological approach will be taken in the form of a case study using textual analysis and interviews. These methods will now be discussed.

- The case study

Maree (2008:75) argues that the term "case study" has multiple meanings. It can be used to describe a unit of analysis (e.g. a case study of a particular organisation) or to describe a research method. Depending upon the underlying philosophical assumptions of the researcher, case study research could be positivist, interpretive or critical. From an interpretivist perspective, the typical characteristic of case studies is that they strive towards a holistic understanding of how participants relate and interact with each other in a specific situation and how they make meaning of a phenomenon under review. Researchers have used the case study research method for many years across a variety of disciplines to answer "how" and "why" questions. Case studies offer a multi-perspective analysis in which the researcher considers not just the voice and perspective of one or two participants in a situation, but also the views of other relevant groups and the interaction between them. This is essential in enabling researchers to come to a deeper understanding of the dynamics of the situation, which is a salient feature of many case studies.

Yin, as quoted by Maree (2008:75), defines the case study research method as an empirical inquiry that investigates a contemporary phenomenon within its real-life context, when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used.

The unit of analysis is a critical factor in case study research. It is often focused on a system of action rather than an individual or group of individuals. Case studies can also be selective, focusing on one or two issues that are fundamental to understanding the system being examined. A key strength of the case study method is the use of multiple sources and techniques in the data gathering process. The researcher determines in advance what evidence to gather and what analysis techniques to use with the data to answer the research question. The data gathered is largely qualitative, but it may also include

quantitative data. Tools to collect data can include surveys, documentation review, observation and even the collection of physical artefacts (Yin, as quoted by Maree, 2008:75).

For the purposes of this case study the unit of analysis will be cost accounting reports and jobs completed in the financial years ending June 2006, 2007 and 2008. The case study will be conducted on a medium sized engineering company that has been using a self-developed costing system for the past 45 years.

- The textual analysis

Qualitative researchers have always known that one can learn a lot about the world by looking at documents (Travers, 2006:5).During the case study the researcher will do a thorough textual analysis of historical documentary sources and other existing data to get a deeper understanding of the costing methods used by the company, how their system functions, and draw a comparison between the methods discussed in the literature study (chapter 2, p.10).

- Structured interviews

In the structured interview questions are prepared in advance. Opportunities for bias from the interviewer are restricted. A common context is achieved by using the same questions, in the same order, with the same cues and prompts permitted (Maree, 2008:87; Smith, 2011:127). This type of interview approach is useful for eliciting information about a specific topic (De Vos, 2002:297). This method was chosen to ensure consistency.

- Quantitative methodology

Quantitative methods focus their attention on measurements and the number of characteristics displayed by people and events that the researcher studies (Thomas, 2003:1). Quantitative research is also referred to as positivistic.The positivistic approach seeks the facts or causes of social. phenomena, with little regard to the subjective state of the individual. Logical reasoning is applied to the research so that objectivity and rigourre places hunches, experiences, and intuition as the means of investigating

research problems. Positivism is based on the assumption that social reality is independent of us and exists regardless of whether we are aware of it (Collis & Hussey, 2003: 84).

In the quantitative research approach, the findings are usually expressed by means of statistical data and have numerical values. This approach includes the measurement of variables in terms of magnitude, extent or amount (height, weight or population size). Quantitative research can be summarised as being associated with analytical research, where the purpose is to arrive at a universal statement. The researcher assigns numbers to observations, and by counting and measuring, data is obtained. This method could include techniques such as observation, pilot studies, quantitative analysis and questionnaires (De Vos, 2002:222).

Positivists look for the existence of a constant relationship between events, or between two variables. The positivist notion is that science becomes credible and possible because every scientist looking at the same bit of reality sees the same thing. However, it has been amply demonstrated that what observers see is not determined simply by the characteristics of the thing observed; the characteristics and perspective of the observer also have an effect (Robson, 2002:21).

Quantitative data collection methods employ measuring instruments such as questionnaires, checklists indexes and scales. In this research study, the researcher used a structured questionnaire as quantitative data collection instrument to obtain information concerning costing methods used at small and medium sized general engineering companies in Southern Gauteng. The information gathered through the questionnaire represents respondent's preferences and experiences of costing methods used. In addition, as no personal information was required in the questionnaire, the participants remained anonymous.

The differences between quantitative (positivistic) and qualitative (phenomenological) methodology are illustrated in table 3.2 (p.50).

Quantitative (Positivistic) Methodology	Qualitative (Phenomenological) Methodology
Evaluates objective data	Evaluates subjective data
Process of analysis uses complex structured methods	Process of analysis uses flexible and explorative methods
Deals with an abstraction of reality	Investigates constraints of day to day events
Interpretation is done from an outsider's perspective	Try to achieve an insider's view
Keep research process stable	Work with the dynamic and changeable nature of reality
The approach is particularistic	The approach is holistic
Focus is on reliability	Focus is on validity
Aims for large numbers	Involves small samples

Table 3.2: Differences between quantitative (positivistic) and qualitative (phenomenological) Methodology.

Source: adapted from Welmann *et al.,* (2009:8)

Figure 3.4 (p. 51) is an illustration of how the research design and research methodology for this study was conducted.

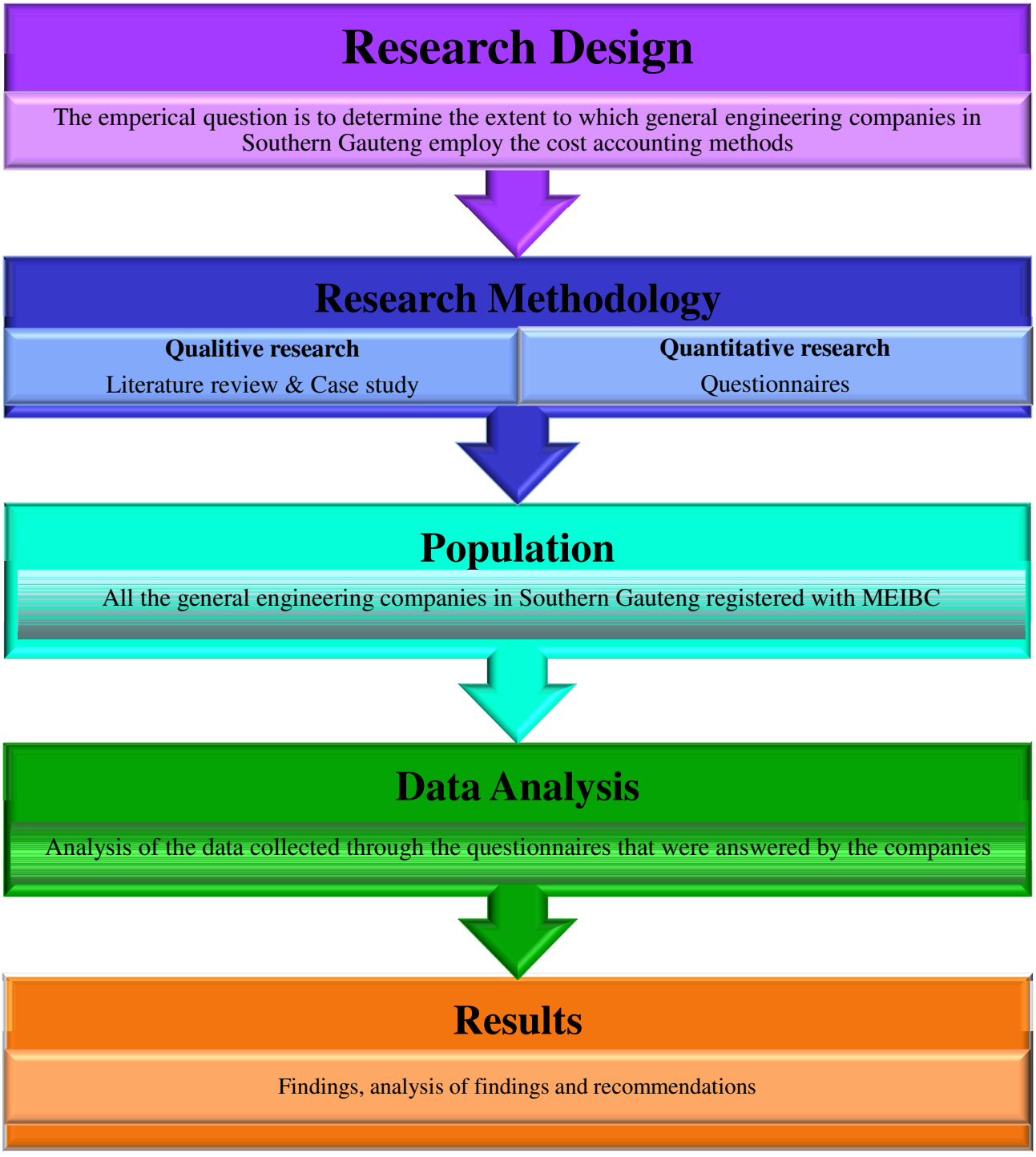


Figure 3.4: The research design of this study

Source: Own research

3.5 THE VALIDITY OF THE RESEARCH METHOD

De Vos (2002:166) defines validity in two parts: the instrument actually measures the theory in question, and the theory is measured accurately. Validity is a measure of the how well the research design captures the variable under inquiry. When one considers how variables are operationalised, it can be said that validity concerns the degree to which the variables in question purport to measure a given phenomenon. It can be described as the accuracy of questions asked, the data collected and the explanations offered. Generally it relates to the data and the analysis used in the research. It refers to the quality of data and explanations and the confidence one might have that it accords with what is true and what is real. Validity concerns the degree to which the variables in question purport to measure a given phenomenon (Denscombe, 2007:101).

Bless and Higson-Smith, as quoted by Brynard and Hanekom (2010:48), state that validity and reliability of data-measuring instruments are fundamental to scientific research. Validity refers to the potential of a design or an instrument to achieve or measure what it is supposed to achieve or measure. It is concerned with the "what" of data-collection procedures and measures.

The internal validity for this research study was arrived at by considering both content validity and construct validity.

The content validity was supported by conducting pilot studies. According to Smith (2011:121) questionnaires need to be tested in order to identify and eliminate problems that might occur. Pilot questionnaires were circulated to 16 companies Ambiguities and doubts were identified and the questionnaire was adopted. This does not mean, however, that there was no possibility that certain questions might still cause problems. The questionnaire was finalised and distributed to the rest of the companies identified by means of purposive sampling.

The construct validity was underpinned by the fact that although the questionnaire focused on different sections, the items all dealt with aspects which were important concerning the use of sound costing methods that lead to improved decision making and profitability.

In table 3.3 (page 53) the various validity criteria are explained.

Content validity	Refers to the correctness and appropriateness of the questions included in a test or questionnaire. It is advisable to test the correctness, relevance and lucidity of the questions in a pilot study (preliminary investigation). Duplication of questions can thus be avoided. The results of a pilot study will help determine whether or not the questions included are relevant to the research problem.
Criterion-related validity	Involves testing whether or not an instrument (A), selected for data collection, measures what it is expected to measure and whether or not it can be compared to another instrument (B), which is known to be valid. If the data collected through both instruments closely match, then instrument (A) is also valid. The stipulation is that the two sets of data should be collected from the same group of subjects.
Construct validity	Refers to the degree to which a measurement technique uncovers the information which it was designed to uncover. For example, questions for a questionnaire should be specifically designed to obtain the desired information.
Face validity	Is concerned with the way an instrument appears to the participants. For example, do they view it as so simple, childish and boring that they experience it as an insult to their intellect, or does it appear so difficult that the participants give up even before starting? Face validity is therefore based on the subjective judgement of the researcher and the respondents.
External validity	The applicability to similar problems of the conclusions drawn from the research, provided that the sample is representative and the study is a simulation of the real world and real-life situations.

Table 3.3: Validity criteria

Source: Adapted from Brynard & Hanekom (2010:48)

3.6 THE RELIABILITY OF THE RESEARCH

According to Brynard and Hanekom (2010:48) reliability pertains to the accuracy and consistency of measures. The same instrument must be able to produce the same data at a later stage under similar conditions. Lincoln and Guba, as quoted by Brynard and Hanekom (2010:48), states that there can be no validity without reliability, a demonstration of validity is enough to establish reliability.

According to Maree (2008:216) the coefficient that is used to measure the internal reliability of an instrument is called Cronbach's alpha coefficient and is based on the inter-item correlations. When items are strongly correlated with each other, their internal consistency is high and the alpha coefficient will be close to one. The questionnaire that was distributed to the respondents achieved a Cronbach's alpha coefficient of 0.946.

3.7 THE SAMPLING TECHNIQUE

Sampling is a technique used to select a small group, called the sample, with a view to determining the characteristics of a large group called the population. If selected carefully the sample will display the same characteristics or properties as the large group (Brynard & Hanekom, 2010:54).

Purposive sampling is applicable for this research study. Purposive sampling simply means that participants are selected because of some defining characteristic that makes them the holders of the data needed for the study. Sampling decisions are therefore made for the explicit purpose of obtaining the richest possible source of information to answer the research questions. Purposive sampling decisions are not only restricted to the selection of participants, but also involve the settings, incidents, events and activities to be included (Maree, 2008:80; De Vos 2002:334). The three most commonly used sampling methods are Stratified purposive sampling, Criterion sampling and Snowball sampling (Chain referral sampling). These methods are set out in table 3.4 (p. 55). Purposive sampling was chosen for this research study and the criterion sampling technique was used.

Stratified purposive sampling	Participants are selected according to preselected criteria relevant to the research question. The sample size may or may not be fixed.
Criterion sampling	Typical characteristics of participants and the number of participants are decided at the design stage.
Snowball sampling (Chain referral sampling)	Is a method whereby participants with whom contact has been made are used to penetrate their social networks to refer other participants who could contribute to the study.

Table 3.4: Sampling methods most commonly used in Purposive sampling
Source: Adapted from Maree (2008:80)

3.8 SAMPLING PROCEDURE

The target population is a clearly defined group of entities that have some characteristics in common (Welmann *et al.,* 2009:42). A population is any group that is the subject of research interest. It is often not possible to study the entire population therefore it is necessary to make general findings based on a study of only a division of the population. Such divisions are called samples. Samples must be representative of the population being studied (Goddard & Melville, 2007:34). A six step procedure for drawing a sample from a population can be followed as illustarted in figure 3.5 (p. 56).

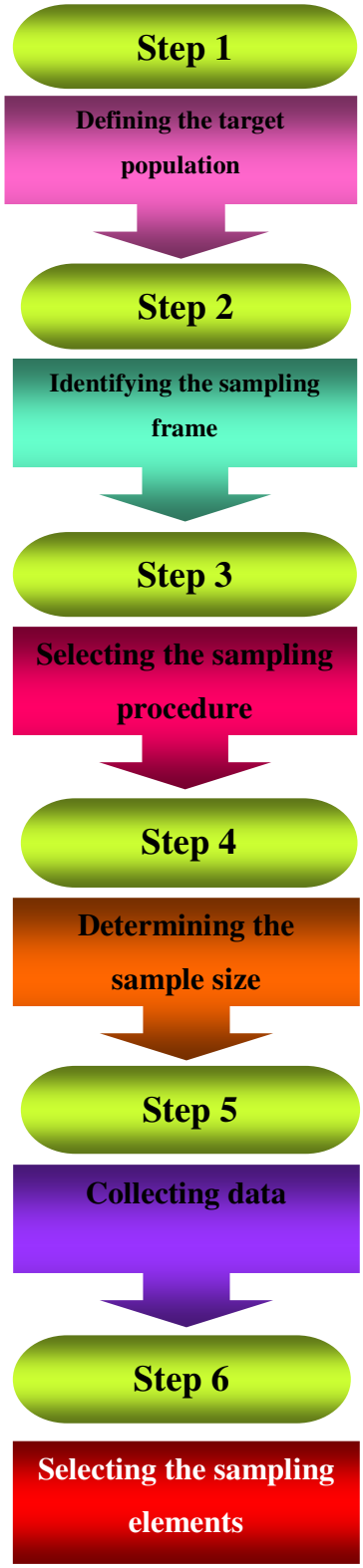


Figure 3.5: Six step procedure for drawing a sample

Source: Churchill and Iacobussi (2002:449)

For the purpose of this research study, the population comprises of engineering companies in Southern Gauteng. The sampling frame will be engineering companies in Southern Gauteng, registered with Steel and Engineering Federation of South Africa (SEIFSA). A list of companies was obtained from SEIFSA for this purpose (Van Huyssteen 2009). There are 118 companies listed in Southern Gauteng. Purposive sampling was used and the questionnaire was administered to companies in accordance with the sound judgement of the researcher that the sample was composed of elements that contain the most characteristic, representative or typical attributes of the population e.g. engineering companies that manufacture multiple products. With reference to Raosoft (2011) a sample size of 91 respondents was calculated. The questionnaires were then delivered by hand to 91 respondents.

3.9 THE DATA COLLECTION METHOD

The choice of data collection methods for the researcher, working from a quantitative approach, can be categorised into questionnaires, checklists, indexes and scales. The method chosen for phase two of this research study is a questionnaire.

A questionnaire can be defined as a set of questions incorporated in a form and which is completed by the respondent in respect of a research project. The questions can be open or closed. Alternatively, the questionnaire can contain statements to which respondents are requested to react (Goddard & Melville 2007:47). The objective of a questionnaire is to obtain facts and opinions about a phenomenon from people who are informed on the particular issue. Questionnaires are the most generally used instruments of all and can be applied in various ways, but must not be confused with research interviews, for which interview schedules are necessary (to be used in phase one). Different types of questionnaires can be identified. An overview of types of questionnaires is provided in table 3.5 (p. 58) (De Vos, 2002:172). Questionnaires for this research study were delivered by hand.

TYPES OF QUESTIONNAIRES	DESIGN	ADVANTAGES	DISADVANTAGES
Mailed questionnaires	Non-threatening. Must create an interesting impression. Prescriptions must be clearly and carefully worded at the level of the understanding of the population.	Low costs. Respondent enjoys high degree of freedom. Information can be obtained from a large population.	Non response rate may be very high. Some questions are often not answered. No control over who completes the questionnaire.
Telephonic questionnaires	Must contain comprehensive instructions.	Response rate is high. Allows quick data gathering. Information can be obtained from respondent without leaving the office.	High costs. Respondents may be sceptical. Bias can creep in to sampling because not everyone has a telephone.
Personal questionnaires	Handed personally to respondent.	Researcher is available in case of problems.	High costs
Questionnaires delivered by hand	Appointment must be made with the respondent. Must be collected within 48 hours.	Saves time. Response rates are raised.	Smaller geographical area can be covered. Respondents may loose questionnaires
Group Administered questionnaires	Combination of the personal interview and mailed questionnaire. Respondents are present in a group	Saves time and costs. Best aspects of mailed and personal questionnaire can be combined.	Obtaining a suitable venue. Mutual influence may occur. Questions may be answered arbitrarily.

Table 3.5: Types of questionnaires

Source: Adapted from De Vos (2002:174)

3.9.1 Types of questions

There are a variety of questions types from which the researcher can select. These questions can be divided in two main categories:

- Open questions where the respondent is requested to provide his/her own answer to the question. A space is provided in the questionnaire where the respondents are to record their answers. These types of questions can be used if the researcher wants to learn how the respondent thinks, to discover what is really important to him/her, to get an answer to a question that has many possible outcomes (Maree, 2008:161).

- Closed questions offer the respondent the opportunity of selecting one or more response choices, according to instructions contained in a numbered questiin selection. Closed questions are used when a substantial amount of information about a subject exists and the response options are relatively well known (De Vos, 2002:179).

In this research study only closed questions were used and they will be discussed. The following are examples of closed questions:

- List questions take a variety of forms:
  a. Dichotomous questions are used when there are only two possible answers e.g. male or female.
  b. Multiple-choice has three or more response categories.
  c. Filter and follow-up questions are used to divide the sample into sub classes.
  d. Ranking questions explore how respondents rank certain issues in order of importance or preference.
  e. Category questions are used where respondents have to choose only one of a set of categories.
  f. Quantity questions are used where respondents have to provide a number which gives the number of some characteristics.
  g. Grid questions in a grid (or table), are used where respondents are requested to provide responses to two or more questions simultaneously.
  h. Biographical questions are used to obtain important information from the respondents such as age, gender and home language (Maree, 2008:163).

In this research study there were a total of 12 closed questions styled as follows:

- Section A: Question 2 – a dichotomous question.
- Section A: Questions 1, 3 & 4 are biographical questions.
- Section C: Questions 1, 2, 3, 4, 5, 6, 7 & 8 are multiple choice questions.

3.9.2 Scales

Bell, as quoted by Maree (2008:167), states that scales are used to help researchers discover the strength of feeling or attitude. The response options are set up in such way that the variables measured can be expressed as numerical scores that are of either an ordinal, interval or ratio type. The scales most commonly used are the Likert scale and the semantic differential scale.

In this research study the Likert scale was used and will be discussed:

The Likert scale provides an ordinal measure of a respondent's attitude. The most common use of the Likert scale is asking respondents whether they agree or disagree with a statement. Four to seven response categories are commonly used e.g. four response categories:

a. Strongly agree
b. Agree
c. Neutral
d. Disagree
e. Strongly disagree

(Maree, 2008:167).

In section B of the questionnaire for this research study a total of ten Likert scale questions were asked.

3.10 THE CONSTRUCTION AND CREATION OF THE QUESTIONNAIRE

The creation and administration of the questionnaire is the most important part of the research study the following eight-step method for the creation and administration of a questionnaire was used in this research study. Table 3.6 (p. 61) illustrates the steps as follows:

	Topic	Suggestion	Implementation in research study
Step 1	Research focus	The central question(s) that the research study is to answer are stated by the researcher.	The research question was stated: Cost accounting methods used in general engineering companies in Southern Gauteng.
Step 2	Constituent sub-questions	Specific questions whose answers contribute to answering the central question are identified.	The questionnaire was formulated with the aim of answering the central question identified in Step 1.
Step 3	Questionnaire format	The questionnaire is formatted in view of the respondents' possible level of: Reading and writing skills. Knowledge of the information sought in the questionnaire. Willingness to report such information in the form that the questionnaire requires.	The questionnaire was constructed after an in depth study of literature on questionnaires. It was distributed to senior- and top management candidates in engineering companies that have good reading and writing skills and have first-hand knowledge of the costing methods used at their company and are willing to share this information as the their responses will be considered anonymous.
Step 4	Manner of administration	The way the questionnaire will be administered to respondents is determined.	After obtaining the distribution list the questionnaire will be distributed to the respondents by hand.
Step 5	Try out	The initial form of the instrument is tried out with a sample of respondents to identify weaknesses in the questionnaire and in the manner of distributing it.	The questionnaire was distributed to 15 individuals within the sample area, this served as a pilot run for the questionnaire.
Step 6	Revision	The results of the try-out are used for improving the clarity of the instrument and the way of administering it.	The questionnaires received from the pilot study were used to fine tune the questionnaire to obtain as much clarity as possible surrounding the questions asked.
Step 7	Selection of recipients	The people who will be asked to complete the questionnaire are identified.	The population of this research study comprises of individuals employed at general engineering companies in Southern Gauteng.
Step 8	Administration	The questionnaire is distributed to recipients who are asked to fill it out and return it to the researcher	The questionnaire was distributed to a total of 180 recipients.

Table 3.6: Creating and administering the questionnaire

Source: Adapted from Thomas (2003:67)

3.11 FINALISING THE QUESTIONNAIRE

A draft questionnaire was discussed with Mrs A. Oosthuyzen of the North-West University, in order to obtain an expert opinion on the questionnaire. The format of the questionnaire was adjusted according to the recommendations made by Mrs Oosthuyzen after which a pilot study was launched.

The pilot study involved the circulation of the questionnaire (Annexure A – p. 131) to 16 companies included in the sample. The respondents were asked to comment on the clarity of the questions. The content was specifically evaluated in terms interpretation, relevance, general validity and interpretation.

3.12 DATA PROCESSING AND ANALYSIS

An independent research statistician, Mrs A. Oosthuyzen from the North West University was consulted regarding various aspects relating to the responses from the research questionnaire. Calculations were made in order to check the reliability of the data.

The data was coded and entered as described by Maree (2008:105) and a decision was made as to which computer programme would be utilised to analyse the data. The following program was considered and used: The International Business Machines Corporation (IBM), Statistical Package for Social Sciences (SPSS), version 20 for Windows.

3.13 ETHICAL ISSUES

Ethics can be defined as a set of widely accepted moral principles that offer rules for and behavioural expectations of the most correct conduct towards experimental subjects and respondents, employers, sponsors, other researchers, assistants and students. Important issues to be considered are:

a. that no harm should come to the experimental subjects and respondents
b. prospective respondents should give their informed consent
c. respondents should not be deceived in any way
d. researchers should be competent and responsible
e. prospective respondents have the right to privacy

(De Vos, 2002: 75; Goddard & Melville, 2007:49)

While conducting this research study the researcher ensured that no harm either through undue stress, embarrassment, or loss of self-esteem came to either the researcher or the respondents to the questionnaires. The necessary permission was obtained from the companies selected. The cover letter attached to the questionnaire furthermore explained the nature of the research being conducted and requested the participation of the respondent. The questionnaires were anonymous thus ensuring the respondent's right to anonymity and confidentiality. Honesty with professional colleagues was maintained by the researcher giving full acknowledgement when another person's ideas or words were used. The Harvard reference method was used throughout the research study.

Ethics and ethical issues in research can cause much harm if not correctly applied. The researcher must ensure at all times that his/her ethical behaviour is of such a nature that professionalism or personal integrity is not compromised.

3.14 CONCLUSION

In this chapter the research design and methodology, the sampling procedure, the research instrument and the measurement process were reviewed. The research design outlines the various steps that were taken in this research study as well as measurement of reliability and validity of the research study.

The various aspects of the qualitative research paradigm were discussed and the first phase of the research study was identified as being qualitative of nature. Aspects of measurement fundamental to quantitative measuring instruments were detailed and quantitative research was identified as the research paradigm for the second phase of the research study, while purposive sampling was identified as the sampling method of choice. The questionnaire was introduced as the measuring instrument. The design, advantages and disadvantages of the measuring instrument were highlighted and various steps for successful use of the questionnaire were introduced.

In chapter 4 the research study progresses toward the research findings, and analysis of data captured in the empirical research study. The findings of the case study will be analysed and discussed. The responses on the questionnaires will be analysed and outlined in this chapter.

CHAPTER 4
RESEARCH FINDINGS

4.1 INTRODUCTION

In chapter two an overview of costing methods applicable to general engineering companies was made and the functioning, advantages and disadvantages of these costing methods were illustrated. In chapter three details were provided of the research methodology employed in the design of the research study. Chapter five details the analysis of data captured in the empirical section of this study.

The data presented in this chapter was gathered through qualitative and quantitative research methods. The qualitative data in the initial part of the study was gathered by means of a case study done at an engineering company in Southern Gauteng. This was used to develop a questionnaire which was distributed to engineering companies in Southern Gauteng.

4.2 THE CASE STUDY

4.2.1 Background of the company

The company was established 47 years ago to meet South Africa's need for locally manufactured turbo machinery spares and to provide repair and maintenance services for all types of turbines and turbo compressors. During the past 47 years, the company's scope of operations has expanded to cover a wide spectrum of precision engineering, which includes machining, fabrication and unique measuring capabilities. There are 120 people employed by the company. The company has been ISO 9001 accredited by the South African Bureau of Standards since 1988. The company is also ISO 3834 accredited by the South African Institute of welding. Among other certifications received are its status as approved supplier for British Aerospace, Mittal Steel SA, Samancor, Manganese Metal Company, Sasol, Engen, Mondi Paper, Atlas Aircraft, Denel, Air Products, Afrox, La Farge Cement, AngloGold, Rand Water and Bucyrus Africa.

The company has three departments in its structure. They are referred to in this study as departments A, B and C:

- **Department A**

  This department has established a unique reputation in the field of precision engineering, repair, maintenance and component manufacture for all types of turbines and turbo compressors. The department also rebuilds turbine rotors, diffusers and manufactures and repairs labyrinth seals. Dynamic balancing, vibration analysis and onsite balancing of all types of rotating equipment are also a specialty of this department. A 24-hour breakdown service is provided for time-critical requirements of its customers. The department has a white-metal casting shop for re-metalling of all types of white metal bearings.

- **Department B**

  This department accommodates some 20 machine tools in a 2400 m^2 area, which includes both conventional and computer numerically controlled (CNC) vertical and horizontal boring mills and lathes, floor borer, lathes incorporating tool post grinding, milling machines, surface grinder, radial and pedestal drills. All lathes, milling machines and boring mills are equipped with digital readout equipment. Typical machining includes the manufacture of heavy-duty shafts, turbine and compressor rotors, crusher components, various armour and artillery assemblies and gearbox line boring. As a precision engineering concern, accurate measuring facilities have always been accorded a high priority. Measuring facilities include a large portal frame computerised three-dimensional measuring machine. This unit is installed in a temperature-controlled inspection room and is used to monitor close tolerances required for machined parts for ultra-high precision applications. Component dimensions of 2 600 milimetres long 1 500 wide 5 900 high can be measured.

- **Department C**

  The fabrication capabilities are built around a high level of welding expertise. The 5 258 m^2 fabrication shop is fully equipped with the necessary cranes and welding hardware. The department

has a history of manufacturing items such as steam condensers storage tanks, steelwork for thermal and nuclear power stations, turbine claddings, acoustic hoods, cross over pipes, gland steam condensers, train coolers, intercoolers and heat exchangers. Finned tubes for heat-transfer engineering are also manufactured in this department. Assembly and welding, in accordance with International codes and the stringent requirements of the armourment and petrochemical industries, are also done in this department. This department is also in the process of manufacturing large De-aerators for the Medupi and Kusile power stations. A substantial investment in specialised machinery and related additions was made by the company to enable it to manufacture vessels of large dimensions in the shortest possible turnaround time. These additions include a 4 Axis CNC rolling machine, the upgrading and retrofitting of sub-arc welding machines with state of the art welding equipment and the designing and manufacturing of lifting and manipulating equipment.

The company is in the process of transforming the company to the required BEE status, by empowering previously-disadvantaged individuals to add meaningful value to the services offered to its clients. Because safety is the cornerstone of a reputable engineering concern, the holistic safety management structure of the company complies with OHSAS 18001 requirements. The recent attainment of the ISO 3834 welding accreditation is not just viewed as another prestigious “award”, but a real tool with which the quality of work can be enhanced. When all-round quality is enhanced the related risks to the company are automatically proportionally diminished. The company is committed to meet customers’ requirements, retain total accountability to clients for all work done, strive to exceed customer’s expectations and maintain an honest open-door policy of transparency.

4.2.2 The costing and estimating system used by the company

4.2.2.1 Estimating

Due to the fact that diverse products and services are offered by the company, each enquiry, received from its customers, is priced individually by technical experts who apply their knowledge and experience, gained in their specific engineering field, to estimate the probable cost of each product or service. Underestimating costs represents a loss to the company while overestimating such costs can result in loss of contracts or customer goodwill.

The activities undertaken by the company can be classified generally as being, machine based production, labour intensive production, technical services and administrative services.

Machine based production activities include turning, milling, grinding, balancing, welding, rolling and bending. Labour intensive production includes; boiler making, fitting and machine operating. Technical services include inspection and 3D measuring.

The preparation of an estimate involves the estimation of the total amount of hours required for each activity necessary to complete the job. Each activity has a predetermined costing rate per hour (Annexure B, p. 137). The total amount of hours is then multiplied by the predetermined rate to determine the total cost of labour. The material required for the job is calculated, and the cost for the material is calculated using a standard cost. The estimated price for the part or service is then sent to the client.

4.2.2.2 Costing

- **Job Costing**

When the client accepts the estimate, an order is placed with the company to commence manufacturing the particular component. On receipt of the order a job is recorded by the accounting department and allocated a specific job number. The job card and a copy of the order from the client are then sent to the originator of the estimate, who is the technical expert for that particular job. The next stage is the planning of the job. The estimator (technical expert) draws up a planning sequence setting out the manner in which the job must move through the workshop. This planning sequence includes specific instructions on how this job must proceed through the manufacturing process. The production resources are specified as well as the total standard time allowed for each operation. During the planning stage a list of material required to manufacture the job is then drawn up and sent to the procurement department which will then source the material from outside suppliers. At the procurement stage the procurement department strives to source the material at a better price than the estimator noted during the quotation stage. Once an order has been placed for the material, the order is printed and sent to the clerk responsible for recording the costs in the job costing Excel spreadsheet program for that particular job number.

Once the material arrives it is issued to production, along with the planning and the manufacturing process data as each department's manufacturing process (Annexure C, D and E, p. 138, 139 and 140) starts at this point. Each employee responsible for the job has to record, on a prescribed form, the hours spent working on the job on a daily basis. For each different operation there is a different code and a different costing rate. The hours worked by each employee are recorded daily in the excel spread sheet program for that specific job. On completion of the job the manager of the particular department gathers all the paper work pertaining to the job, puts it in a file and sends it to the accounts department for invoicing.

The accounts department draws the job costing sheet for the job being invoiced. From the job costing sheet (Annexure F p. 141) the inter-departmental costs, incurred by attending to the job in the different departments, are added and allocated to that specific department in the sales journal analysis. The job file is then returned to the department manager for his perusal. The completed job file is then archived.

- **Departmental Costing**

The company's three production departments function as independent business units. Their performance is monitored monthly and recorded in an internal report called an analysis. Each department's actual material and labour costs are recorded as well as the relevant portion of the company's overhead costs and service department costs. The overhead costs are absorbed into to the three production departments on the basis of floor space occupied. The service department costs are allocated on actual hours worked by the service department in the different production departments.
Management relies heavily on this monthly report to inform it of problem areas and non - performing departments.

4.2.3 Total Quality Management (TQM)

The company has implemented the ISO 9001:2000 quality management system and strives to exceed customer expectations. TQM is a culture at the company and continuous improvement is their main focus. The only costing reports that are kept are the costs of rework in cases where a non- conformance is reported and the total costs of repairing the mistake are recorded. At this stage the company keeps no other cost or quality reports.

4.2.4 The costing system and the financial accounting system

The company runs two separate systems. The financial accounting system conforms to the General Accepted Accounting Practice principals and is not reconciled to the costing system.

4.2.5 Findings of the structured interviews

For the interviews only the management responsible for production was selected.

4.2.5.1 Responses to the structured questionnaire

- **The classification of costs at the company**

In figure 4.1 we see that only 40% of the candidates interviewed said that the costs at the company were classified as material labour and overheads.

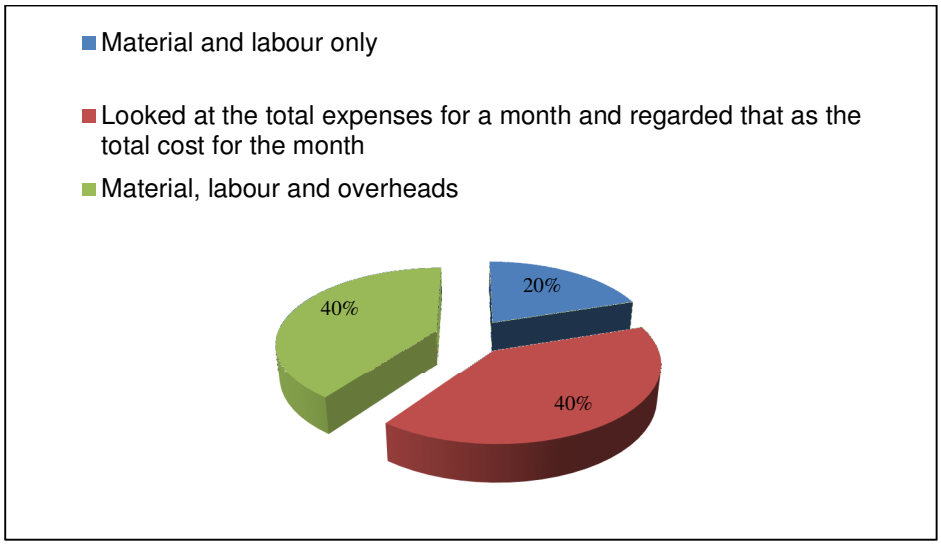


Figure 4.1: Candidates' perception of the company's cost classification

- **The job costing system used at the company**

Figure 4.2 (p. 71) indicates that 80% of the candidates interviewed agree that that company uses a custom made computer program for job costing purposes.

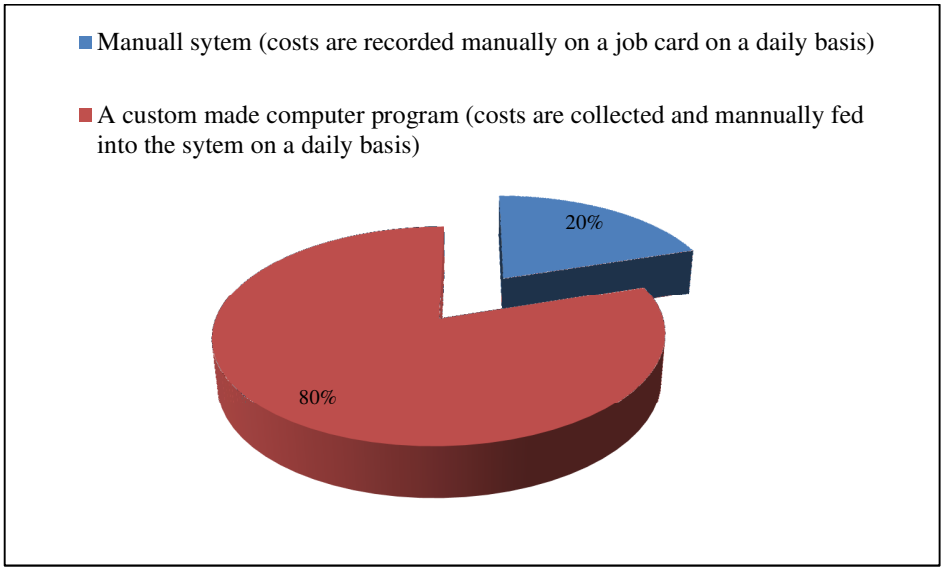


Figure 4.2: Candidates perception of the job costing system used by the company

- **The determination of the labour rate used in the estimates to customers**

Figure 4.3 shows that 60% of the respondents used historical costs for labour and overheads, 20% used "gut feel" and 20% used the amount that customers are willing to pay.

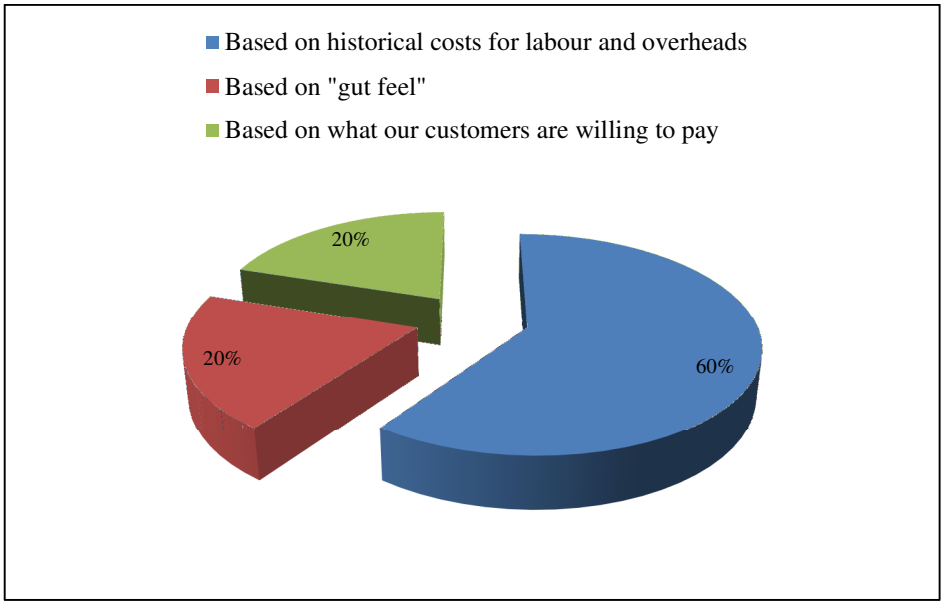


Figure 4.3: Candidates responses to the determination of the labour rate used for estimates.

- **The analyses of variances on completion of jobs**

Figure 4.4 shows that only 40% of the candidates interviewed analysed variances on completion of jobs.

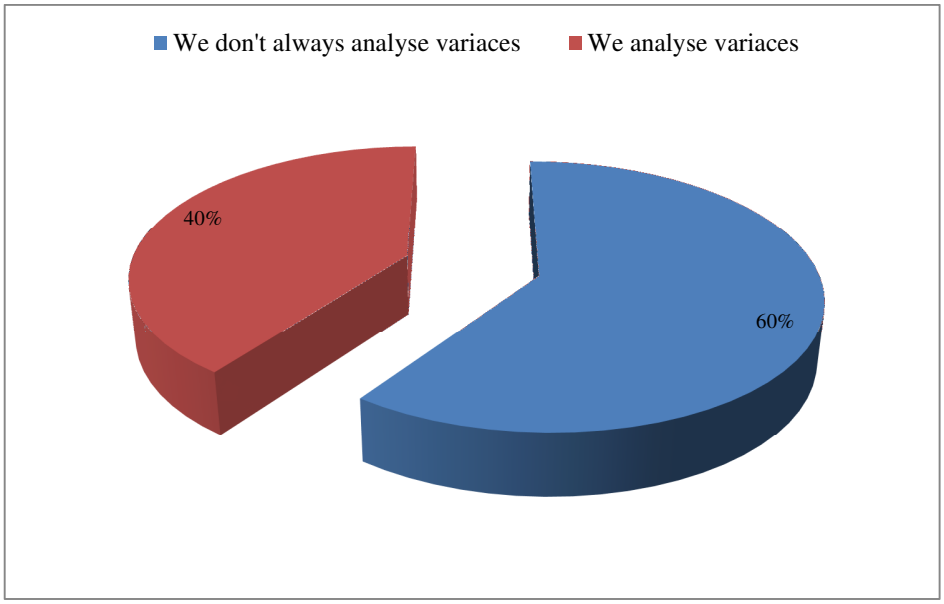


Figure 4.4: Candidates responses to variance analyses on completion of jobs

- **The absorption of overheads**

Figure 4.5 (p. 73) shows that 60% of the candidates said that the company used traditional costing methods, according to floor space occupied per department as basis for overhead absorption.

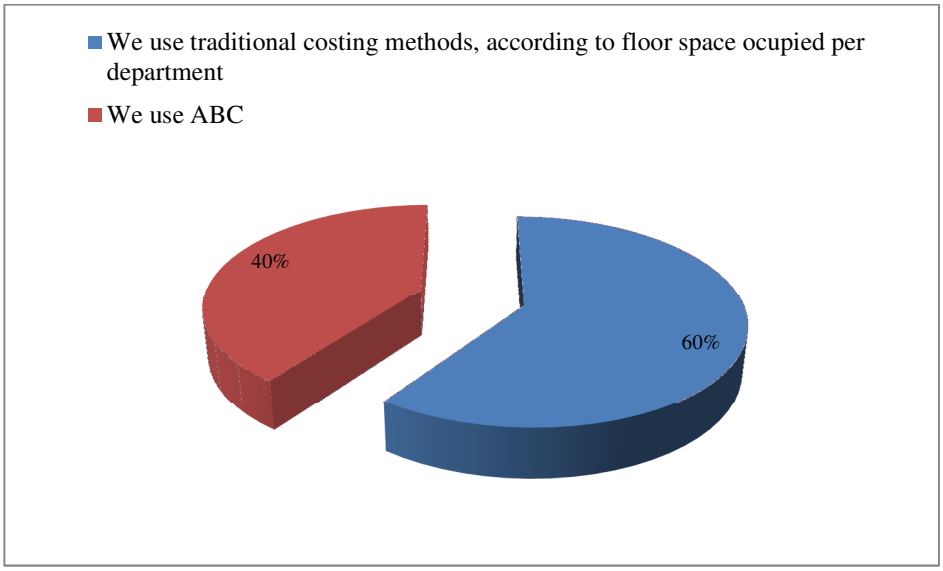


Figure 4.5: Candidates responses to the method of overhead absorption at the company

- **Total Quality Management**

Figure 4.6 indicates that 100% of candidates indicated that Total Quality Management was implemented at the company.

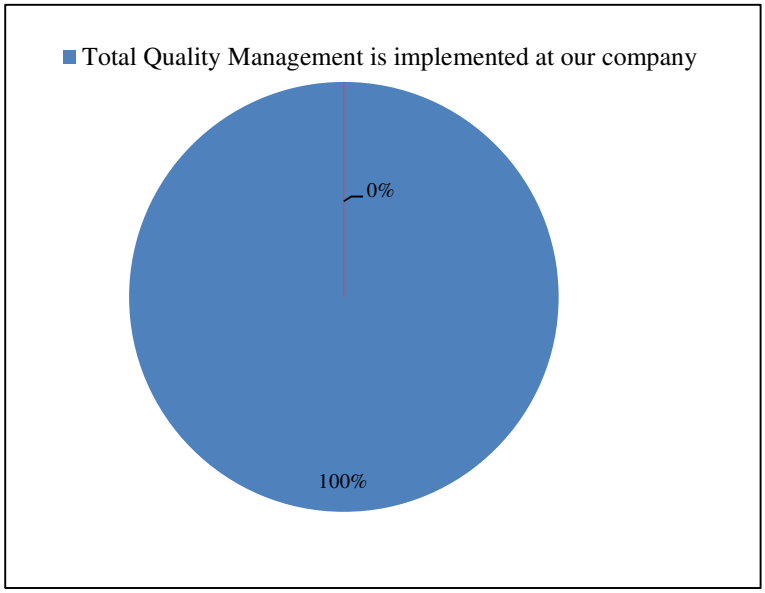


Figure 4.6: Candidates responses to Total Quality Management at the company

4.2.6 Findings of the analyses of the company's costing records

The company made their costing records available, namely 50 job files per department and departmental analyses for three years. The selected files were audited to determine if they were compliant with the following criteria:

a. Each job has a quotation (estimate).
b. Quotations (estimates) showed the cost for labour and material.
c. A profit or loss could be verified.
d. The planning for each job had been done.
e. The standard times required per operation were indicated on the planning.
f. Variances between estimates and costs had been identified and analysed.

Figure 4.7 (p. 75) shows each department's results according to the criteria: a – f.

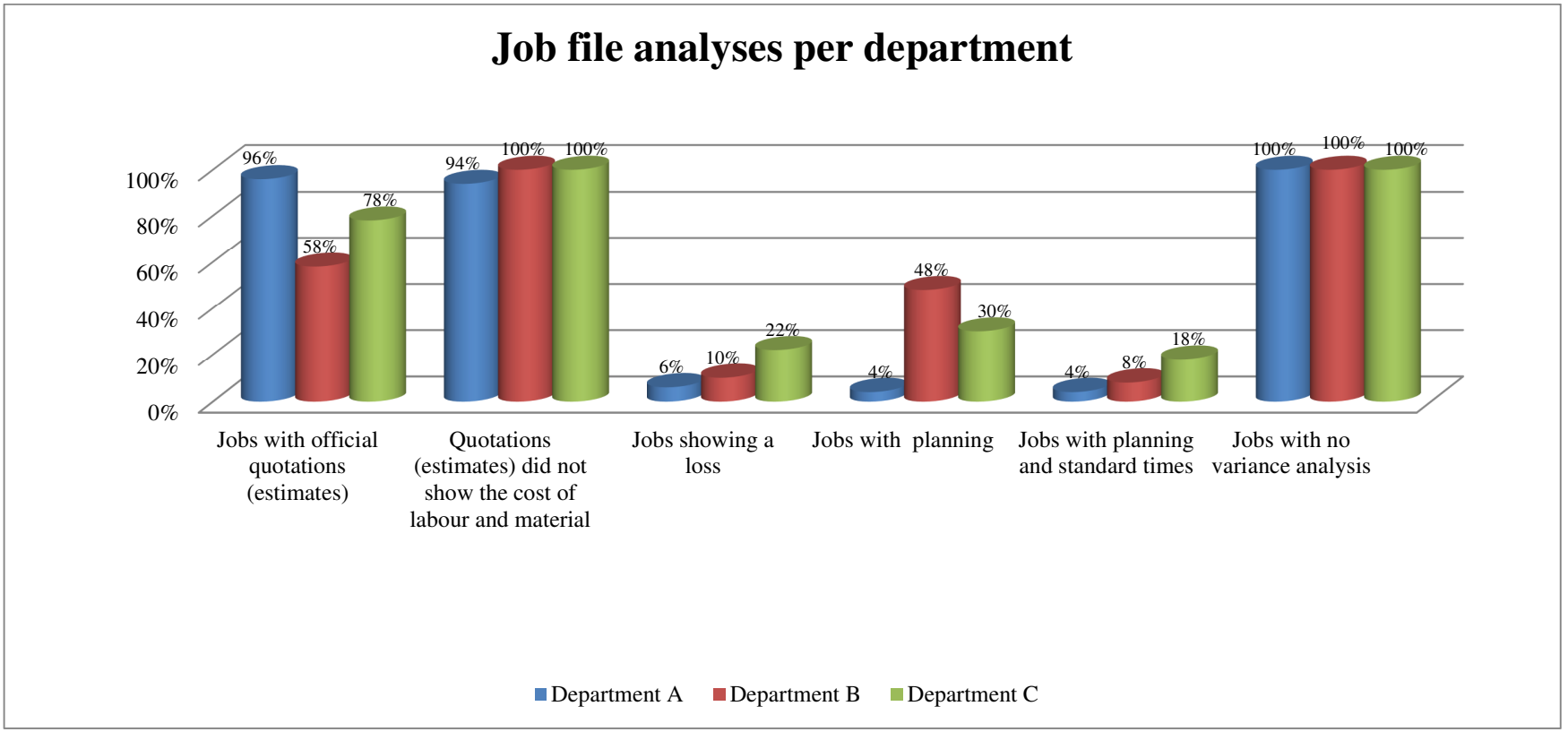


Figure 4.7: Results of job file analyses according to criteria a to f

4.2.7 Departmental analyses

4.2.7.1 Departmental analyses using the company's traditional method of overhead allocation

Table 4.1 reflects the actual results per department using a three year average.

	Skilled employees	Skilled hours	Skilled wages	Skilled cost per hour	Unskilled employees	Unskilled hours	Unskilled wages	Unskilled cost per hour	Monthly paid employees	Monthly paid employees cost per month	Total employee costs	Service dep. cost	Admin. overheads	Cost of material	Total cost	Turnover	Profit/Loss	% Profit/Loss
Department A	**15**	**2,990**	**109,432**	**61**	**12**	**2,279**	**22,000**	**34**	**8**	**131,431**	**131,431**	**(3,800)**	**57,414**	**228,749**	**413,793**	**652,434**	**238,641**	**37%**
Department B	**15**	**2,781**	**61,491**	**41**	**8**	**1,334**	**9,858**	**26**	**5**	**95,760**	**95,760**	**(549)**	**51,688**	**101,741**	**248,640**	**272,606**	**23,966**	**9%**
Department C	**8**	**1,901**	**33,588**	**33**	**14**	**2,138**	**14,727**	**22**	**4**	**61,332**	**61,332**	**(75)**	**47,490**	**321,673**	**430,420**	**411,051**	**(19,370)**	**-5%**

Table 4.1: Three year average performance analyses per department using traditional costing methods

4.2.7.2 Departmental analysis using activity based costing to absorb overheads

Table 4.2 eflects the revised results using activity based costing with the cost driver being total hours worked. Its co incidental that the hours worked per department are in proportion to the floor space occupied. Should there be a change in the hours worked due to increased work load in any of the departments ABC will show different results.

	Skilled employees	Skilled hours	Skilled wages	Skilled cost per hour	Unskilled Employees	Unskilled hours	Unskilled wages	Unskilled cost per hour	Monthly paid employees	Monthly paid employees cost per month	Total employee costs	Service dep. Costs	Admin. overheads	Cost of material	Total cost	Turnover	Profit/Loss	% Profit/Loss
Department A	15	2,990	109,432	61	12	2,279	22,000	34	8	131,431	131,431	(3,800)	61,466	228,749	417,845	652,434	234,589	36%
Department B	15	2,781	61,491	41	8	1,334	9,858	26	5	95,760	95,760	(549)	48,005	101,741	244,957	272,606	27,649	10%
Department C	8	1,901	33,588	33	14	2,138	14,727	22	4	61,332	61,332	(75)	47,121	321,673	430,052	411,051	(19,001)	(5%)

Table 4.2: Three year average performance analyses per department using activity based costing

4.3 THE RESULTS OF THE SURVEY DONE ON GENERAL ENGINEERING COMPANIES IN SOUTHERN GAUTENG

4.3.1 The response rate

A total of 91 questionnaires were distributed as per sample size calculated in chapter 3 (p. 56), of which 67 were returned, giving a response rate of 73,63%.

4.3.2 An overview of the information required through the questionnaire

The questionnaire was divided into four sections; A to D. Section A required general information and the demographic profile of the respondents. Section B covered views on cost accounting methods applicable to the general engineering environment. Section C gathered information regarding cost accounting methods currently used in the company. Section D examined the relevance and effectiveness of costing methods in decision making.

4.3.3 The reliability of the questionnaire

The questionnaire was tested for reliability and achieved a Cronbach's Alpha of 0.946, which indicates a high reliability.

4.3.4 Testing for normality

To test the hypothesis, differences between groups were analysed using parametric tests (e.g paired t-tests and ANOVA). According to Laerd statistics (2012) a common assumption of parametric tests is that the dependant variable is approximately distributed for each category of the independent variable. The skewness and kurtosis results for the three sections of the questionnaire are displayed in Table 4.3. (p.79). Table 4.3 (p.79) shows the skewness and kurtosis values are within ±2.00 therefore the data is normally distributed and does not violate the normality assumption.

Section	N	Mean	Std. Dev.	Skewness	Kurtosis
B	67	4.04	0.83	-1.38*	1.39*
C	67	2.14	0.37	-0.02*	-0.59*
D	67	3.6	1.14	-0.44*	-1.154*

Table 4.3: Normality test * within ±2.00

4.3.5 Respondents response to the questionnaire

Only responses to the questions as set out in the questionnaire (Annexure A – p.129) are presented in this chapter. The discussions that follow cover the questionnaire responses of the respondents, the comparison of their views and the furnishing their personal details.

4.3.5.1 Section A – Demographic profile and general information

- **The gender of the respondents**

The gender of the respondents is shown in Figure 4.8. The largest proportions (94%) of the respondents were male.

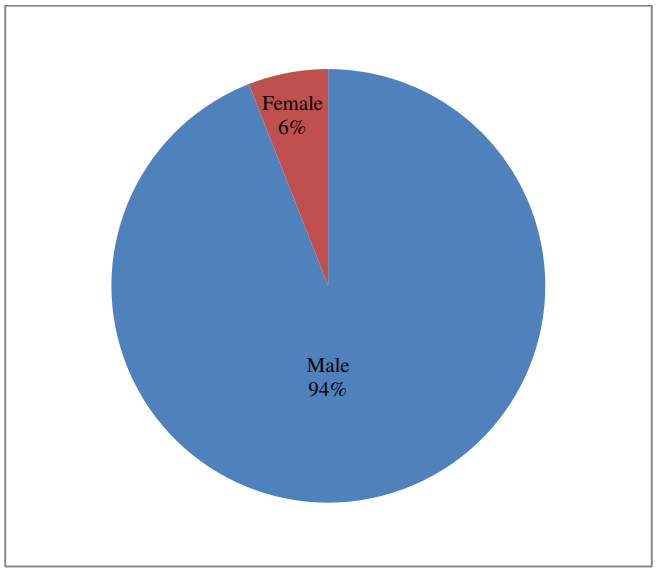


Figure 4.8: Gender distribution (n=67)

- **The education level of the respondents**

The question relating to the educational level attained by the respondents yielded the results as indicated in Figure 4.9. Only 55% had a tertiary education and 45% had Grade 12 qualifications.

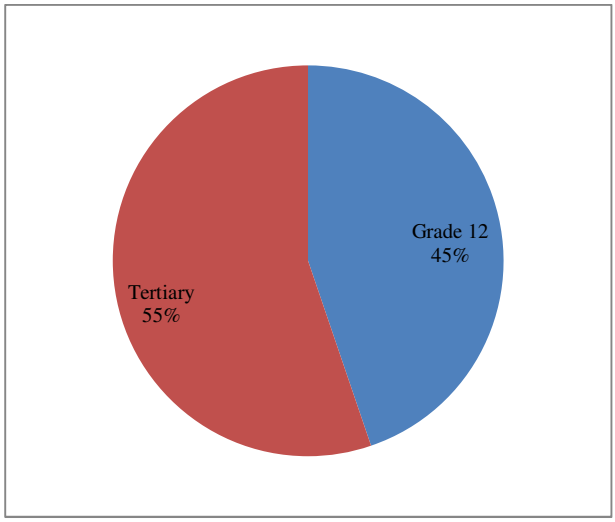


Figure 4.9: Educational level of respondents (n=67)

- **The years of service in the company**

The majority of respondents (34%) had 1- 10 years of service within the company followed by 27% with 20+ years, 22% with 11 – 15 years and there were 17% with 16 – 20 years of service as indicated in figure 4.10 .

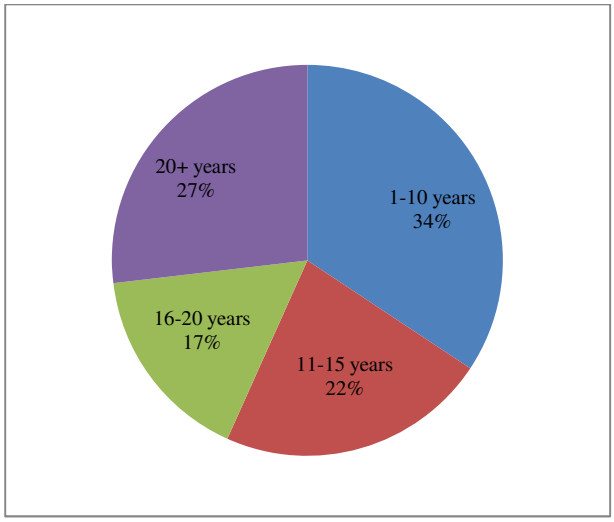


Figure 4.10: Number of years at the company (n=67)

- **The company's turnover per year**

In figure 4.11 the majority (36%) of companies have a turnover of R10 000 000+, followed by a turnover of R4 000 001 – 10 000 000 (33%) and only 31% had a turnover of R100 000 – R4 000 000.

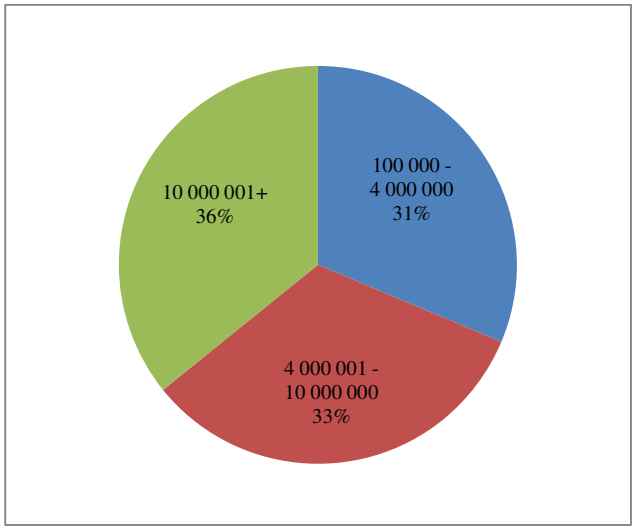


Figure 4.11: The companies' turnover in Rand (n=67)

- **The number of permanent employees in the company**

Figure 4.12 (p. 82) shows that a vast majority (61%) of companies employed 5 – 100 employees, followed by 25% employing 1-4 employees, 11% employed 100-200 employees and only 3% employed more than 200 employees.

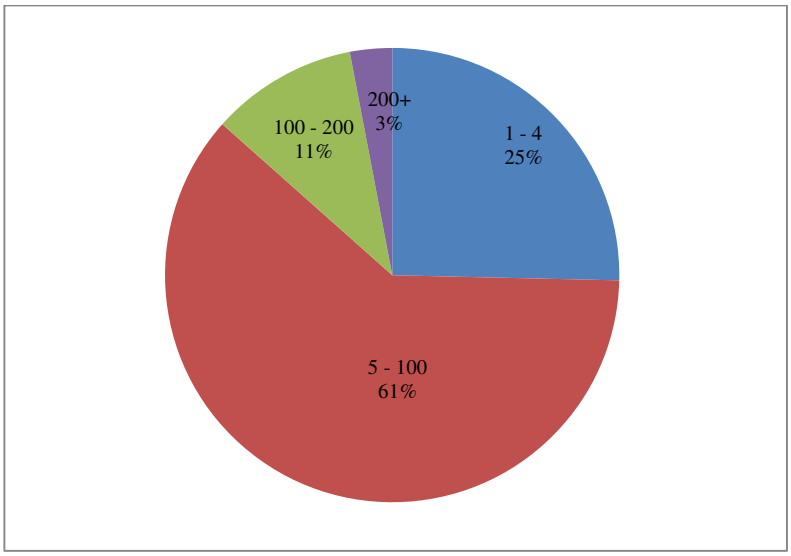


Figure 4.12: The companies' number of permanent employees (n=67)

- **The respondents position in the company**

Figure 4.13 shows that 54% of the respondents were the owners of the business, 21% were managers, 10% were accountants, 7% were estimators, 5% were foremen and 3% had other titles.

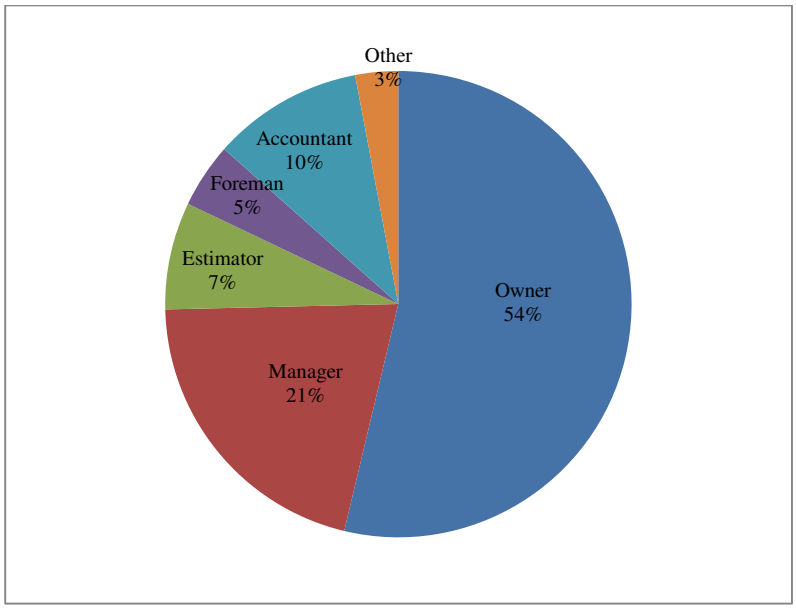


Figure 4.13: The respondents' position in the company (n=67)

4.3.5.2 Section B – Views on cost accounting methods

In this section, respondents were asked to indicate to what extent they agree or disagree with the statements made in table 4.4 (p. 84) pertaining to the cost accounting methods applicable to general engineering companies.

Respondents were asked to state their choice by encircling the appropriate answers, the scale used was: Strongly disagree = 1; Disagree = 2; neutral = 3; Agree = 4; and Strongly agree = 5. Figure 4.14 shows the choices for each statement.

The responses were as follows:

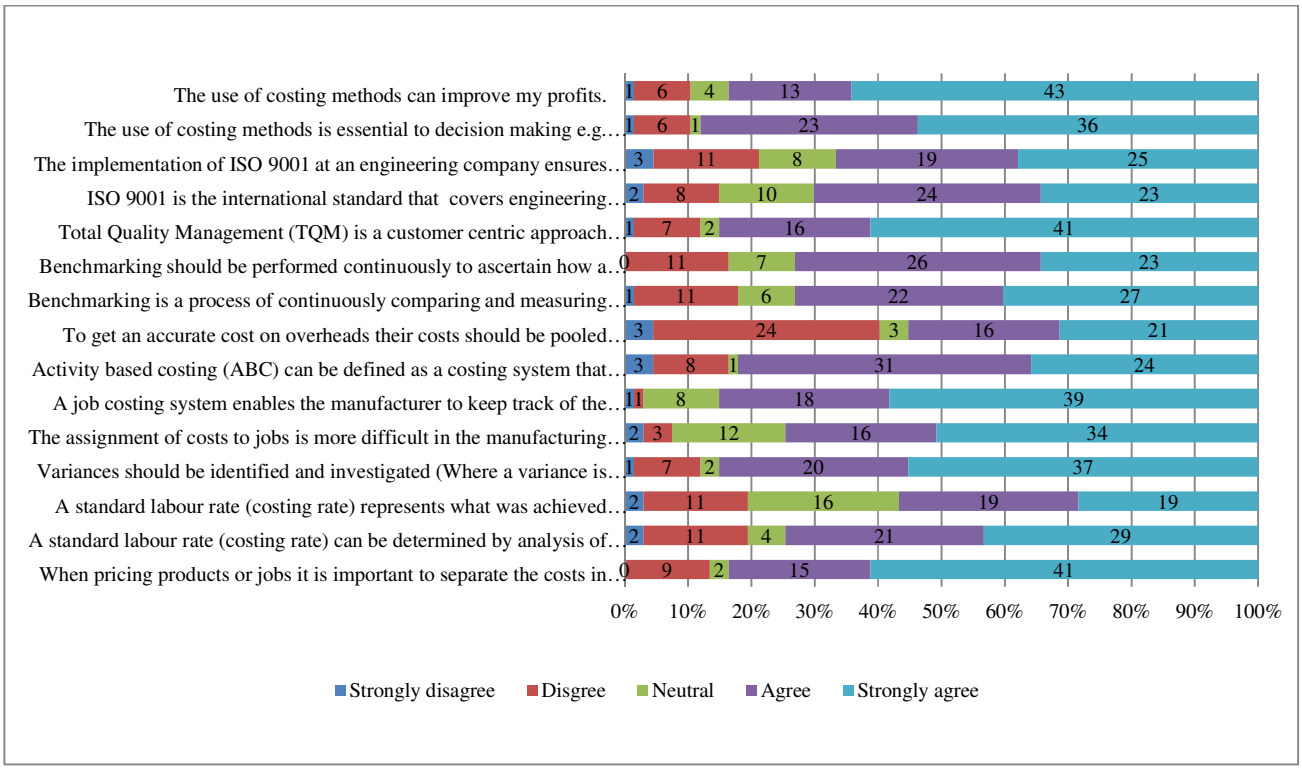


Figure 4.14: Views on cost accounting methods applicable to general engineering companies (n=67)

Respondent's views on the importance of costing methods are shown in figure 4.14 above, and ranked in table 4.4 (p. 84)

Ranking	Views on the importance of cost accounting methods	Mean	Std. dev.
1.	A job costing system enables the manufacturer to keep track of the costs attributable to each job.	4.39	.870
2.	The use of costing methods can improve my profits.	4.36	1.04
3.	Total Quality Management (TQM) is a customer centric approach based on the principle of, "get it right the first time".	4.33	1.05
4.	When pricing products or jobs it is important to separate the costs in categories such as direct material, direct labour and manufacturing overheads.	4.31	1.05
5.	The use of costing methods is essential to decision making e.g. pricing of products and jobs.	4.30	.98
4.	Variances should be identified and investigated (Where a variance is defined as the difference between a standard cost (estimated cost) and an actual cost)	4.27	1.04
8.	The assignment of costs to jobs is more difficult in the manufacturing environment where different jobs and products are manufactured.	4.15	1.06
6.	Activity based costing (ABC) can be defined as a costing system that recognizes that the forces behind overhead costs are cost drivers."	3.97	1.13
9.	A standard labour rate (costing rate) can be determined by analysis of historical data.	3.96	1.20
11.	Benchmarking is a process of continuously comparing and measuring a company's business processes with those of its successful competitors	3.94	1.14
10.	Benchmarking should be performed continuously to ascertain how a company's processes, systems and activities can be improved	3.91	1.05
12.	ISO 9001 is the international standard that covers engineering companies	3.87	1.11
13.	The implementation of ISO 9001 at an engineering company ensures a competitive edge in today's competitive environment.	3.79	1.25
14.	A standard labour rate (costing rate) represents what was achieved (charged) in the past.	3.63	1.15
15.	To get an accurate cost on overheads their costs should be pooled according to the activities that cause the costs.	3.42	1.37

Table 4.4: The importance of cost accounting methods ranked in order of importance from 1 to 15 (n=67)

4.3.5.3 Section C – Cost accounting methods used at the respondent's company

In this section, respondents were asked to indicate which costing methods are currently used at their company.

- **The classification of manufacturing costs at the company**

Figure 4.15 shows that 61% classify costs as material labour and overheads, 19% classify costs as material and labour only, 12% do not do any classification and 8% rely on their financial statements.

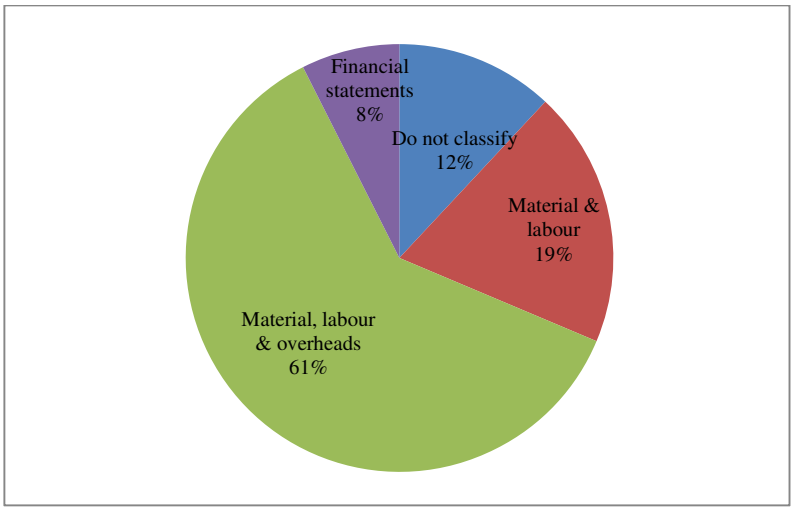


Figure 4.15: The classification of manufacturing costs (n=67)

- **The method used to determine the labour rate**

In figure 4.16 (p. 86) we see that 55% of the respondents use a standard rate, 19% use benchmarking, 18% use gut feel and 8% use what the customer is willing to pay.

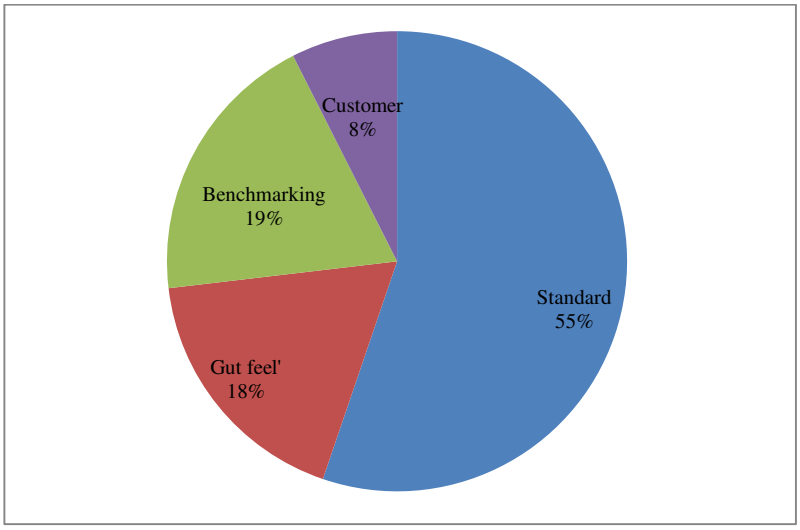


Figure 4.16: The method used to determine the labour rate (n=67)

- **The method used to determine the material cost**

In figure 4.17 we see that 69% of the respondents use the actual cost (current market price), 21% use the standard cost, 9% use "gut feel" and 1% use the cost that the customer is willing to pay.

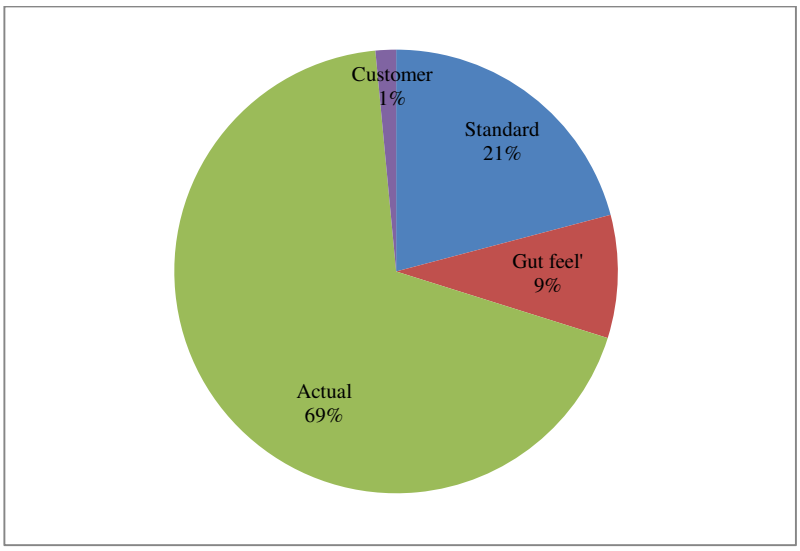


Figure 4.17: The method used to determine the material cost (n=67)

- **The job costing system used by the company**

Figure 4.18 indicates that 40% of respondents do job costing on a manual system, 34% use a custom made system, 17% use no system at all and 9% use a computerised system linked directly to the clocking station and stores receiving.

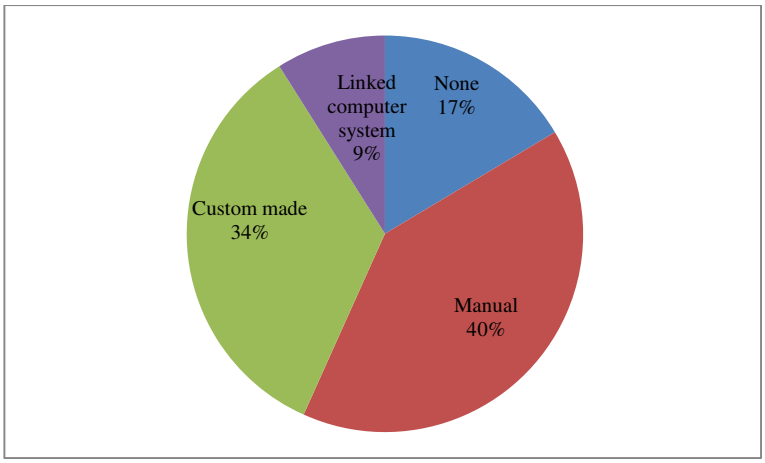


Figure 4.18: The job costing system used (n=67)

- **Is variance analysis done at your company?**

In figure 4.19 we see that 37% of respondents say that it is compulsory to analyse variances, 31% don't analyse variances but would like to, 21% do not do any variance analyses and 11% say that "some people do but others don't".

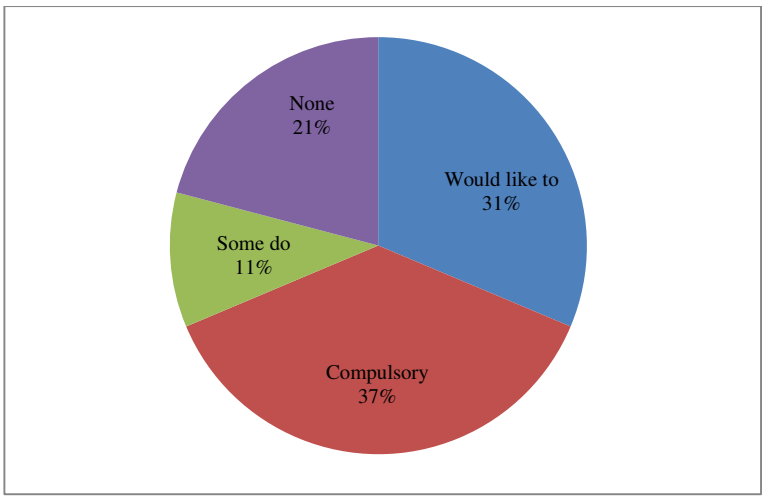


Figure 4.19: The occurrence of variance analysis at the companies (n=67)

- **How is the labour rate calculated for quotation purposes?**

Figure 4.20 shows that 75% of respondents use historical costs based on labour and overheads, 15% use "gut feel", 6% use the rate the competitors are charging and 4% use what the customer is willing to pay.

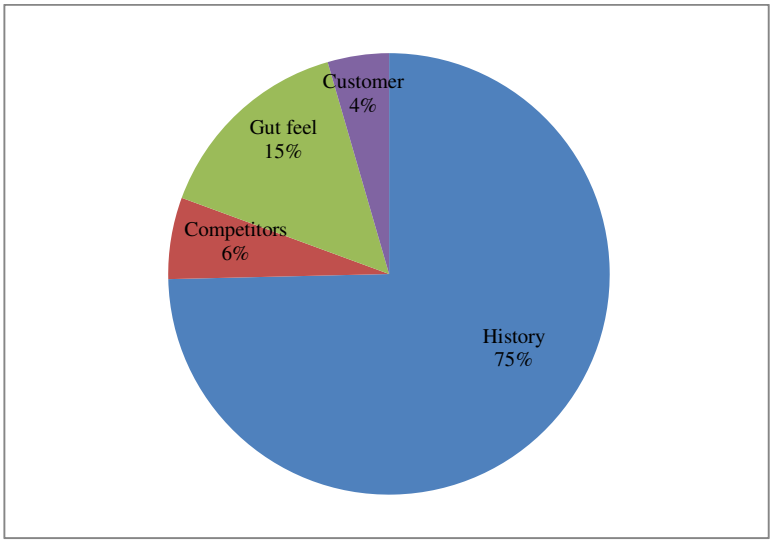


Figure 4.20: How the labour rate for quotation purposes is calculated (n=67)

- **The cost accounting method used to allocate overheads**

In figure 4.21 we see that 40% of respondents say that they use ABC, 30% do not allocate overheads, 21% use traditional cost methods, 5% use "gut feel" and 4% say they use other methods.

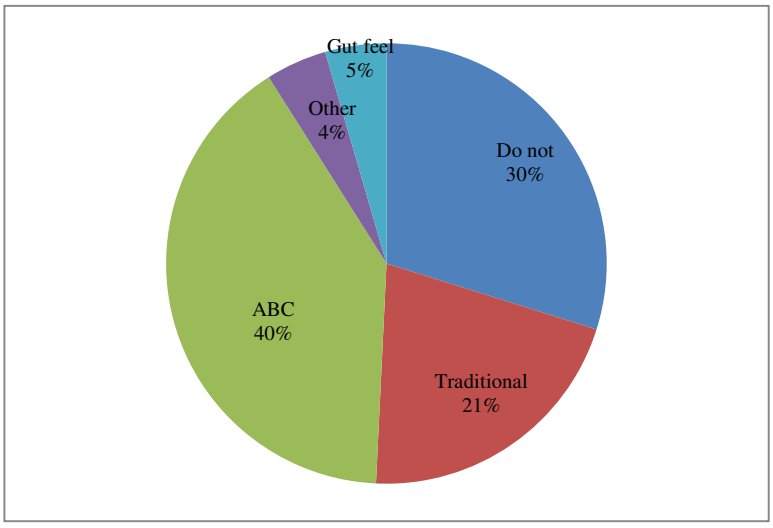


Figure 4.21: Cost accounting methods used to allocate overheads (n=67)

- **Is Total Quality management implemented in the company?**

Figure 4.22 shows 58% of the companies would like to implement TQM, 36% have implemented it, 4% say it is a waste of time and 2% say they don't know what TQM is.

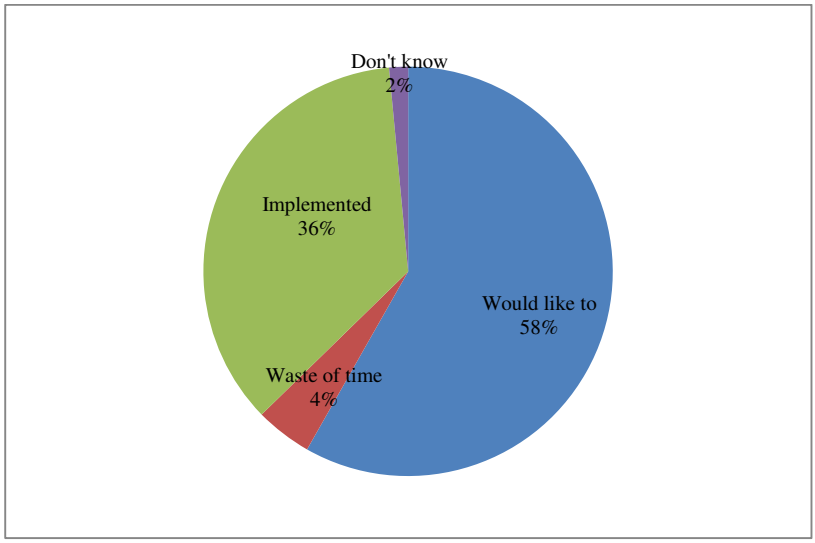


Figure 4.22: The implementation of Total Quality Management at the companies

4.3.5.4 Section D – The relevance and effectiveness of costing methods in decision-making

In this section, respondents were asked to indicate to what extent they agree or disagree with the statements made in table 4.5 (p. 90) pertaining to the relevance and effectiveness of cost accounting methods applicable to general engineering companies.

Respondents were asked to state their choice by encircling the appropriate answers, the scale used was: Strongly disagree = 1; Disagree = 2; Neutral = 3; Agree = 4 and Strongly agree =5. Figure 4.23 (p. 90) shows the choices made by the respondents for each statement.

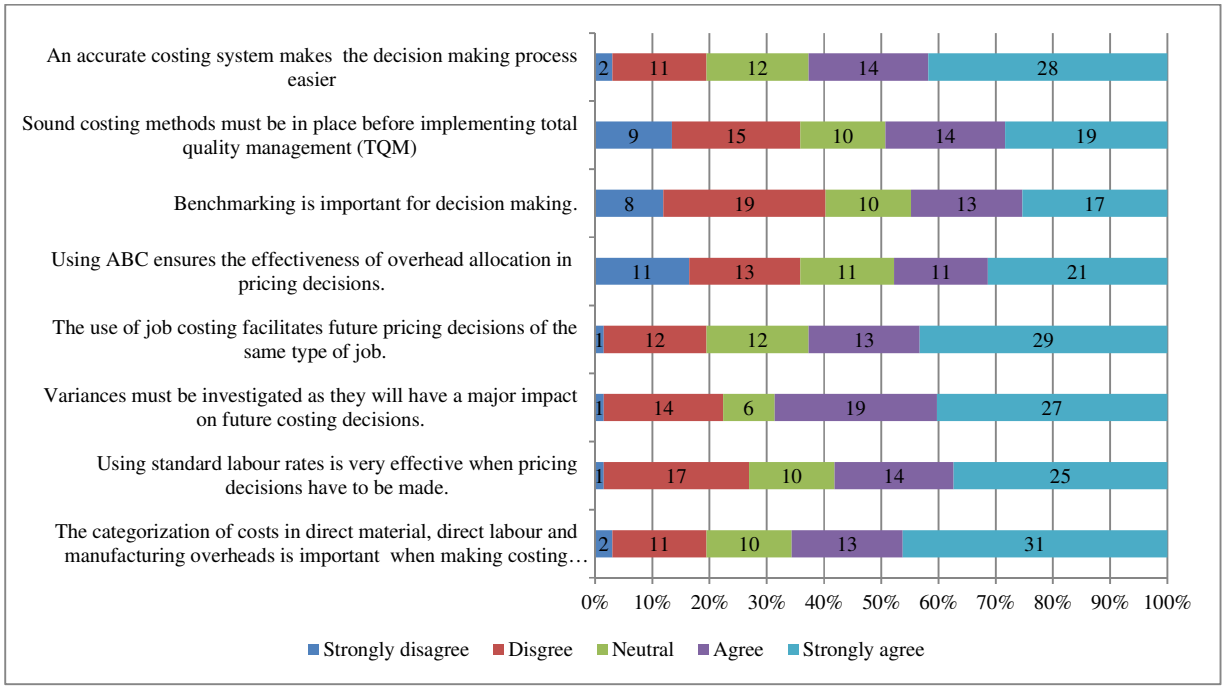


Figure 4.23: Respondents' views on the relevance and effectiveness of cost accounting methods in decision-making n=67

Ranking	Views on the relevance and effectiveness of cost accounting methods	Mean	Std dev
2.	The categorisation of costs in direct material, direct labour and manufacturing overheads is important when making costing decisions.	3.90	1.24
1.	Variances must be investigated as they will have a major impact on future costing decisions.	3.85	1.21
4.	The use of job costing facilitates future pricing decisions of the same type of job.	3.85	1.21
3.	An accurate costing system makes the decision making process easier	3.82	1.23
5.	Using standard labour rates is very effective when pricing decisions have to be made.	3.67	1.26
6.	Sound costing methods must be in place before implementing total quality management (TQM)	3.28	1.43
7.	Using ABC ensures the effectiveness of overhead allocation in pricing decisions.	3.27	1.49
8.	Benchmarking is important for decision making.	3.18	1.40

Table 4.5: The relevance and effectiveness of cost accounting methods in decision-making ranked in order of importance from 1 to 8 (n=67)

- **A comparison of the positive responses on the views of cost accounting methods categorised according to the companies' levels of turnover**

  Figure 4.24 indicates that in the lower income bracket only 18% of respondents had positive views on cost accounting methods, 7% from the middle income bracket and 27% in the higher income bracket.

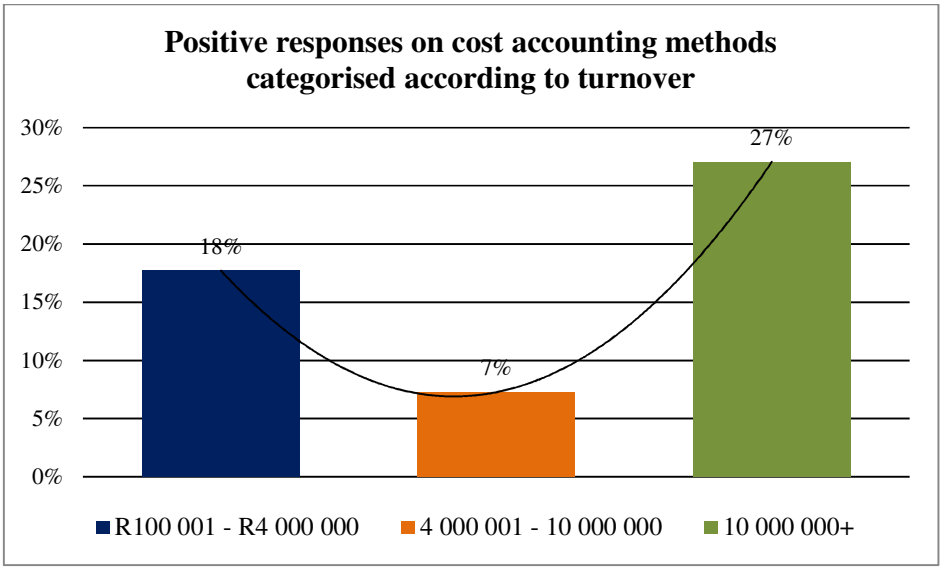


Figure 4.24: Positive responses on cost accounting methods categorised according to turnover (n=67)

- **Testing Hypothesis 1**

The SPSS one-way analysis of variance (ANOVA) was used to determine whether there is a mean difference between companies' regarding their views on costing methods when categorised according to their turnover. When exploring the results in table 4.5 (p. 90) it is clear that there is a statistically significant difference between means ($p < .05$) and therefore we can reject the null hypothesis.

The results obtained in table 4.6 (p. 92) correspond with the results obtained in the bar chart, figure 4.24, which clearly indicates differences between the groups when categorised according to turnover.

Views	Sum of Squares	df	Mean Square	F	Sig.
Between groups	5.92	2	2.96	4.72	.012*
Within groups	40.10	64	.63		
Total	46.02	66			

*Significant at the 5% level

Table 4.6: The Anova analysis of the results obtained for the views on cost accounting methods categorised according to turnover

- **A comparison of the positive responses on the relevance and effectiveness of cost accounting methods on decision making categorised according to the companies' levels of turnover**

Figure 4.25 indicates that in the lower income bracket only 9 % of respondents had positive responses on the relevance and effectiveness of cost accounting methods on decision making, 18% from the middle income bracket and 30% in the higher income bracket.

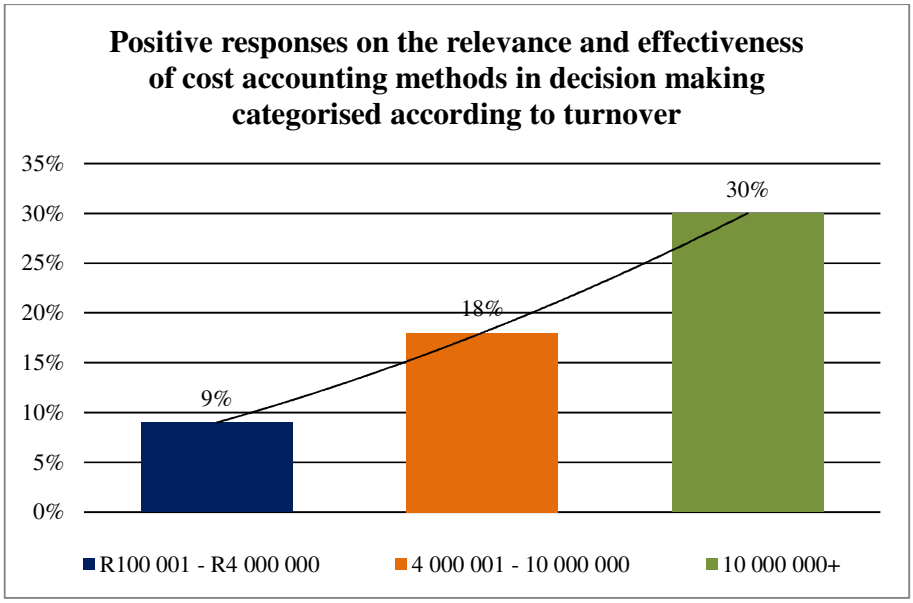


Figure 4.25: Positive responses on the relevance and effectiveness of cost accounting methods in decision making (n=67)

- **Testing Hypothesis 2**

The SPSS one-way analysis of variance (ANOVA) was used to determine whether there is a mean difference between companies' regarding the effectiveness and relevancy of costing methods when categorised according to their turnover. When exploring the results in table 4.6 (p. 92) one sees that there is a statistically significant difference between means ($p < .05$) and therefore we reject the null hypothesis.

The results obtained in table 4.7 correspond with the results obtained in the bar chart, figure 4.25 (p. 92), which clearly indicates differences between the groups responses on the relevance and effectiveness of cost accounting methods in decision making, when categorised according to turnover.

Relevance and effectiveness	Sum of Squares	df	Mean Square	F	Sig.
Between groups	20.996	2	10.498	10.336	.000*
Within groups	65.002	64	1.016		
Total	85.998	66			

*Significant at the 5% level

Table 4.7: The Anova analyses of the results obtained for the relevance and effectiveness of cost accounting methods on decision making categorised according to turnover

- **A comparison of the respondents views, the costing methods they currently use and the effectiveness and relevance of the costing methods**

  - **The classification of costs into material, labour and overheads.**

Figure 4.26 (p. 94) indicates that 84% of respondents view this method as important, 61% actually implement it and 66% say it is relevant and effective**.**

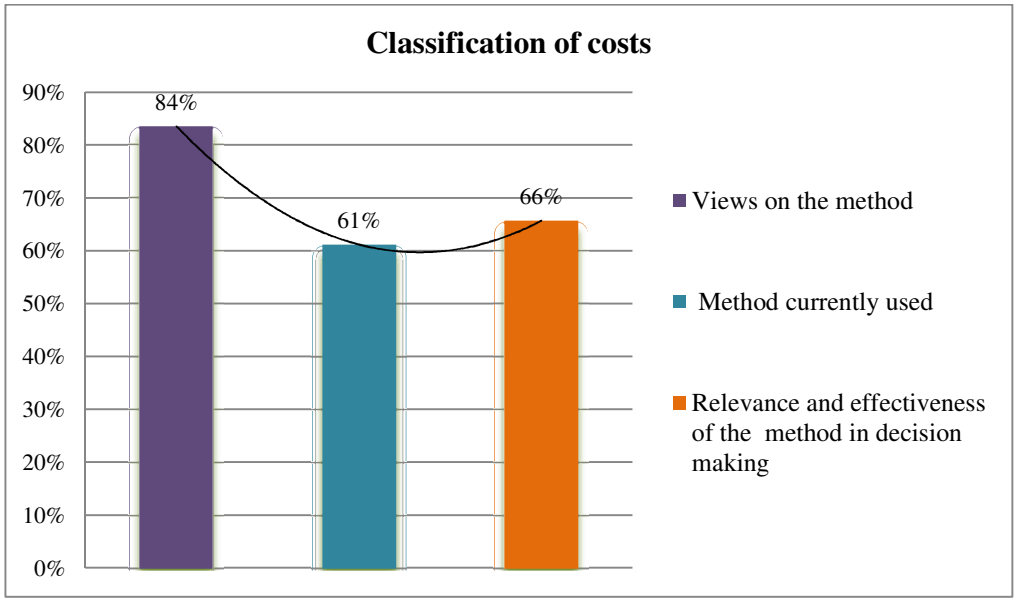


Figure 4.26: Classification of costs (views, method used and relevance and effectiveness on decision making)

- **The use of standard costing for labour rate determination**

Figure 4.27 indicates that 75% of respondents view this method as important, 55% actually implement it and 58% say it is relevant and effective**.**

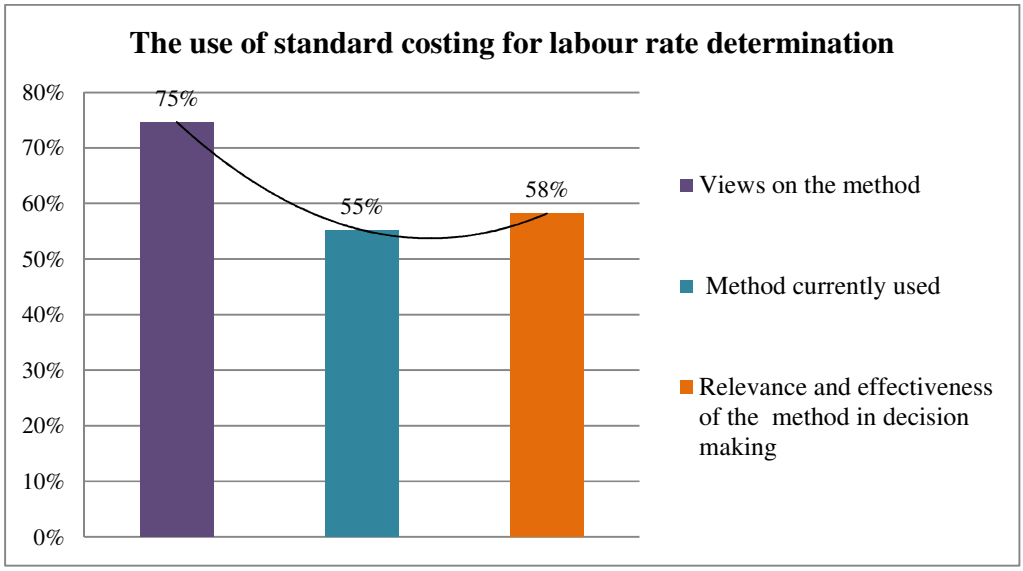


Figure 4.27: The use of standard costing for labour rate determination

- **The use of job costing to keep track of costs**

Figure 4.28 indicates that 85% of respondents view this method as important, 84% actually implement it and 63% say it is relevant and effective**.**

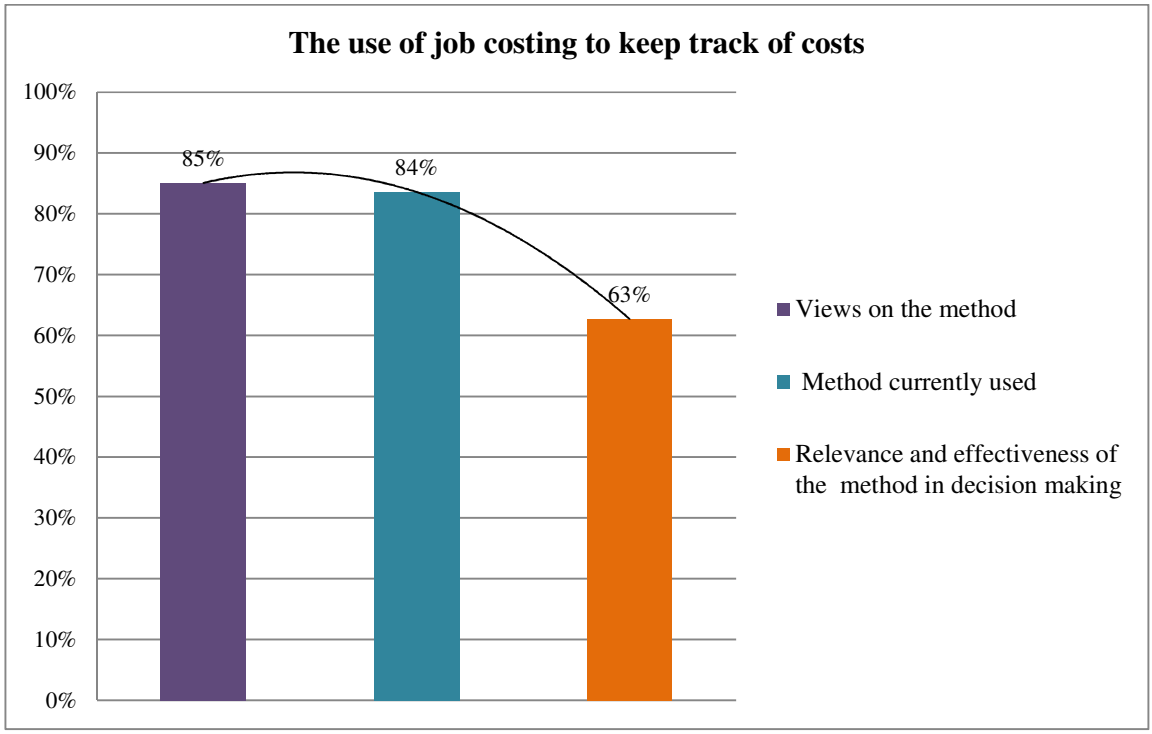


Figure 4.28: The use of job costing to keep track of costs

- **Activity based costing as a tool for the allocation of overheads**

Figure 4.29 (p. 96) indicates that 55% of respondents view this method as important, 40% actually implement it and 48% say it is relevant and effective**.**

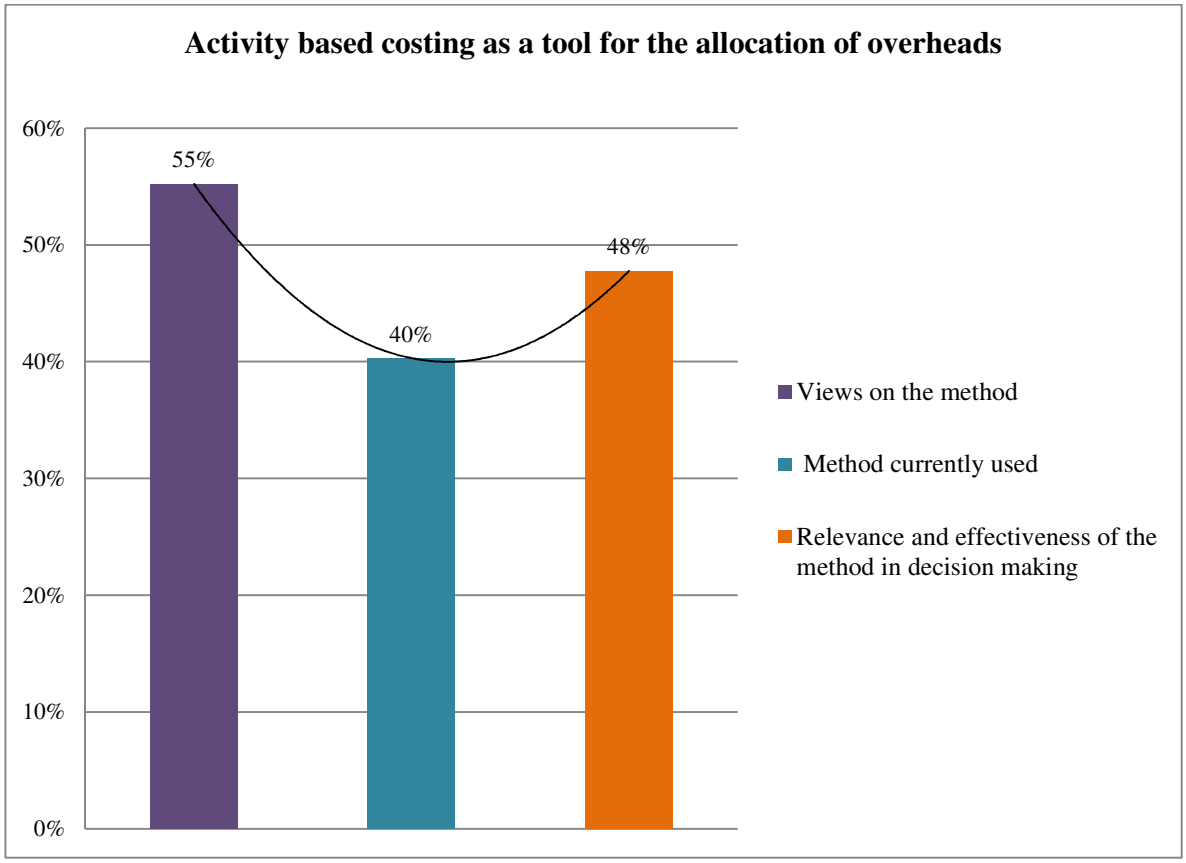


Figure 4.29: Activity based costing as a tool for the allocation of overheads

- **The use of benchmarking as a cost accounting tool**

Figure 4.30 (p. 97) indicates that 73% of respondents view this method as important, 6% actually implement it and 45% say it is relevant and effective**.**

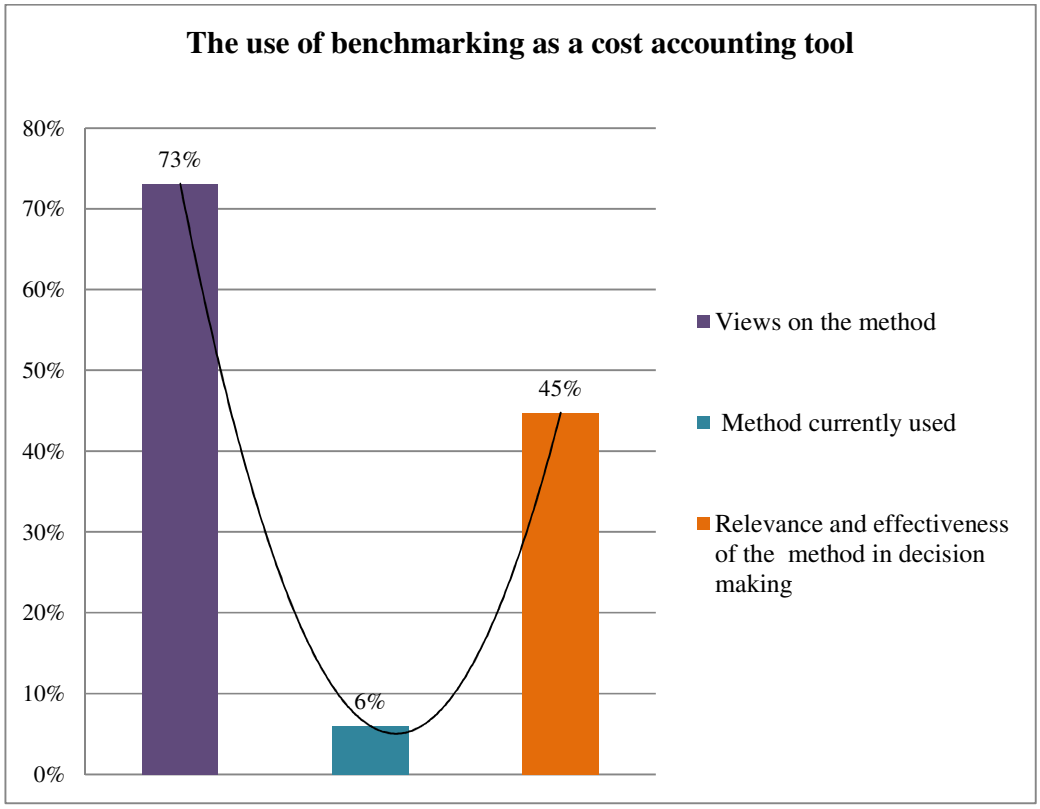


Figure 4.30: The use of benchmarking as a cost accounting tool

- **Total Quality Management**

Figure 4.31(p. 98) indicates that 66% of respondents view Total Quality Management (TQM) as important, 36% actually implement it and 49% say it is relevant and effective**.**

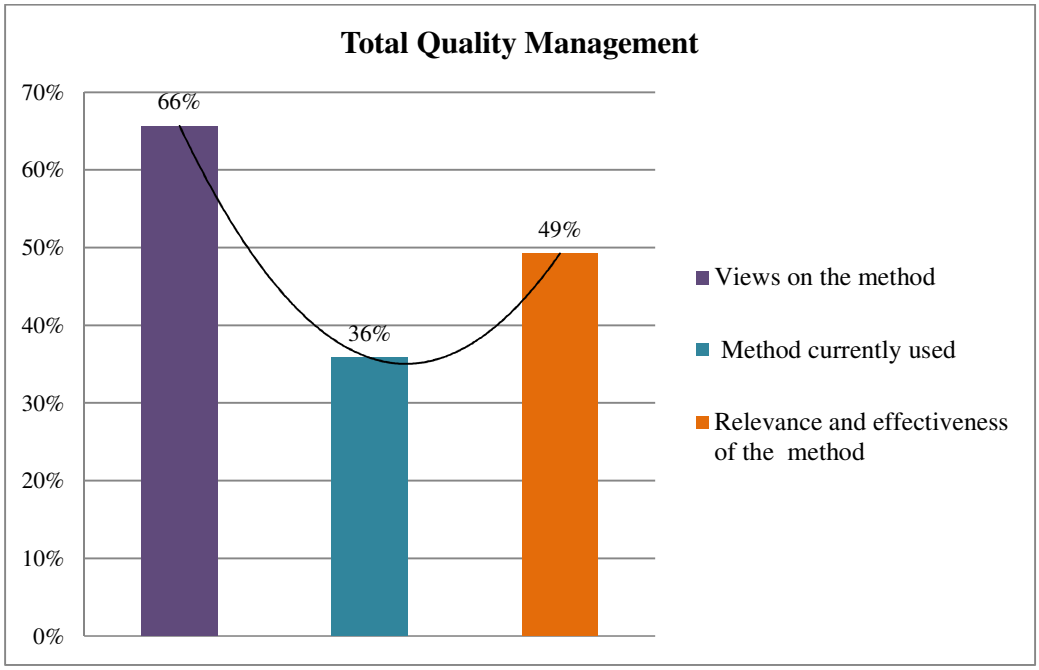


Figure 4.31: The implementation of Total Quality Management (TQM)

- **Testing Hypothesis 3**

The paired-samples t-test was used to determine whether there is a significant mean difference between the companies' views on costing methods, their relevance and effectiveness, and the methods they currently use. As illustrated in figures 4.26 to 4.31 (p. 94 - 98), when exploring the results in table 4.7 (p. 93) one sees that there is a statistically significant difference between means ($p < .05$) and therefore the null hypothesis must be rejected.

The results obtained in table 4.8 (p. 99) correspond with the results obtained in the bar charts, figures 4.26, 4.27, 4.28, 4.29, 4.30 and 4.31 (p. 94 - 98), which clearly indicates differences between the respondents' views, regarding the methods they currently use and the relevance and effectiveness of these methods in decision making.

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence interval of the difference				
				Lower	Upper			
Pair 1 views tot – current methods tot	1.90	.88	.107	1.68	2.11	17.72	66	.00*
Pair 2 views tot – relevance and effectiveness tot	.44	.96	.12	.20	.67	3.71	66	.00*
Pair 3 current methods tot relevance and effectiveness tot	-1.46	1.15	.14	-1.74	-1.18	-10.38	66	.00*

*Significant at the 5% level

Table 4.8: The paired samples t-test analysis of the results obtained for the comparison made between companies' views on costing methods, their relevance and effectiveness in decision making and the methods they currently use

- **The classification of manufacturing costs at the companies categorised according to turnover**

Figure 4.32 (p. 102) shows the majority of companies with a turnover of R100 000 – R4 000 000 (n=21); 52% categorise their costs as material, labour and overheads, 33% do not classify costs, 10% rely on their financial statement information and 5% categorise their costs in material and labour only.

Figure 4.33 (p. 102) shows the majority of companies with a turnover of R4 000 001 – R10 000 000 (n=22); 59% categorise their costs as material, labour and overheads, 32% categorise their costs in material and labour only. and 9% rely on their financial statement information.

Figure 4.34 (p. 102) shows the majority of companies with a turnover of R10 000 000 (n=24); 71% categorise their costs as material, labour and overheads, 21% categorise their costs in material and labour only, 4% do not classify costs and 4% rely on their financial statement information.

- **The method used by the companies to determine the labour rate categorised according to turnover**

Figure 4.35 (p. 103) shows the majority of companies with a turnover of R100 000 – R4 000 000 (n=21); 48% use standard costing, 33% use their "gut feel", 10% use the rate that the customer is willing to pay, and 9% do benchmarking.

Figure 4.36 (p. 103) shows the majority of companies with a turnover of R4 000 001– R10 000 000 (n=22); 59% use standard costing, 23% do benchmarking , 9% use their gut feel, and 9% use the rate that the customer is willing to pay.

Figure 4.37 (p. 103) shows the majority of companies with a turnover of R10 000 000+ R10 000 000 (n=22); 59% use standard costing, 23% do benchmarking, 9% use their "gut feel", and 9% use the rate that the customer is willing to pay.

- **The method used by the companies to determine the material cost categorised according to turnover**

Figure 4.38 (p. 104) shows the majority of companies with a turnover of R100 000 – R4 000 000 (n=21); 62% use actual costs, 29% use their "gut feel" and 9% use the standard rate.

Figure 4.39 (p. 104) shows the majority of companies with a turnover of R4 000 000 – R10 000 000 (n=21); 73% use actual costs, 23% use the standard rate and 4% use what the customer is willing to pay.

Figure 4.40 (p. 104) shows the majority of companies with a turnover of R10 000 000 + (n=21); 71% use actual costs, and 29% use the standard rate.

- **The job costing system used by the companies categorised according to turnover**

Figure 4.41 (p. 105) shows the majority of companies with a turnover of R100 000 – R4 000 000 (n=21); 43% don't use any job costing system, 38% use a manual system and 19% use a custom made computerised system.

Figure 4.42 (p. 105) shows the majority of companies with a turnover of R100 000 – R4 000 000 (n=21); 55% use a manual system and 32% use a custom made computerized system, 9% don't use any job costing system and 4% use a more sophisticated job costing system linked to their payroll and purchasing system.

Figure 4.43 (p. 105) shows the majority of companies with a turnover of R10 000 000+ (n=21); 50% use a custom made computerised system, 29% use a manual system and 21% use a more sophisticated job costing system linked to their payroll and purchasing system.

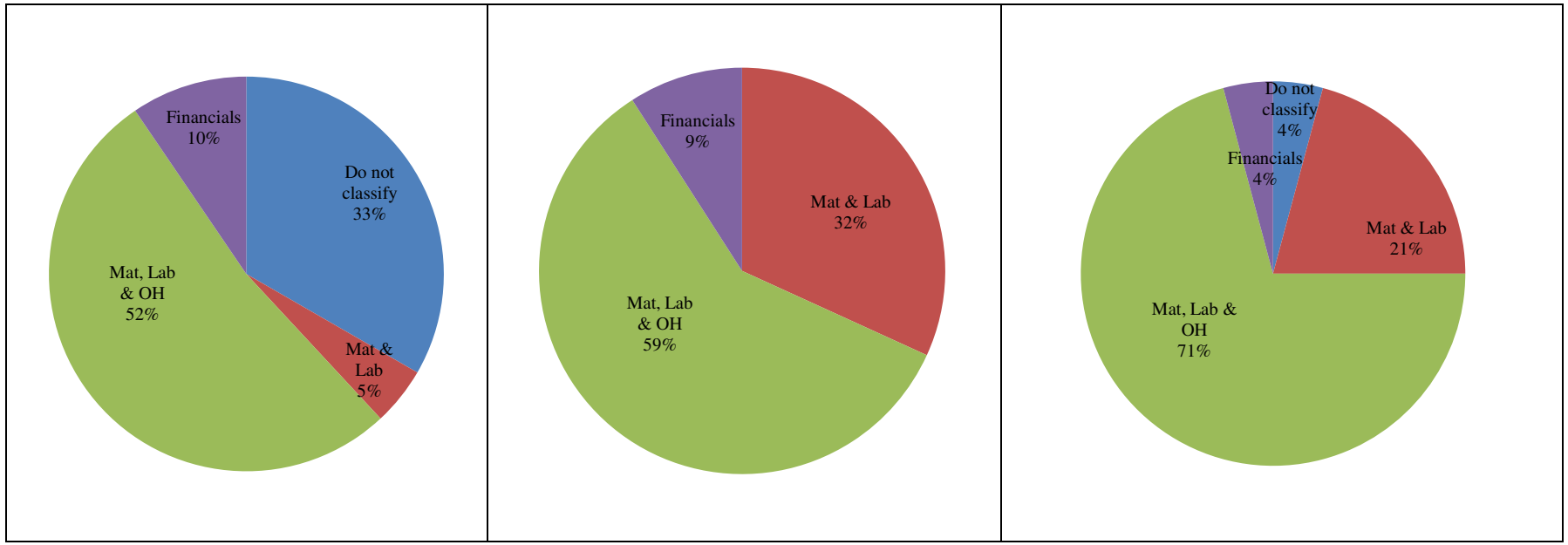
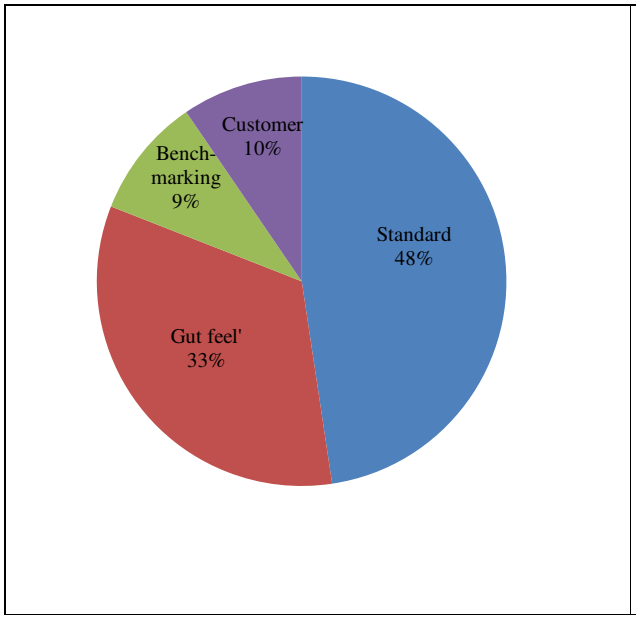
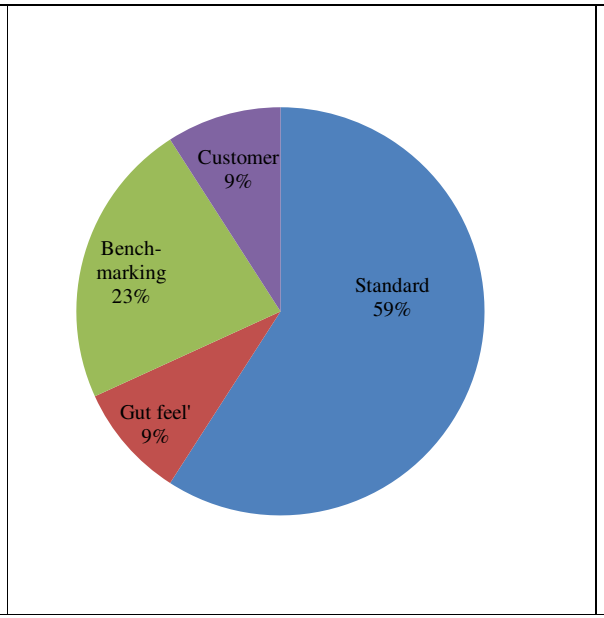


Figure 4.32 – Turnover R100 000 –R 4 000 000 n=21 **Figure 4.33 – Turnover R4 000 001 – R10 000 000 n=22** **Figure 4.34 – Turnover – R10 000 000+ n=24**

Figure 4.32 – 4.34: The classification of manufacturing costs at the companies categorised according to turnover





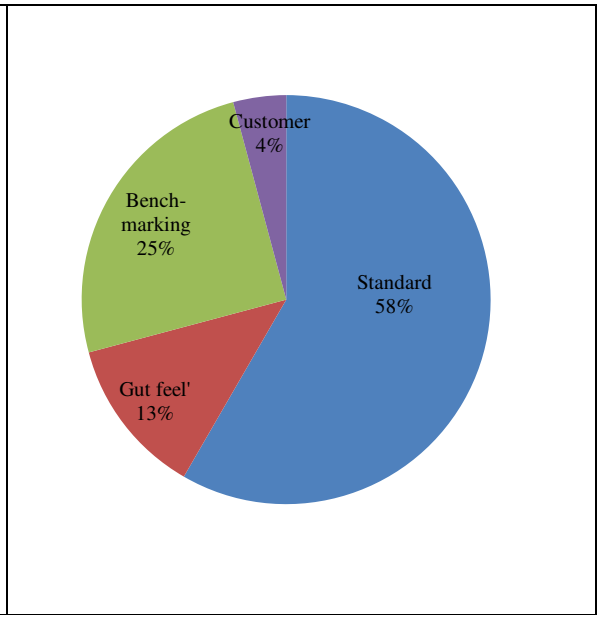


Figure 4.35 – Turnover R100 000 –R 4 000 000 n=21

Figure 4.36 – Turnover R4 000 001 – R10 000 000 n=22

Figure 4.37 – Turnover – R10 000 000+ n=24

Figure 4.35 – 4.37: The method used to determine the labour rate at the companies categorised according to turnover

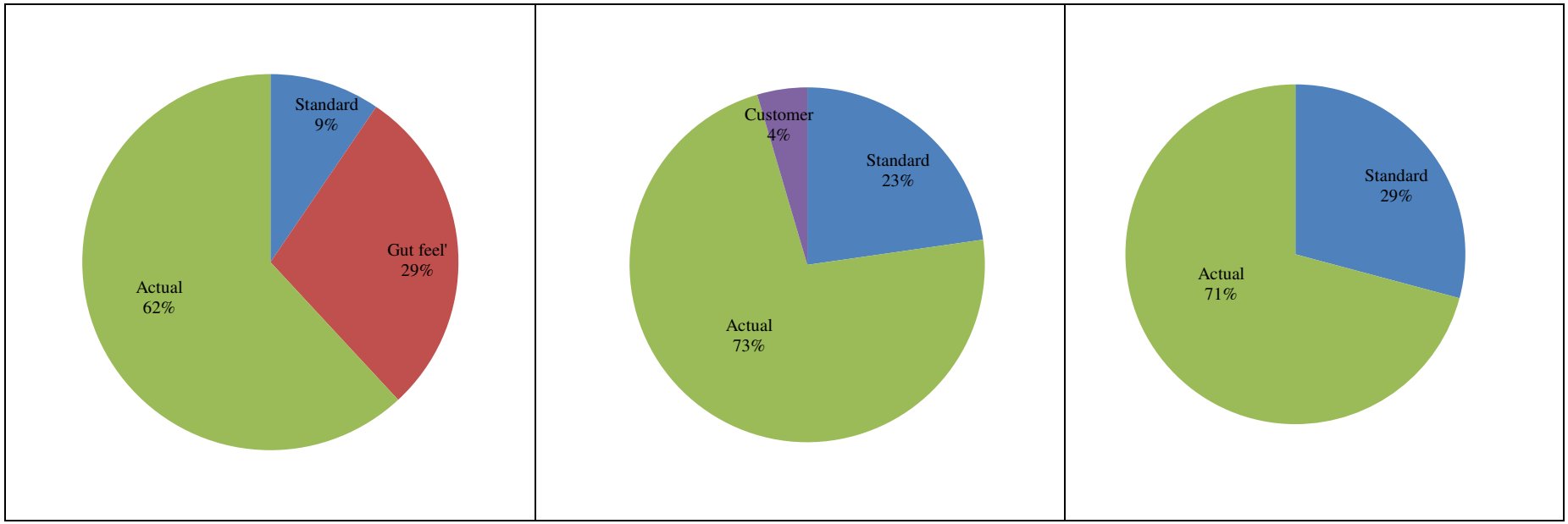
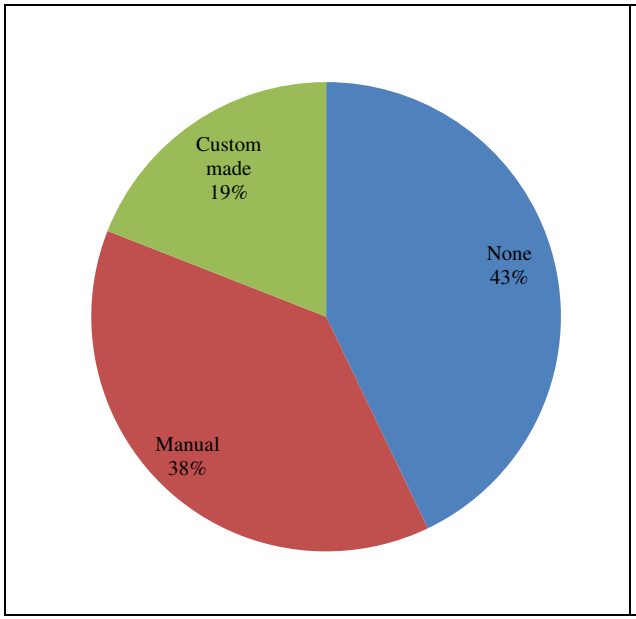


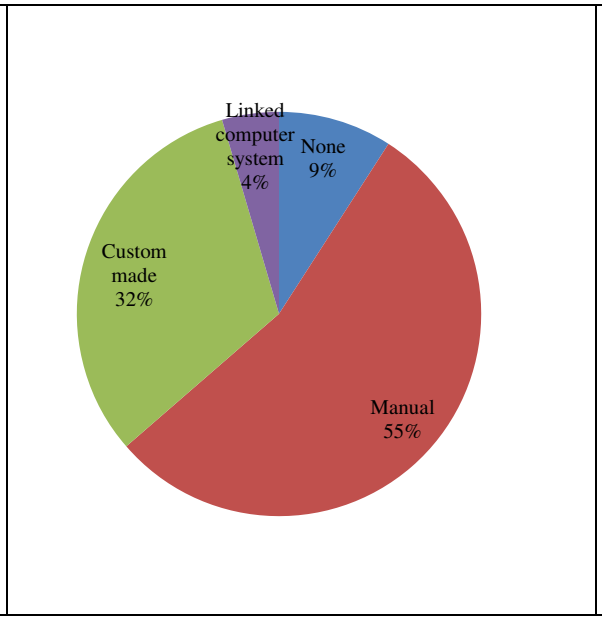
Figure 4.38 – Turnover R100 000 –R 4 000 000 n=21

Figure 4.39 – Turnover R4 000 001 – R10 000 000 n=22

Figure 4.40 – Turnover – R10 000 000+ n=24

Figure 4.38 – 4.40: The method used by the companies to determine the material, cost categorised according to turnover





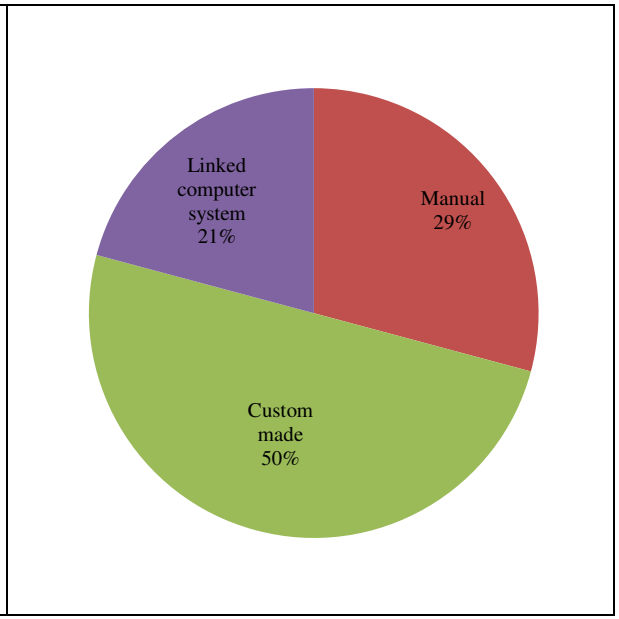


Figure 4.41 – Turnover R100 000 –R 4 000 000 n=21

Figure 4.42 – Turnover R4 000 001 – R10 000 000 n=22

Figure 4.43 – Turnover – R10 000 000+ n=24

Figure 4.41 – 4.43: The job costing system used by the companies categorised according to turnover

- **How variance analysis is done at the companies categorised according to turnover**

Figure 4.44 (p. 107) shows the majority of companies with a turnover of R100 000 – R4 000 000 (n=21); 38% don't do variance analysis, 29% would like to do it, 24% say it is compulsory at their company and 9% say that it is done only by some people.

Figure 4.45 (p. 107) shows the majority of companies with a turnover of R4 000 001– R10 000 000 (n=22); 41% would like to analyse variances, 36% say it is compulsory at their company, 14% say they don't analyse variances and 9% say that it is done by some people.

Figure 4.46 (p. 107) shows the majority of companies with a turnover of R10 000 00+ (n=24); 50% say it is compulsory at their company, 25% would like to analyse variances their company, 12% say that it is done by some people and 13% say that no variance analysis is done.

- **How the companies calculate their labour rates for quotation purposes categorised according to turnover**

Figure 4.47 (p. 108) shows the majority of companies with a turnover of R100 000 – R4 000 000 (n=21); 57% rely on history to calculate their labour rates for estimating purposes, 38% use their "gut and 5% say they use the same rates as their competitors.

Figure 4.48 (p. 108) shows the majority of companies with a turnover of R4 000 001– R10 000 000 (n=22); 82% rely on history to calculate their labour rates for estimating purposes, 9% use their "gut and 9% say they use the same rates as their competitors.

Figure 4.49 (p. 108) shows the majority of companies with a turnover of R10 000 00+ (n=24); 83% rely on history to calculate their labour rates for estimating purposes, 13% use the rate their customers are willing to pay and 4% say they use the same rates as their competitors.

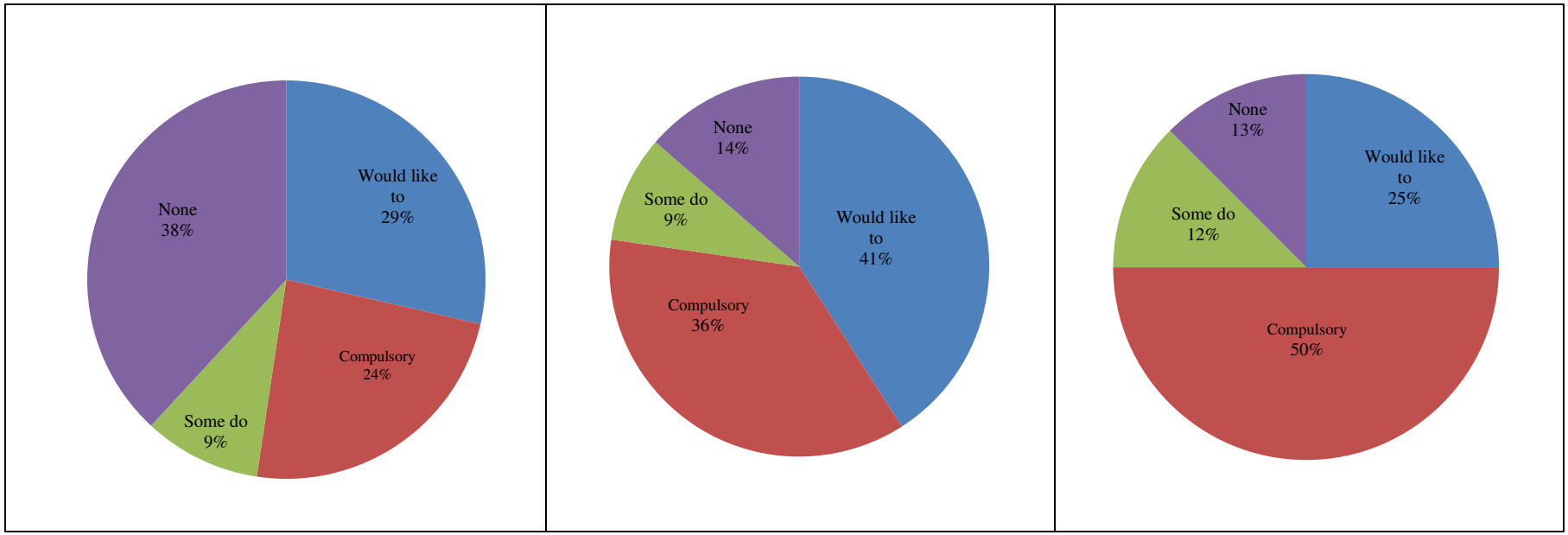


Figure 4.44 – Turnover R100 000 –R 4 000 000 n=21

Figure 4.45 – Turnover R4 000 001 – R10 000 000 n=22

Figure 4.46 – Turnover – R10 000 000+ n=24

Figure 4.44 – 4.46: How variance analysis is done at the companies categorised according to turnover

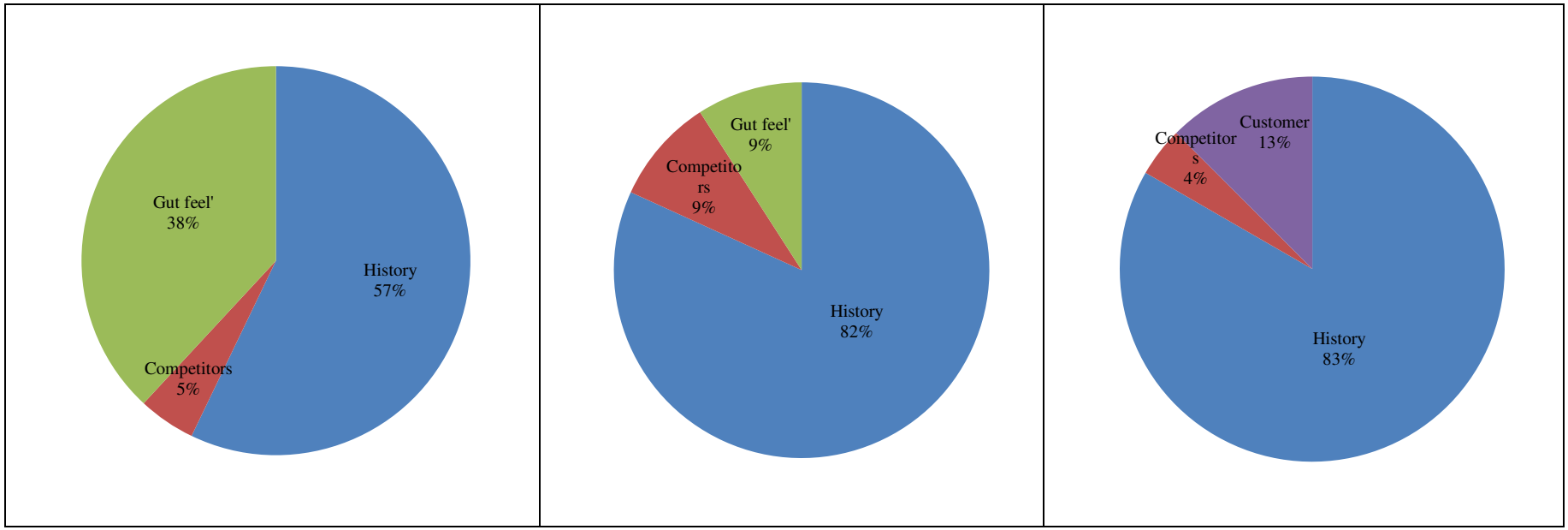


Figure 4.47 – Turnover R100 000 –R 4 000 000 n=21

Figure 4.48 – Turnover R4 000 001 – R10 000 000 n=22

Figure 4.49 – Turnover – R10 000 000+ n=24

Figure 4.47 – 4.49: How the companies calculate their labour rates for quotation purposes categorised according to turnover

- **The cost accounting method used by the companies to allocate overheads categorised according to turnover**

Figure 4.50 (p. 110) shows the majority of companies with a turnover of R100 000 – R4 000 000 (n=21); 52% do not allocate overheads, 24% use traditional methods and 24% say they use Activity Based Costing (ABC).

Figure 4.51 (p. 110) shows the majority of companies with a turnover of R4 000 001– R10 000 000 (n=22); 64% say they use Activity Based Costing (ABC), 23% do not allocate overheads, 9% allocate overheads according to "gut feel" and 4% use traditional methods.

Figure 4.52 (p. 110) shows that companies with a turnover of R10 000 00+– (n=24); 33% say they use Activity Based Costing (ABC), 33% use traditional methods, 17% do not allocate overheads, 13% use other methods and 4% use their "gut feel".

- **The implementation of Total Quality Management (TQM) at the companies categorised according to turnover**

Figure 4.53 (p. 111) shows the majority of companies with a turnover of R100 000 – R4 000 000 (n=21); 76% would like to implement Total Quality Management, and 24% say they have implemented it.

Figure 4.54 (p. 111) shows the majority of companies with a turnover of R4 000 001– R10 000 000 (n=22); 68% would like to implement Total Quality Management, and 27% say they have implemented it and 5% say they don't know what it is.

Figure 4.55 (p. 111) shows that companies with a turnover of R10 000 00+ (n=24); 54% say they have implemented Total Quality Management, 38% would like to implement Total Quality Management and 8% say that it is a waste of time.

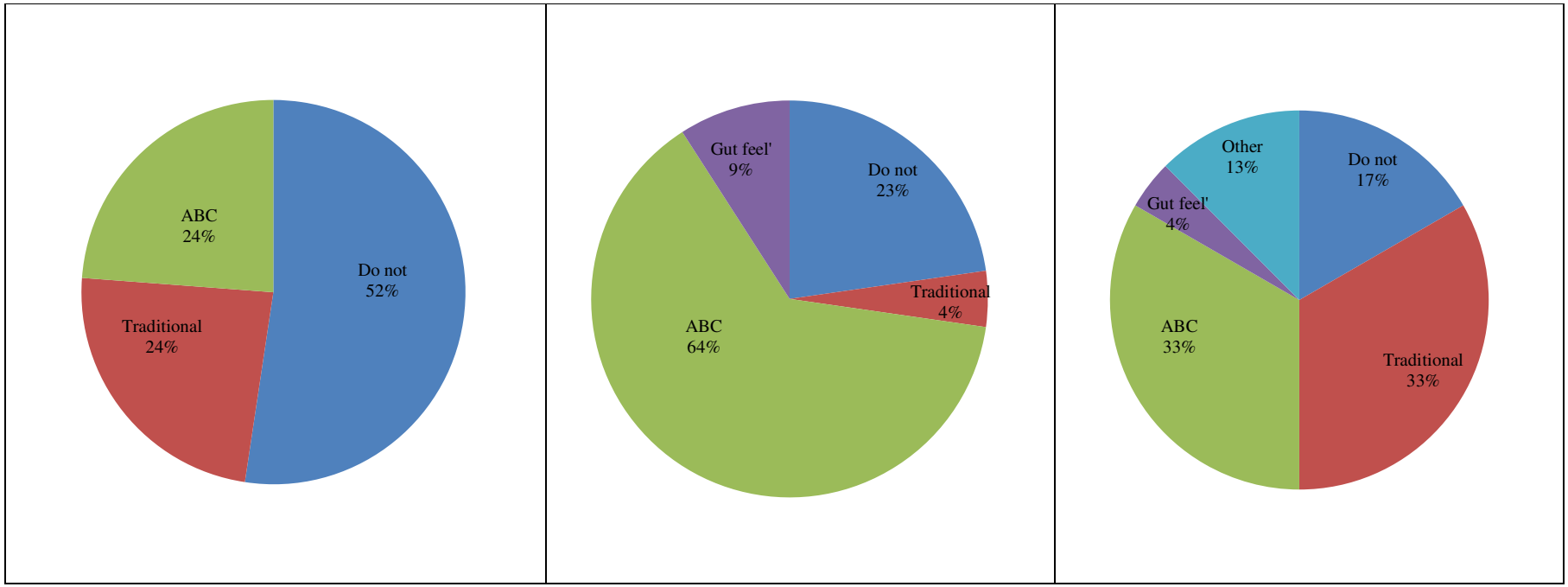


Figure 4.50 – Turnover R100 000 –R 4 000 000 n=21

Figure 4.51 – Turnover R4 000 001 – R10 000 000 n=22

Figure 4.52 – Turnover – R10 000 000+ n=24

Figure 4.50 – 4.52: The cost accounting method used by the companies to allocate overheads categorised according to turnover

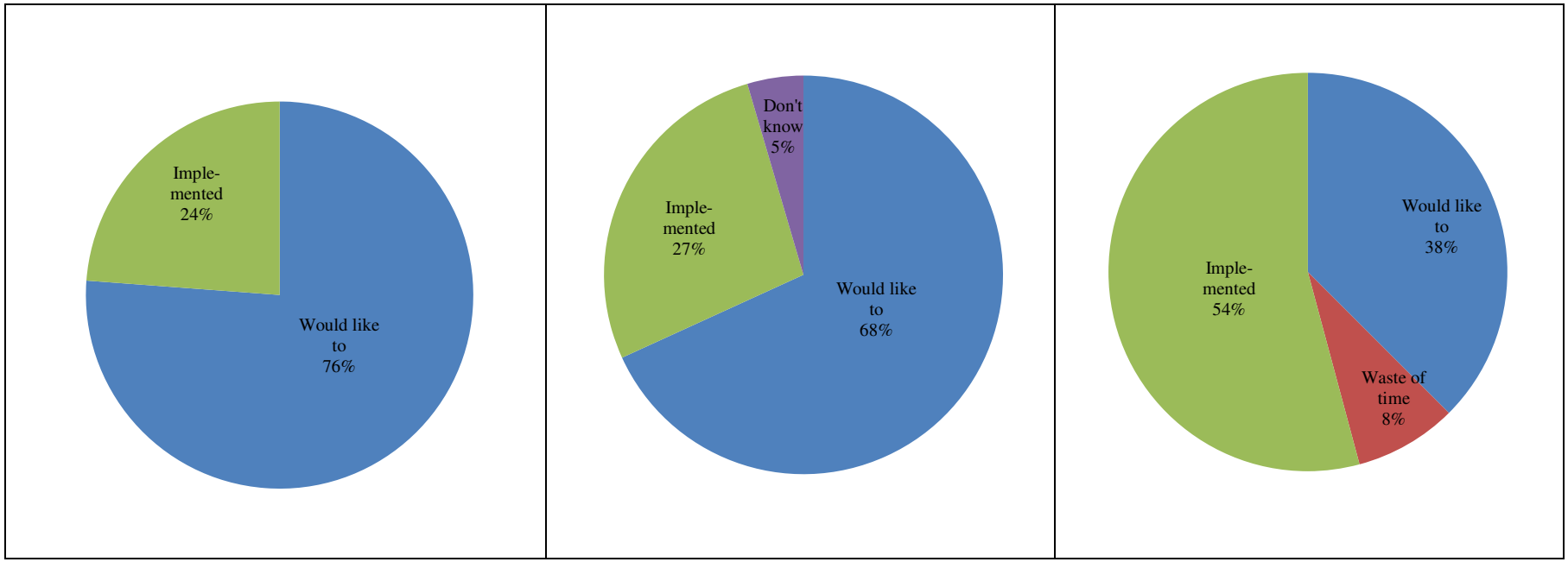


Figure 4.53 – Turnover R100 000 –R 4 000 000 n=21

Figure 4.54 – Turnover R4 000 001 – R10 000 000 n=22

Figure 4.55 – Turnover – R10 000 000+ n=24

Figure 4.53 – 4.55: The implementation of Total Quality Management (TQM) at the companies categorised according to turnover

4.4 CONCLUSION

This chapter focused on the presentation of the research findings. The case study was used as a benchmark to draw up the questionnaire which comprised 4 sections (from Section A - Section D). There were only closed questions in the questionnaire where the respondents had the opportunity of selecting one response. The aim of this chapter was the gathering of information to enable conclusions to be made on research findings.

The findings from the analysis of the questionnaire are summarised in Chapter 5, the Conclusion and the Recommendations. Conclusions reached from the analysis of the questionnaire are also presented. Recommendations regarding cost accounting methods used at general engineering companies will be presented.

CHAPTER 5
CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION AND BACKGROUND

This chapter will evaluate whether the objectives of the study have been achieved. It will also determine whether the hypothesis set out in this is true. This chapter will also suggest further research areas for cost accounting methods used in general engineering.

The literature review, covered in Chapter 2, highlighted cost accounting systems and methods applicable to the general engineering industry worldwide. Chapter 3 discussed the research methodology applicable to this research study.

The research findings of this study were identified and discussed by means of various statistical and descriptive techniques and methods in chapter 4. The conclusion from the literature study and the empirical section (through the analysis of the questionnaires) of the study are presented here. Chapter 5 aims to explain the research findings and reach a conclusion to this research study.

5.2 CONCLUSIONS

5.2.1 The case study

The information obtained during the case study proved that the company could be used as a benchmark to draw up the questionnaire. The company has been conducting business successfully in the general engineering environment for 47 years, and evidence of its costing system was analysed and the positive findings were set out in chapter 4, paragraph 4.2 (p. 65).

5.2.2 The response rate of the survey

The response rate of the survey was 73,63%. Follow-up calls made to the respondents who had not handed in their questionnaires failed. The respondents who were contacted stated that

they were too busy to complete the questionnaires. After several attempts to improve the response rate, the current response rate was accepted as the final response rate.

5.2.3 Section A – Demographic profile and general information

5.2.3.1 The gender distribution of the respondents

The response captured indicates that the largest portion of the respondents were male. Judging from their period of employment, their level of education, and their position in the organisation, all of them have been exposed to costing methods and systems. They were thus capable of providing their perspectives and insight into to the costing methods and systems at their organisation.

5.2.3.2 The education level of the respondents

The majority of the respondents had a tertiary education and the rest of the respondents had completed Grade 12.

5.2.3.3 The years of service with the organisation

The information captured by the questionnaires indicate that the respondents individual years of service with the organisation ranged from between 1 to more than 20 years.

5.2.3.4 The organisation's turnover per year

The turnover figures ranged from R100,000 to more than R10,000,000 with the highest concentration being in the range of R 10 000 000 and more.

5.2.3.5 The number of permanent employees at the company

The number of employees ranged from 1 to 200 and more. A large majority of the businesses had between 5 and 100 employees.

5.2.3.6 The position of the respondents in their respective companies

Most of the respondents were the owners or directors of businesses followed, in numbers, by managers in the companies with a minority being estimators, foreman, accountants and others who were not specified.

The conclusion that can be drawn from Section A (demographic profile and general information) is that the respondents have been in the sphere of general engineering for a varying number of years, they have thus been exposed to the cost accounting methods of their organisations.

5.2.4 Section B – Views on cost accounting methods

The responses to the statements are summarized as follows:

- 'The use of costing methods can improve my profits' – 84% of respondents agreed with the statement, 6% were neutral and 10% disagreed.
- 'The use of costing methods is essential to decision making e.g. pricing of products and jobs' – 88% of respondents agreed with the statement, 1% were neutral and 10% disagreed.
- 'The implementation of ISO 9001 at an engineering company ensures a competitive edge in today's competitive environment' – 67% o of respondents agreed with the statement, 12% were neutral and 21% disagreed.
- 'ISO 9001 is the international standard that covers engineering companies' – only 70% agreed with the statement, 15% were neutral and 15% disagreed.
- 'Total Quality Management (TQM) is a customer centric approach based on the principle of, "get it right the first time" '- 85% agreed with the statement, 3% were neutral and 12% disagreed.
- 'Benchmarking should be performed continuously to ascertain how a company's processes, systems and activities can be improved' – 73% were in favour of benchmarking, 10% were neutral and 16% disagreed.
- 'To get an accurate cost on overheads their costs should be pooled according to the activities that cause the costs' – 55% agreed with the statement, 4% were neutral and 40% disagreed.

- ‘Activity based costing (ABC) can be defined as a costing system that recognises that the forces behind overhead costs are cost drivers’. – 82% agreed with this statement, 1% were neutral and 16% disagreed.
- ‘A job costing system enables the manufacturer to keep track of the costs attributable to each job’ – 85% agreed with the statement, 12% were neutral and 3% disagreed.
- ‘The assignment of costs to jobs is more difficult in the manufacturing environment where different jobs and products are manufactured’ - 75% agreed with this statement, 18% were neutral and 7% disagreed.
- ‘Variances should be identified and investigated (Where a variance is defined as the difference between a standard cost (estimated cost) and an actual cost’ - 85% agreed with this statement, 3% were neutral and 12% disagreed.
- ‘A standard labour rate (costing rate) represents what was achieved (charged) in the past’ - 57% agreed with this statement, 24% were neutral and 19% disagreed.
- ‘A standard labour rate (costing rate) can be determined by analysis of historical data’ - 75% agreed with this statement, 6% were neutral and 19% disagreed.
- ‘When pricing products or jobs it is important to separate the costs in categories such as direct material, direct labour and manufacturing overheads” - 84% agreed with this statement, 3% were neutral and 13% disagreed.

In conclusion of this section, it can be said that it becomes evident from the above responses that the respondents have a good understanding of the methods applicable to the general engineering environment.

5.2.5 Section C – Cost accounting methods currently used

The responses to this section can be classified as follows:

- How are your manufacturing costs classified? - 61% material labour and overheads, 19% material and labour only, 12% do not do any classification at all and 8% wait for their financial statements to see their costs.
- Which of the following methods do you use to determine the rate of your labour? - 55% use a standard rate, 19% use benchmarking, 18% use their “gut feel” and 8% use the rate that the customer is willing to pay.

- Which of the following methods do you use to determine the material cost? - 69% use the actual market price, 21% use a standard rate, 9% use their "gut feel" and 1% use the rate that the customer is willing to pay.
- Which of the following job costing systems do you use? – 40% use a manual system, 34% use an in house custom made system, 17% use no system at all and 9% use a computerised system linked to the employees clocking station and stores receiving.
- Which of the following statements regarding variance analysis (comparing estimates with actual costs per job) represents what is currently the practice at your company? - Only 37% of the respondents analyse variances, 11% say that some people in the organisation do analyse variances others don't, 31% don't analyse variances but would like to and 21% do not identify and analyse variances.
- When we do job costing or estimating we use a predetermined labour rate calculated as follows: - 75% of respondents use historical costs to determine the predetermined labour rate, 15% use "gut feel", 6% use what their competitors are using and 4% use what their customers are willing to pay.
- The allocation of overheads at our company is done according to the following method: - 40% of respondents use ABC, 30% do not allocate overheads, 21% use the traditional method 5% use "gut feel" and 4% use other methods.
- Which of the following statements best describes Total Quality Management (TQM) at your company? - 36% have implemented TQM, 58% would like to implement TQM, 4% see TQM as a waste of time and 2% don't know what TQM is.

In conclusion when the responses of this section are compared to the responses of the previous section, it is evident that although respondents have a good understanding of costing methods, the implementation thereof at the organisations is still lacking in some areas.

The areas of concern are the following:

- The determination of a standard rate for costing labour.
- A computerised job costing system
- The use of ABC for the allocation of overhead costs.
- Total Quality Management.

5.2.6 Section D – The relevance and effectiveness of costing methods in decision-making

The responses to this section can be classified as follows:

- 'The categorization of costs in direct material, direct labour and manufacturing overheads is important when making costing decisions' – 66% agreed, 15% remained neutral and 19% disagreed.
- 'Using standard labour rates is very effective when pricing decisions have to be made' – 58% agreed, 15% remained neutral and 27% disagreed.
- 'Variances must be investigated as they will have a major impact on future costing' – 69% agreed, 9% remained neutral and 22% disagreed.
- 'The use of job costing facilitates future pricing decisions of the same type of job' – 63% agreed, 18% remained neutral and 19% disagreed.
- 'Using ABC ensures the effectiveness of overhead allocation in pricing decisions' – 48% agreed, 16% remained neutral and 36% disagreed.
- 'Benchmarking is important for decision making' – 45% agreed, 15% remained neutral and 36% disagreed.
- 'Sound costing methods must be in place before implementing total quality management (TQM)' – 49% agreed, 18% remained neutral and 19% disagreed.
- 'An accurate costing system makes the decision making process easier' – 63% agreed, 18% remained neutral and 19% disagreed.

In conclusion, the responses to this section compared with sections B and, C clearly indicate once again that, although their views on costing methods are very strong the relevance and effectiveness of costing methods are not as strong. This could be as a result of the fact that the implementation of these methods at their organisations were still lacking in certain areas. When testing Hypotheses 3 we see that there are significant differences between companies' views on costing methods their relevance and effectiveness and the methods they currently use

5.3 RECOMMENDATIONS

After an intensive and complete literature review (Chapter 2) followed by a rigorous empirical section (Chapter 4) the conclusion of this study has been reached. Recommendations based on the empirical section of the study are presented.

In line with the problem statement in Chapter 1, and following the conclusions drawn from the empirical research conducted in Chapter 4, various recommendations will be put forward.

5.3.1 Literature review

From the extensive literature review in Chapter 2, it became evident that in a highly competitive business environment quality products produced at the lowest possible cost, as well as timely deliveries to clients, is what keeps companies in business. In order to achieve this in general engineering companies need a set of reliable methods and techniques to create more value at lower cost using diverse performance measures to assess the impacts of decisions. Without a cost management system management does not have any support when specific decisions need to be made, regarding pricing, costing and performance.

The various costing methods, techniques, advantages and disadvantages were discussed in detail and it became evident that, to function profitably in a job costing environment, there has to be a costing system in place.

5.3.2 Research design and methodology

In Chapter 3 the research design and methodology for the study, the sampling procedure and the research instrument process were discussed. The research design outlined the various steps that were taken in this research study. Measurement of reliability and validity of the research was discussed.

5.3.3 Achievement of the research objective

In Chapter 1 specific objectives for the research study were identified. After having processed the relevant information through the literature review in Chapter 2, and an empirical research,

the findings of which were highlighted in Chapter 5, it can now be determined how the objectives have been met.

5.3.3.1 Main objective

The main objective of this study was to explore the extent to which general engineering companies in Southern Gauteng are employing cost accounting methods. The study focused on the current methods as well as their relevance and effectiveness in providing the information required by the users to maintain a competitive edge in the market.

The profile of the general engineering companies in Southern Gauteng was determined in Section A and discussed in paragraph 5.2.3 (page 114)

The views of general engineering companies in Southern Gauteng was determined in Section B and discusses in paragraph 5.2.4 (page 115). It is evident that general engineering companies have a good understanding of the methods applicable to the general engineering environment.

The methods employed by general engineering companies was determined in Section C – and the results discussed in paragraph 5.2.5 (page 116) indicate that some cost accounting methods are implemented at engineering companies in Southern Gauteng and that the following are still areas of concern:

- The determination of a standard rate for costing labour.
- A computerised job costing system.
- The use of ABC for the allocation of overhead costs.
- Total Quality Management.

The relevance and effectiveness of cost accounting methods in decision making determined in Section D and the results discussed in paragraph 5.2.6 (p. 118) indicate that not all the methods are effective and relevant in decision making. The following areas of concern correspond with those from Section C:

- The determination of a standard rate for costing labour.

- A computerised job costing system.
- The use of ABC for the allocation of overhead costs.
- Total Quality Management.

5.3.3.2 Theoretical objectives

The theoretical objectives were set at the beginning of this study and recognized as being important to support the achievement of the primary objective:

The theoretical objectives were:

- An in-depth literature study to be conducted on the current and latest cost accounting systems and methods.
- A literature review on the effects of cost accounting systems and methods on planning and decision making.
- An extensive literature study on the cost accounting systems generally employed by the general engineering companies worldwide.

These objectives were achieved through the intensive and rigorous literature review conducted in Chapter 2. A detailed analysis on cost accounting methods and systems, how they function and their effects on planning and decision making was done. Therefore the theoretical objectives were achieved.

The methods employed by general engineering companies worldwide were also investigated and discussed.

The final conclusion that can be drawn from this study is that cost accounting systems and methods have a positive effect on planning and decision making and that they can give companies a competitive advantage over their competitors who do not employ these methods. When the responses were categorised according to the companies' turnovers, and the first and second hypotheses were tested, it was evident that turnover did play role in the companies' views on costing methods and showed their relevance and effectiveness in decision making. Those with a higher turnover had relatively more costing methods and systems in place.

5.4 OPPORTUNITIES FOR FURTHER RESEARCH

The research study created opportunities for further and future research. Cost accounting methods applicable to general engineering companies were identified as being relevant and effective for planning and decision making. Further research can now be conducted into the following areas of concern:

- The determination of a standard rate for costing labour.
- A computerised job costing system.
- The use of ABC for the allocation of overhead costs.
- Total Quality Management.
- Barriers to the implementation of cost accounting methods
- Does having systems like Total Quality Management in place attract more customers and lead to higher turnover?

The reasons why these areas are problematic, and finding a solution therefore can be researched.

5.5 CONCLUSION

The main objective of this study was to explore the extent to which general engineering companies in Southern Gauteng are employing cost accounting methods. The study focused on the current methods, their relevance and effectiveness in providing the information required by the users to maintain a competitive edge in the market. In conclusion to this research study it can be stated that the main objective of this study has been achieved.

In paragraph 5.3.3.1 (p. 120), the main objective as set out in Chapter one (p. 3) was repeated and discussed in detail and the conclusion that was reached was that:

General engineering companies in Southern Gauteng view cost accounting methods and techniques as an important part of decision making and planning, although their views and the implementation thereof differ significantly as tested by the third hypothesis. These results reflect the statement of Brierly, Cowton & Drury (2001:202) statement that companies are

still not making good use of cost accounting systems as an aid to better decision making, planning and control.

After extensive literature and empirical research, that spanned five chapters and saw the main and theoretical objectives being achieved, this research study has been concluded.

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ANNEXURE A

Cover letter and questionnaire

To: All respondents

From: Gina Fouché
MTech student – Vaal University of Technology
Department of Accountancy, Vanderbijlpark

Re: Request to complete questionnaire

Dear Sir/Madam

I am currently a MTech Cost and Management Accounting student at the Vaal University of Technology. The title of my dissertation is: ***The application of cost accounting methods by the general engineering companies in Southern Gauteng.*** As part of my research project, I need to collect information from companies to validate my studies; therefore a questionnaire has been formulated to collect the necessary data. The successful completion of my research study requires your assistance. I kindly request that you afford me 10 to 15 minutes of your time to answer the attached questionnaire.

The information that you will provide will be treated in total confidence and your responses to questions will be considered anonymous.

Thank you for the courtesy of your assistance.

Sincerely yours

Gina Fouché

QUESTIONNAIRE

COSTING METHODS, ITS RELEVANCE AND EFFECTIVENESS IN GENERAL ENGINEERING COMPANIES IN SOUTHERN GAUTENG

Thank you for participating in this important research endeavour. We are interested in finding out the various costing methods, their relevance and effectiveness in decision-making among general engineering companies in Southern Gauteng. There are four sections to this questionnaire. Please complete all sections of the questionnaire and answer the questions honestly.

SECTION A – DEMOGRAPHIC PROFILE & GENERAL INFORMATION

In this section we would like to know a little about the characteristics of respondents and general aspects of your organisation. Please place a cross (x) in the appropriate block.

A1	Gender	Male	1	Female	2

A2	Education level you have attained	Matric (Grade 12)	1
		Diploma/degree	2
		Honours/Bachelor of Tech (B.Tech)	3
		Masters	4
		Doctorate	5
		Other (specify)	6

A3	Years of service in the organisation	1 - 5 years	1
		6 -10 years	2
		11-15 years	3
		16 -20 years	4
		Over 20 years	5

A4	Your organisation's turnover (Gross sales) per year **(This question is optional)**	Between 100 000 – 500 000	1
		500 001 - 1 000 000	2
		1 000 001 - 4 000 000	3
		4 000 001 – 10 000 000	4
		10 000 001 – 40 000 000	5
		Above 40 000 000	6

A5	Number of permanent employees in your organisation	Between 1 to 4 employees (Micro)	1
		Between 5 to 100 employees (Small)	2
		Between 100 to 200 employees (Medium)	3
		More than 200 employees (large)	4

A6	Position in your company	Owner	1
		Manager	2
		Estimator (Contracts Engineer)	3
		Foreman	4
		Accountant	5
		Other (Specify)	6

SECTION B: VIEWS ON COST ACCOUNTING METHODS

This section examines the costing methods your organisation employs. Please indicate your level of agreement with each statement. Please be as honest as possible in your responses.
Strongly disagree = 1; Disagree = 2; Neutral = 3; Agree = 4 and Strongly agree =5.

B1	When pricing products or jobs it is important to separate the costs in categories such as direct material, direct labour and manufacturing overheads.	Strongly disagree	1	2	3	4	5	Strongly agree
B2	A standard labour rate (costing rate) can be determined by analysis of historical data.	Strongly disagree	1	2	3	4	5	Strongly agree
B3	A standard labour rate (costing rate) represents what was achieved (charged) in the past.	Strongly disagree	1	2	3	4	5	Strongly agree
B4	Variances should be identified and investigated (Where a variance is defined as the difference between a standard cost (estimated cost) and an actual cost)	Strongly disagree	1	2	3	4	5	Strongly agree
B5	The assignment of costs to jobs is more difficult in the manufacturing environment where different jobs and products are manufactured.	Strongly disagree	1	2	3	4	5	Strongly agree
B6	A job costing system enables the manufacturer to keep track of the costs attributable to each job.	Strongly disagree	1	2	3	4	5	Strongly agree
B7	Activity based costing (ABC) can be defined as a costing system that recognizes that the forces behind overhead costs are cost drivers."	Strongly disagree	1	2	3	4	5	Strongly agree
B8	To get an accurate cost on overheads their costs should be pooled according to the activities that cause the costs.	Strongly disagree	1	2	3	4	5	Strongly agree

B9	Benchmarking is a process of continuously comparing and measuring an organisation's business processes with those of its successful competitors	Strongly disagree	1	2	3	4	5	Strongly agree
B10	Benchmarking should be performed continuously to ascertain how a company's processes, systems and activities can be improved	Strongly disagree	1	2	3	4	5	Strongly agree
B11	Total Quality Management (TQM) is a customer centric approach based on the principle of, "get it right the first time".	Strongly disagree	1	2	3	4	5	Strongly agree
B12	ISO 9001 is the international standard that covers engineering companies	Strongly disagree	1	2	3	4	5	Strongly agree
B13	The implementation of ISO 9001 at an engineering company ensures a competitive edge in today's competitive environment.	Strongly disagree	1	2	3	4	5	Strongly agree
B14	The use of costing methods is essential to decision making e.g. pricing of products and jobs.	Strongly disagree	1	2	3	4	5	Strongly agree
B15	The use of costing methods can improve my profits.	Strongly disagree	1	2	3	4	5	Strongly agree

SECTION C: COST ACCOUNTING METHODS CURRENTLY USED

This section examines the cost accounting methods that are currently used in your organisation. Please answer the questions by circling the appropriate number/s corresponding to what is currently happening in your company.

C1	How are your manufacturing costs classified?	
	We do not classify costs	1
	We classify costs as material & labour only	2
	We classify costs as material, labour and overheads	3
	We rely on our financial statements to see if we made a profit or a loss	4

C2	Which of the following methods do you use to determine the rate of your labour?	
	Standard costing (based on historical costs)	1
	Gut feel	2
	Benchmarking (we find out what our competitors are charging)	3
	We use the rate that the customer is willing to pay	4

C3	Which of the following methods do you use to determine the material cost?	
	Standard Costing (based on historical costs)	1
	"Gut feel"	2
	Actual costs (current market price)	3
	We use the rate that the customer is willing to pay	4

C4	Which of the following job costing systems do you use?	
	No system at all	1
	Manual system (costs are recorded manually on a job card on a daily basis)	2
	A custom made computer program (costs are collected and manually fed into the system on a daily basis)	3
	A computerized system directly linked to the clock station and stores receiving.	4

C5	Which of the following statements regarding variance analysis (comparing estimates with actual costs per job) represents what is currently the practice at your company?	
	We would like to analyse variances but do not have a proper system to do it	1
	At our company it is compulsory to analyse variances and their causes	2
	At our company some of the management analyse variances others don't	3
	We do not analyse variances at our company	4

C6	When we do job costing or estimating we use a predetermined labour rate calculated as follows:	
	Based on historical costs for labour and overheads	1
	Based on what our competitors are charging	2
	Based on "gut feel"	3
	Based on what our customers are willing to pay	4

C7	The allocation of overheads at our company is done according to the following method:	
	We don't allocate overheads	1
	We use traditional costing methods e.g. According to floor space occupied	2
	We use ABC.	3
	We use our "gut feel"	4
	Other (please specify)	5

C8	Which of the following statements best describes Total Quality Management (TQM) at your company?	
	We have not implemented TQM (ISO 9001) yet but would like to	1
	TQM (ISO 9001) is a waste of time and money	2
	TQM (ISO 9001) is implemented at our company	3
	We don't know what TQM (ISO 9001) is	4

SECTION D: RELEVANCE AND EFFECTIVENESS OF THE CURRENT COSTING METHODS IN DECISION-MAKING

This section examines the relevance and effectiveness of the costing methods in decision-making. Please indicate your level of agreement with each statement. Please be as honest as possible in your responses. Strongly disagree = 1; Disagree = 2; Neutral = 3; Agree = 4 and Strongly agree = 5.

D1	The categorization of costs in direct material, direct labour and manufacturing overheads is important when making costing decisions.	Strongly disagree	1	2	3	4	5	Strongly agree
D2	Using standard labour rates is very effective when pricing decisions have to be made.	Strongly disagree	1	2	3	4	5	Strongly agree
D3	Variances must be investigated as they will have a major impact on future costing decisions.	Strongly disagree	1	2	3	4	5	Strongly agree
D4	The use of job costing facilitates future pricing decisions of the same type of job.	Strongly disagree	1	2	3	4	5	Strongly agree
D5	Using ABC ensures the effectiveness of overhead allocation in pricing decisions.	Strongly disagree	1	2	3	4	5	Strongly agree
D6	Benchmarking is important for decision making.	Strongly disagree	1	2	3	4	5	Strongly agree
D7	Sound costing methods must be in place before implementing total quality management (TQM)	Strongly disagree	1	2	3	4	5	Strongly agree
D8	An accurate costing system makes the decision making process easier	Strongly disagree	1	2	3	4	5	Strongly agree

Thank you for your cooperation. Your views are much appreciated.

ANNEXURE B

Predetermined costing rates

Department A

DESCRIPTION	CODE	RATE
Fitter normal time	22	38
Fitter overtime	23	50
Labourers normal time	24	19
Labourers overtime	25	25
Waiting time Artisan	70	38
Waiting time Operator	71	19
Welder NT	72	38
Welder OT	73	50
Sandblasting NT	76	19
Sandblasting OT	77	25
Artisan normal time	127	44
Artisan overtime	128	56
Apprentices NT	361	19
Apprentices OT	362	25
Large lathe NT	930	50
Large lathe OT	931	63
Medium lathe NT	932	44
Medium lathe OT	933	56
Small lathe NT	934	44
Small lathe OT	935	56
Milling NT	936	44
Milling OT	937	56

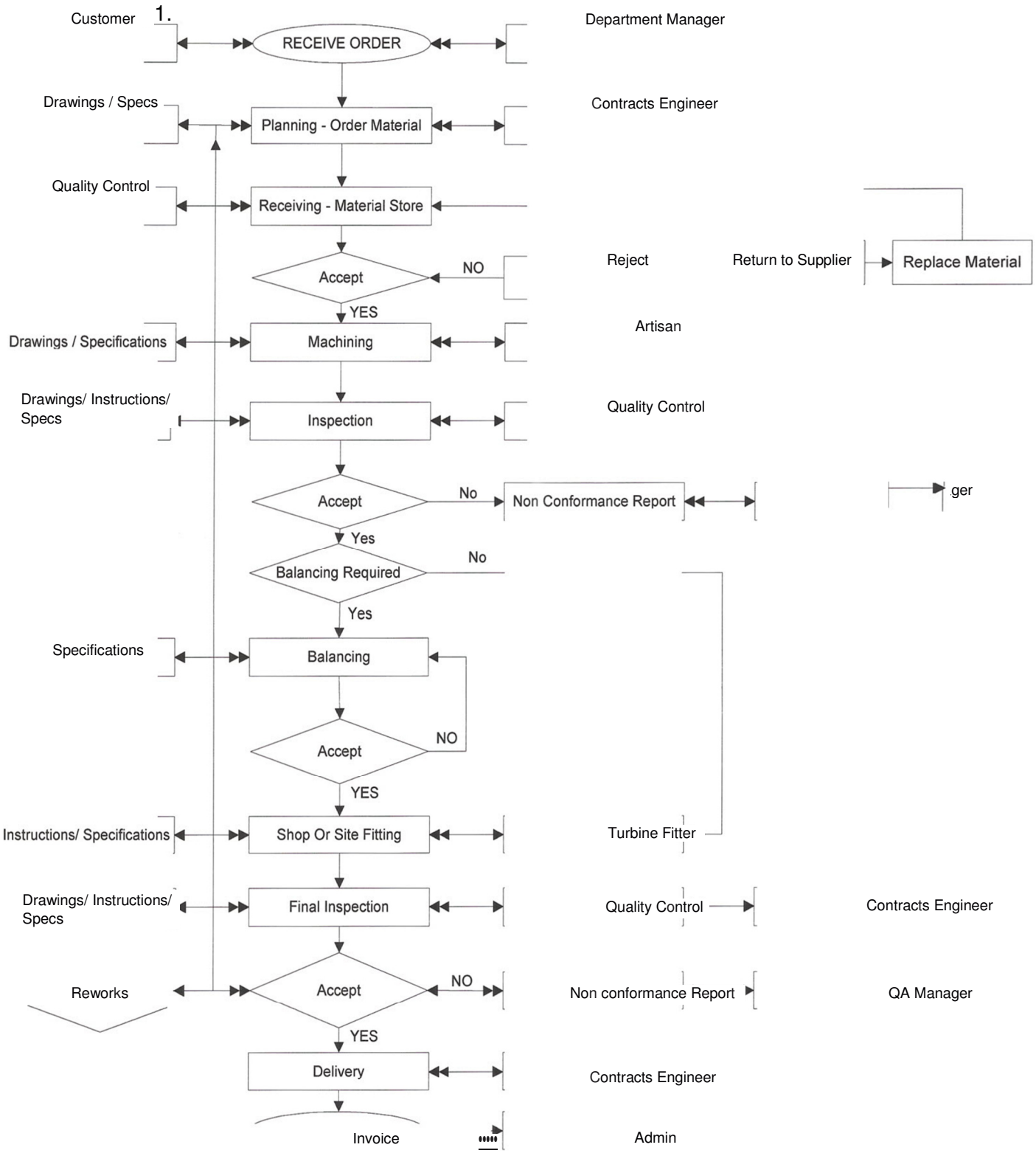
Department B

DESCRIPTION	CODE	RATE
Fitter normal time	12	38
Fitter overtime	13	50
Operators normal	14	31
Operat0rs overtime	15	38
Waiting time Artisan	78	50
Waiting time Operator	79	31
Boilermaker NT	142	38
Boilermaker OT	143	50
Welder NT	150	38
Welder OT	151	50
Normal time Medium	162	50
Overtime Medium	163	63
Normal time Large	152	63
Overtime Large	153	75
Tooling	122	38
Labourer normal time	144	19
Labourer overtime	145	25
Apprentices NT	154	19
Apprentices OT	155	25
Normal time small	172	44
Overtime Small	173	50
Inspection	164	38
3D measuring NT	212	88
3D measuring OT	213	106

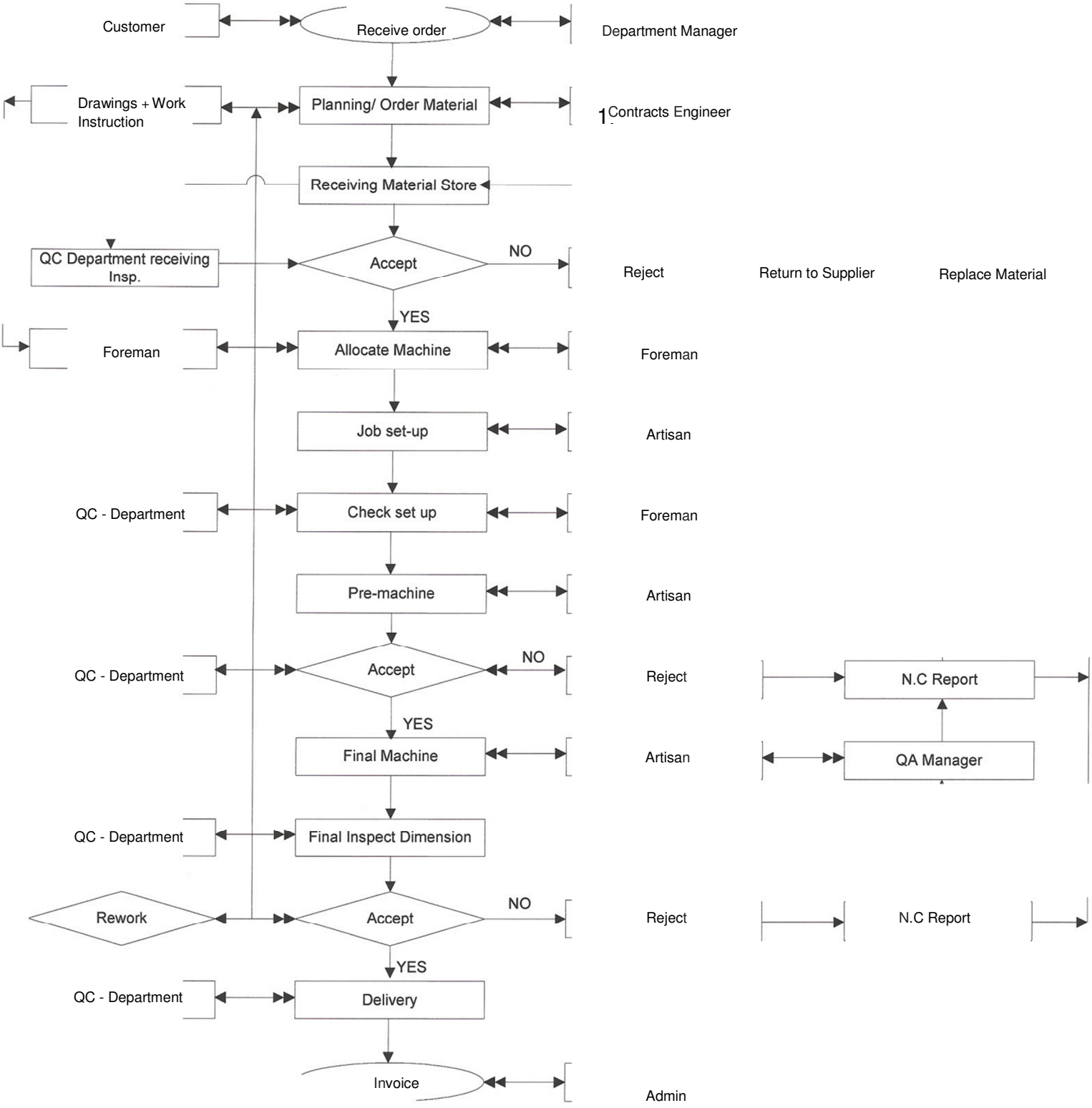
Department C

DESCRIPTION	CODE	RATE
Boilermaker NT	42	38
Boilermaker OT	43	50
Welder NT	242	38
Welder OT	243	50
Apprentices NT	252	19
Apprentices OT	253	25
Drilling NT	254	31
Drilling OT	255	38
Waiting time Artisan	589	38
Waiting time Operator	590	19
Labourer normal time	912	19
Labourer overtime	913	25
Grinder NT	918	25
Grinder OT	919	31
QC Service NT	466	38
QC Service OT	467	50

ANNEXURE C - MANUFACTURING PROCESS DEPARTMENT A



ANNEXURE D - MANUFACTURING PROCESS DEPARTMENT B



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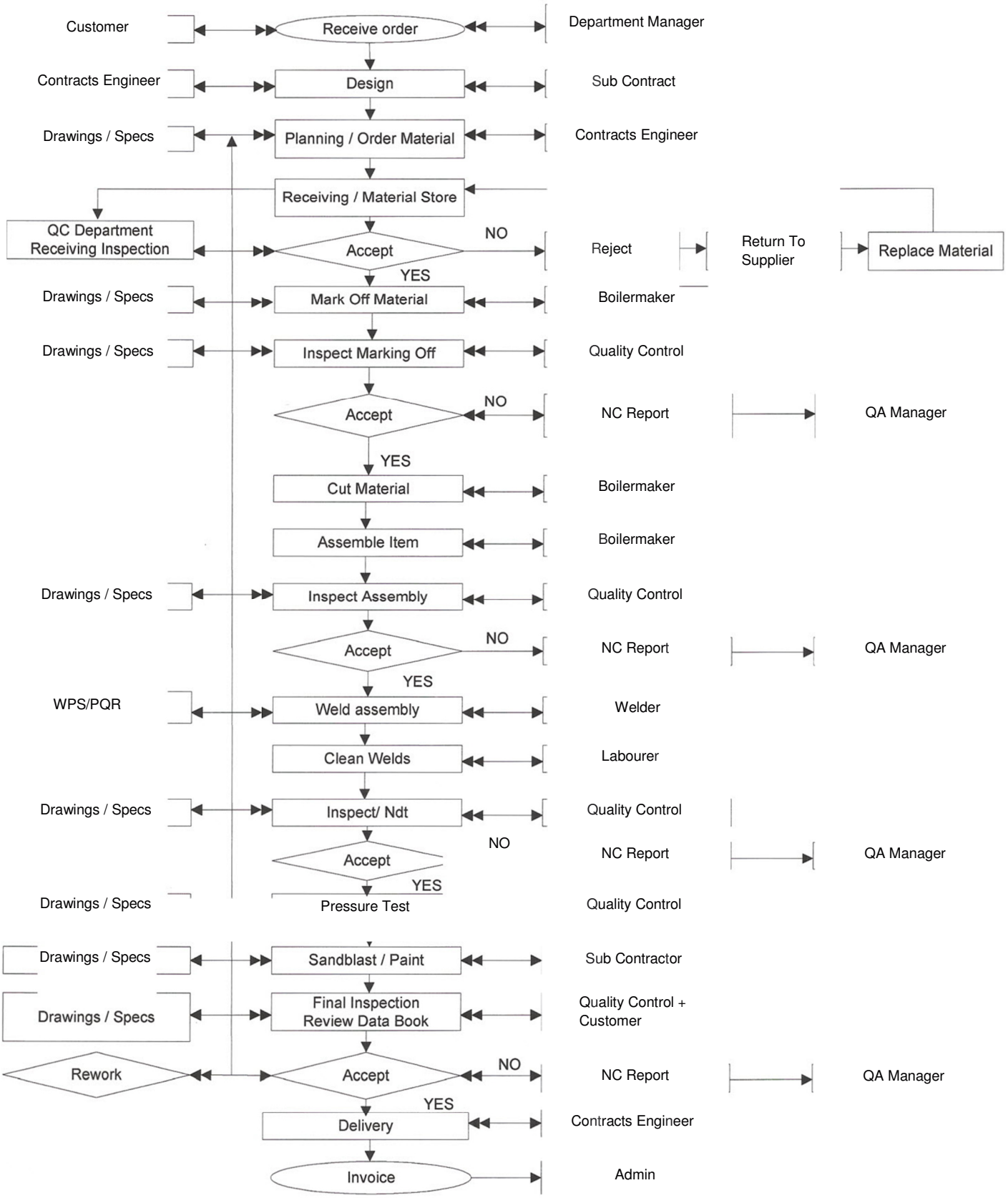
ANNEXURE E-MANUFACTURING PROCESS DEPARTMENT C



ANNEXURE F

Job costing report

Job Number	23560
Customer	XYZ
Description	Block assy
Department	B
Job Opened on Date	25.01.2008
Expected Delivery Date	28.03.2008
Value	87,924.25

Notes		
	sts	2,575
	tra	260
	Dep A	38
	Dep B	15,088
	Dep C	3,333
	mte	0
Total Material and Labour to this date		44,106
Total left for the Job		43,819

Total Labour		18,459
	Hours	
Dep B Fitter normal time	82	3,107
Dep B Fitter overtime	0	0
Dep B Operators normal	7	202
Dep A Sandblasting NT	2	38
Dep A Sandblasting OT	0	0
Dep B Waiting time Artisan	3	138
Dep B Boilermaker NT	3	95
Dep B Boilermaker OT	2	75
Dep B Labourer normal time	42	803
Dep B Labourer overtime	3	75
Dep B Welder NT	27	1,007
Dep B Welder OT	6	275
Dep B Normal time Large	82	5,166
Dep B Overtime Large	2	113
Dep B Apprentices NT	54	1,026
Dep B Normal time Medium	55	2,725
Dep B Overtime Medium	5	284
Dep C Welder NT	71	2,708
Dep C Welder OT	13	625

Total Material	25,647
Restaurant Voucher	0
Stores	2,575
Material Ordered	22,074
Petty Cash	27
Subcontractor	711
Transport	260