A COSTING SYSTEM FOR THE CONSTRUCTION INDUSTRY IN SOUTHERN AFRICA

by

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DECLARATION

Student number: 45296278

I, Evans Mushonga, declare that the research entitled:

A COSTING SYSTEM FOR THE CONSTRUCTION INDUSTRY IN SOUTHERN AFRICA

is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

_____ _____

SIGNATURE DATE

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ABSTRACT

This research is based on the problem of allocating indirect overheads to construction projects in order to establish the performance of each project. Traditional costing (TC) systems and Activity-Based Costing (ABC) systems are both used for the allocation of overheads**.**

Both primary and secondary data were used in this research. Primary data was collected by means of two questionnaires, one addressed to construction companies and the other to consultants. The sample of respondents was obtained from the register of contractors and construction industry companies. The researcher sent the links to the Lime survey by email to all respondents.

The purpose of the literature review was to identify gaps and justify the need for this research. It considered existing findings by previous researchers. Primary data was therefore required to find answers specific to the problem of overheads allocation in the construction industry. According to the respondents, the use of TC systems produces distorted project cost results while ABC produces more accurate results when used in the construction industry. However, contractors had not adopted the ABC system but used TC systems despite their producing distorted project costs.

It is recommended that both TC and ABC systems be used in the construction industry since they complement each other. Contractors may have to adopt the ABC system to enhance their decision-making while continuing to use the TC systems for external reporting.

Key terms:

Traditional costing; Activity-based costing; Construction industry.

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CHAPTER 1: BACKGROUND TO THE RESEARCH

1.1 INTRODUCTION

The construction industry is a unique business sector where the need for accurate costing systems is more vital than any other since competitive bidding is deeply rooted in its tradition and the lowest bidder wins the contract (Lehtonen, 2001). If a contractor is to quote (bid) competitively for a construction project, he will need to maintain proper costing systems with sound mechanisms for the accurate allocation and apportionment of overhead costs. This might ensure that a project is neither under-priced, leading to losses, nor overpriced resulting in a loss of business to competitive bidders. Construction companies usually run several projects simultaneously, from which relevant performance information is required (Lehtonen, 2001). Lehtonen (2001) argues that to produce this performance information, a cost build-up for each project must be done, after which the profitability of each project can be accurately determined and management can identify which projects are contributing profits and which are making losses. The cost build-up for each construction project calls for proper costing systems to ensure that project performance is accurately measured. However, construction companies are failing to deal adequately with overhead costs, often resulting in financial losses and even bankruptcy (Siskina, Juodis & Apanaviciene, 2009).

Costs in the production process are classified as either direct or indirect costs and both types should be allocated to products, services or projects in order to obtain total costs and determine selling prices (Izhar & Hontoir, 2001). Innes and Mitchell (1998) indicate that direct costs are those costs that can be linked or traced to the final product or service offered. They usually pose few problems as specific identification with a product line is possible through material issue records in the case of direct material and work time analysis for direct labour according to Innes and Mitchell (1998). They explain indirect costs as representing the consumption of company resources that are shared by its products, and establishing a system to monitor their usage is therefore difficult. They also argue that such overhead costs pose a problem when an attempt is made to allocate them to the final product.

The problem outlined in this research emanates from the need to trace indirect overhead costs to projects so that project costs and hence selling prices are

determined accurately and reliable strategic decisions are made. A study of overheads allocation in general is important because of the role this plays in total cost determination, cost accumulation, cost management, and pricing of goods and services (Dwommor, 2012). In the construction industry it is convenient to view such overheads from two perspectives: the home office perspective and the project perspective (Kim & Ballard, 2001). The home office perspective deals with the assignment of home office overheads such as material procurement and general administration overheads, whilst the objective of the project perspective is to allocate project overhead costs to jobs or sections of a job. According to Chao (2008), the contractor's project overhead costs are the onsite related costs that are incurred when supporting the construction of the project. These include supervision, office, utilities and services. Unlike direct construction costs, these project overhead costs are not directly connected to the performance of any particular element of a project, but are required for the running of the project as a whole (Chao, 2008). However, there may be a need for contractors to establish a proper system to allocate these project overhead costs to different sections of the project and also to allocate or assign the home office overheads to different projects.

It is possible that construction companies may be applying both Traditional Costing (TC) and Activity Based Costing (ABC) systems in the treatment of overhead costs. However, the new costing system, ABC, may provide more advantages when compared to the TC, systems according to Kim, Han, Shin and Choi (2011).The former system produces significantly more accurate and valuable information than traditional cost accounting (Oseifuah, 2013). Research could determine which of these costing systems gives the most useful results regarding a project's cost and performance for management information and decision-making. In recent years several researchers (Cokins, 2002; Oker & Ozyapc, 2013) have criticised TC systems as providing distorted product cost information, while hailing and promoting ABC for producing accurate product costs and eliminating waste.

James and Elmezughi (2010), for example, believe that traditional cost accounting information produces distorted product and service costs with the result that misleading decisions on pricing, marketing and profitability are made, whilst Gamal (2012) and Lopez (2013) declare that the current TC systems are almost obsolete in lean manufacturing systems. Consequently, Petcharat and Mula (2012) find that

companies are intending to change to new management accounting practices while looking for ways to improve costs. As a result, ABC has been promoted as the basis for making strategic decisions and for improving profit performance (Kaplan & Cooper, 1997; Herath & Indrani, 2010; Moisello, 2012). Therefore, the application of ABC may produce more accurate cost information for the construction industry as well, enabling strategic decision-making in the industry.

While strategic decisions are believed to be improved by the accurate costs reported by an ABC system, a TC system such as absorption costing has been criticised for misleading management through the reporting of distorted product cost results and project performance (Bastl, Grubic, Templar, Harrison & Fan, 2010). As a result, management may even reduce the selling price of an already loss-making product based on the TC system's information that indicates that the product is very profitable (Bhimani, Horngren, Datar & Rajan, 2012). To this end, Vigario (2007) avers that while the conventional absorption costing system and ABC system are essentially the same, ABC is superior since the cost allocation to products system is more relevant.

The advent of the ABC system itself can be attributed to a number of changes affecting the business sector in the early 1980s, as indicated by the following researchers. Elhamma and Fei (2013) report that increasing levels of competition that were complemented by shortened product life cycles required a change in the management of costs, whereas Ismail (2010) notes that a rapid digital revolution in the education sector needed universities to find effective cost methodologies that could link accounting data to a university's strategic plan and performance. Furthermore, a new type of customer was emerging who was both quality conscious and better informed than customers in the past (Sartorius & Kamala, 2007). The introduction of new management practices such as Just in Time (JIT) and Total Quality Management (TQM) also rendered the TC systems unsuitable for product costing and strategic decision-making (Kroll, 1996). These changes might have exposed the limitations and irrelevance of TC systems and led to the development of more reliable systems such as ABC.

The literature shows that the advent of Management Accounting Systems such as the ABC system is attributable to the evolution of the environment (Wegmann, 2009). These changes have led business sectors such as the manufacturing and service

sectors to move away from TC systems and to choose instead the ABC system (Namazi, 2009). Therefore, to ensure survival of companies in the construction industry in Southern Africa, research is required to establish to what extent these companies can benefit from the success stories that have been widely reported in the literature on ABC application in sectors such as manufacturing and the service industry (Mabberley, 1992; Innes & Mitchell, 1998).

ABC has been dubbed superior to TC systems by many researchers since the late 1980s (Hansen, 1985; Drury & Tayles, 2005; Siskina *et al.,* 2009). It would therefore be expected that the TC system would by now have been made obsolete by the introduction of the new ABC system, but on the contrary, research by Pavlatos and Paggios (2009:81) concluded that TC systems "were very much alive and well". Many companies still use TC systems and find them appropriate (Sartorius & Kamala, 2007) and Pavlatos and Paggios (2009) established that traditional Management Accounting was even more widely adopted than the recently developed tools. According to Sartorius and Kamala (2007), it is not clear whether such companies find TC systems appropriate or whether they simply do not regard ABC as a better option. This is because many researchers have pointed out several problems associated with ABC, especially those related to its implementation (Innes & Mitchell, 1998; Doyle, 2002; Drury & Tayles, 2005; Garrison, Noreen & Brewer, 2011). According to Stout and Popri (2011), ABC is associated with high costs of implementation and high time consumption. Doyle (2002) also discovered that ABC generates a new cost database thereby making the previous one obsolete. These problems could have slowed down or prevented the global adoption of the ABC system and could be the reason why, for lack of another option, some companies have continued to use TC systems. The findings by Stout and Popri (2011) suggest that some managers are not persuaded by the ABC system's effectiveness. Consequently, there is still debate in the Management Accounting community regarding which costing system is the more appropriate one (Cokins, 2014).

Notwithstanding the problems associated with ABC implementation, there is consensus among many researchers that ABC produces more accurate product cost results than TC systems (Johnson & Kaplan, 1987; Hicks, 1999; Kim & Ballard, 2001; Cokins, Câpusneanu & Barbu, 2011). These accurate product cost results are achieved because the ABC system establishes a causal relationship between

organisational activities and overhead resources (Clarke & Mullins, 2001; Cugini, Michelonn & Pilonatos, 2013). On the other hand, TC systems use a single overhead allocation basis that is volume related and bears no relationship to the incurrence of overheads. As a result, TC systems may produce inaccurate cost information.

The purpose of this study was to determine the most appropriate costing system for the construction industry in Southern Africa. To this end, the study sought to establish which costing system provides more accurate project cost, is more relevant for project valuation and for management decision-making purposes. Despite giving more accurate project cost, for any costing system to be relevant and appropriate for the construction industry in Southern Africa, it should also conform to the accounting notion that the benefit derived from the implementation and running of the system should justifiably outweigh the cost of implementing it (Horngren, Bhimani, Datar & Foster, 2002). This research study therefore sought to determine which costing system produces accurate product costs in a cost effective way.

1.1.1 Goal of Chapter 1

The goal of Chapter 1 is to set the scene for the whole research study.

1.1.2 Structure of Chapter 1

This chapter is therefore structured as depicted in Figure. 1.1.

Figure 1.1: Layout of Chapter 1

1.2 STATEMENT OF THE PROBLEM

There have been several changes in the business world since the 1980s (Wegmann 2009). For instance, labour intensive production has been substituted by capital intensive production, resulting in a reduction in the use of direct labour in manufacturing (Tanis & Özyapici, 2012). Consequently, continued usage of traditional costing methods to allocate overheads produces distorted product cost results, according to Ratnatunga and Waldmann (2010) and Gervais, Levant and Ducrocq (2010). The demand for a relevant system which allocates overheads to products accurately, in the construction industry specifically, therefore justifies further research. This is because the use of an appropriate cost system helps the company to protect and maintain a competitive advantage (Tanis & Özyapici, 2012). The adoption of ABC by organisations would therefore help identify inefficient products, departments and activities and to allocate resources to profitable products (Salawu & Ayoola, 2012).

In a construction company an unsuitable costing system may result in management failing to measure the project's performance accurately. This might in turn lead to

strategic decisions being made on the basis of inaccurate project costs, with the result that management would concentrate on less profitable projects at the expense of seemingly loss-making yet profitable projects.

The measurement of project performance is therefore important as it enables important management decisions to be reached and also helps in identifying areas requiring improvement.

Without a proper costing system, pricing and bidding for tenders becomes difficult with the result that business may be lost to competitors. For example, a company without a proper costing system may be awarded a project for which it has under-priced, leading to losses being incurred by the project. This may be even more challenging where a project is awarded with a 'no contract price adjustment' clause. In this case, the contractor may have no room to negotiate a review of the contract price and may be forced to deliver the project at a loss. As a result, cash flow limitations will set in as project expenses exceed income and this may cause the project delivery to be delayed. The employer may have to invoke the penalty clause on the contract and start charging penalties for each day of delivery delay. These detrimental consequences based on an inefficient project costing system therefore justify research to establish reliable and suitable costing systems that will enhance profitability and hence survival and growth of the construction industry.

Kim and Ballard (2002) state that the problem with the current practice regarding overhead assignment is that companies do not know the real costs for each work division or those for each participant such as sub-contractors. This is because they do not assign overhead costs or they use a uniform cost driver for assignment of overheads. In using a uniform cost driver, building contractors often fail to determine reliably the actual overhead costs, leading to financial losses or even bankruptcy of the construction company (Siskina *et al.*, 2010).Companies using TC systems frequently do not make an attempt to determine the profitability of work divisions or, where they do, they report the wrong profitability figures as a result of using blanket overhead absorption rates (Kim & Ballard, 2002). Nassar, Al-Khadash and Sangster (2011) found that the limitations of TC systems, including lack of details of cost information for decision-making, lack of accuracy of product costs and cost allocation and lack of timely cost information have all encouraged companies to seek solutions to these limitations by adopting the ABC system. This research study sought

therefore to determine which appropriate costing system(s) could be used in the construction industry in Southern Africa for the purpose of accumulating costs and allocating overheads in order to produce reliable cost information for decision-making by management. Finding the appropriate costing system was particularly important in the case of small and medium enterprises that are under pressure to remain competitive in today's global economy (Hall & McPeak, 2011).

1.3 PURPOSE AND OBJECTIVES

The research reviewed and investigated both TC and ABC systems and proposed the relevant costing system for the construction industry in Southern Africa. The specific objectives of the research were to:

- Determine whether the use of TC systems in the Southern African construction industry produces distorted project cost information.
- Establish the causes of cost distortions in project costing.
- Establish whether the use of ABC in project costing removes cost distortions in construction projects.
- Establish the extent to which the ABC system has been adopted in the construction industry in Southern Africa.
- Establish which costing system is widely used in the construction industry in Southern Africa.

1.4 RESEARCH QUESTIONS

Overall, this research answers the following question:

Does the implementation of activity-based costing in the construction industry in Southern Africa, eliminate project cost distortions which are brought about by the use of TC systems?

Therefore the study sought answers to the following specific questions:

- Do TC systems produce distorted costing results when employed in the construction industry in Southern Africa?
- What are the causes of cost distortions in TC systems?
- Does the ABC system prevent cost distortions when employed in the construction industry?

- To what extent has the ABC system been adopted by construction companies in Southern Africa?
- Which costing system is more popular in the construction industry in Southern Africa?

1.5 THESIS STATEMENT

The use of the ABC system in the construction industry in Southern Africa will eliminate cost distortions in construction projects costing that arise from applying TC systems to allocate overheads. The implementation of an ABC system in the construction industry will result in increased efficiency and the elimination of waste. Consequently, costs will decrease as a result of reduced wastage, leading to an increase in profitability of contractors' projects.

1.6 SIGNIFICANCE OF THE STUDY

This research sought to establish which costing system produces the most accurate project cost information for the construction industry in Southern Africa. The study is significant in that:

- Accurate project costs allow better project performance measurement. With accurate project costs, management can determine how much profit or loss has been made by each project as well as each section of a project.
- Performance measurement in turn leads to performance improvement as areas of waste are pinpointed and remedial action can be taken by the management. Elimination of waste results in a reduction of costs and hence increased profitability from the contractor's projects.
- It gives provides insight into the problems of overhead costs allocation, which is important in tendering for projects. A limited understanding of overhead costs can lead to inadequate estimation and bidding for construction projects. Some items may be left unbilled, causing difficulty in managing jobs in progress and estimating the cost to complete them (Blattner, 2008).
- The findings will contribute new information on TC systems and the ABC system. Moreover, by providing academics with insights for further investigation, the findings may be useful to some companies that are contemplating a change from a TC system to an ABC system in the future.

1.7 RESEARCH METHODOLOGY

This study used both secondary and primary data to find answers to the research questions. The secondary data was obtained from existing literature. For primary data, the research used a questionnaire as a data gathering instrument. The target respondents for the questionnaire were accounting practitioners, accounting consultants and managers of construction companies. A questionnaire was chosen since this is less time consuming and less expensive than other investigating methods. It also allows adequate time for the respondent to reflect on the questions and give precise answers (Clarke & Mullins, 2001). Moreover, using the questionnaire method makes the way the information is collected and analysed clear to all concerned (Veal, 2005). This transparency enhances the reliability and validity of the findings and the recommendations that were made in this research.

1.8 LIST OF TERMS

Activity: An event in an ABC system that causes the consumption of overhead resources (Garrison, Noreen & Brewer, 2011).

Activity Based Costing: Is “a method for measuring the cost and performance of activities, products and customers” (Turney, 1996).

Contract price: “This is the tender or negotiated amount, inclusive of value added tax (VAT) as accepted by the employer and stated in the contract data that is not subject to adjustment” (The Joint Building Contracts Committee (JBCC), 2007:2).

Contract price adjustment clause: This is a standard clause in the JBCC Principal Building agreements which states that the contract price or contract sum is not subject to adjustment (JBCC, 2007).

Contractor: “The party contracting with the employer for the execution of the works as named in the contract data” (JBCC, 2007).

Direct costs: Those costs that can be identified with specific cost units (Atrill & McLaney, 2012).

Employer: “The party contracting with the contractor for the execution of the works as named in the contract data” (JBCC, 2007).

Indirect costs or overheads: These are those cost items that cannot be directly measured in respect of each particular cost unit (Atrill & Maclaney, 2012).

Penalty: A monetary value determined at a rate per calendar day as stated in the contract data which the contractor is liable to pay to the employer for failing to bring the works or sections of the works to practical completion on the date stated in contract data (JBCC, 2007).

Traditional cost systems: Any of the older costing systems that use direct material and labour consumed as the primary means of apportioning overheads (Turney, 1996).

1.9 STRUCTURE OF THE DISSERTATION

The subsequent chapters of this dissertation are set out as follows:

Chapter 2: Literature Review

In this chapter a review of related literature is presented. The chapter explores the factors leading to the advent of the ABC system and analyses both the TC and ABC systems. A brief outline of the applications of the two systems in the construction industry is provided. The chapter concludes with a review of the limitations of the ABC system.

Chapter 3: Research Methodology

The chapter explains the methodology used to gather and analyse data. The research design is explained and the reasons for choosing the design are discussed. The limitations of the research techniques used in the study are also highlighted. Ethical considerations are discussed in this chapter.

Chapter 4: Research findings and data analysis: Accountants and managers.

In this chapter the data from accountants and managers is presented and analysed.

Chapter 5: Research findings and data analysis: Consultants.

This chapter analyses the data that was collected from consultants in the construction industry.

Chapter 6: Summary, conclusions and recommendations.

This chapter summarises the findings and outlines the recommendations of the study. The chapter also highlights the contributions of the research and concludes with suggestions for further studies.

1.10 SUMMARY

This chapter has highlighted the problem statement, the purpose and objectives of the study, the research questions, the thesis statement, and the significance of the study. The research methodology was also discussed and a list of terminology provided. The chapter ends with a brief explanation of the structure of the dissertation. In Chapter 2 the literature review is discussed.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter the themes of the dissertation are explored. The two costing systems, TC and ABC, are discussed. Weetman (2003) and Charaf and Bescos (2013) suggest that the current trend in modern accounting is that more and more companies are moving away from conventional costing systems (TC) and adopting ABC. This is particularly the case in developed countries more than in developing countries where ABC incorporation is still very low (Sartorius & Kamala, 2007). The case for ABC is driven by the view that different jobs, products and services consume resources differently; using a single or multiple resource based overhead absorption rate (OAR) to allocate these overheads to cost objects such as is done in TC produces distorted cost results (Horngren *et al.,* 2002). This product cost distortion causes product cross-subsidisation, according to Horngren *et al*. (2002). Therefore, the application of the ABC costing system may eliminate these cost distortions and product *cross-subsidisation* which is brought about by the arbitrary allocation of overheads in TC, even in the construction industry.

Product cross-subsidisation means that one mis-costed product causes the mis-costing of other products in the organisation (Bhimani *et al.*, 2012). As a result, a product with high resource consumption is reported as having a relatively low total cost, according to Bhimani *et al.* (2012).This product *cross-subsidisation* occurs because TC systems use inappropriate allocation bases and make no attempt to establish links between expenditure and its causes (Mabberley, 1992). Bhihami *et al*. (2012) observe that a good example of product cross-subsidisation occurs when costs are uniformly spread across multiple users without regard to their different demands for resources. Hence, a company may not know the real costs of its products (that is, projects in the construction industry) and therefore pursues loss making products (projects) at the expense of profitable products (projects) when decisions are based on TC system information.

However, Adamu and Olotu (2009) and Wegmann (2011) suggest that despite the evident product cost distortions which result from the use of resource based (TC) costing systems, more companies still use TC than ABC systems. This research assesses the problems of the ABC system that may have prevented a possible large

scale adoption of the technique and which probably out-cost the benefits derived from the use of an ABC system, especially in the construction industry. The remainder of the chapter is set out as follows:

Section 2.2 defines and compares TC and ABC systems. In Section 2.3 some common construction theories are discussed and the applicability of the TC and ABC systems to the construction industry is examined. The limitation of an ABC system is outlined in Section 2.4 while Section 2.5 summarises the findings from the literature review.

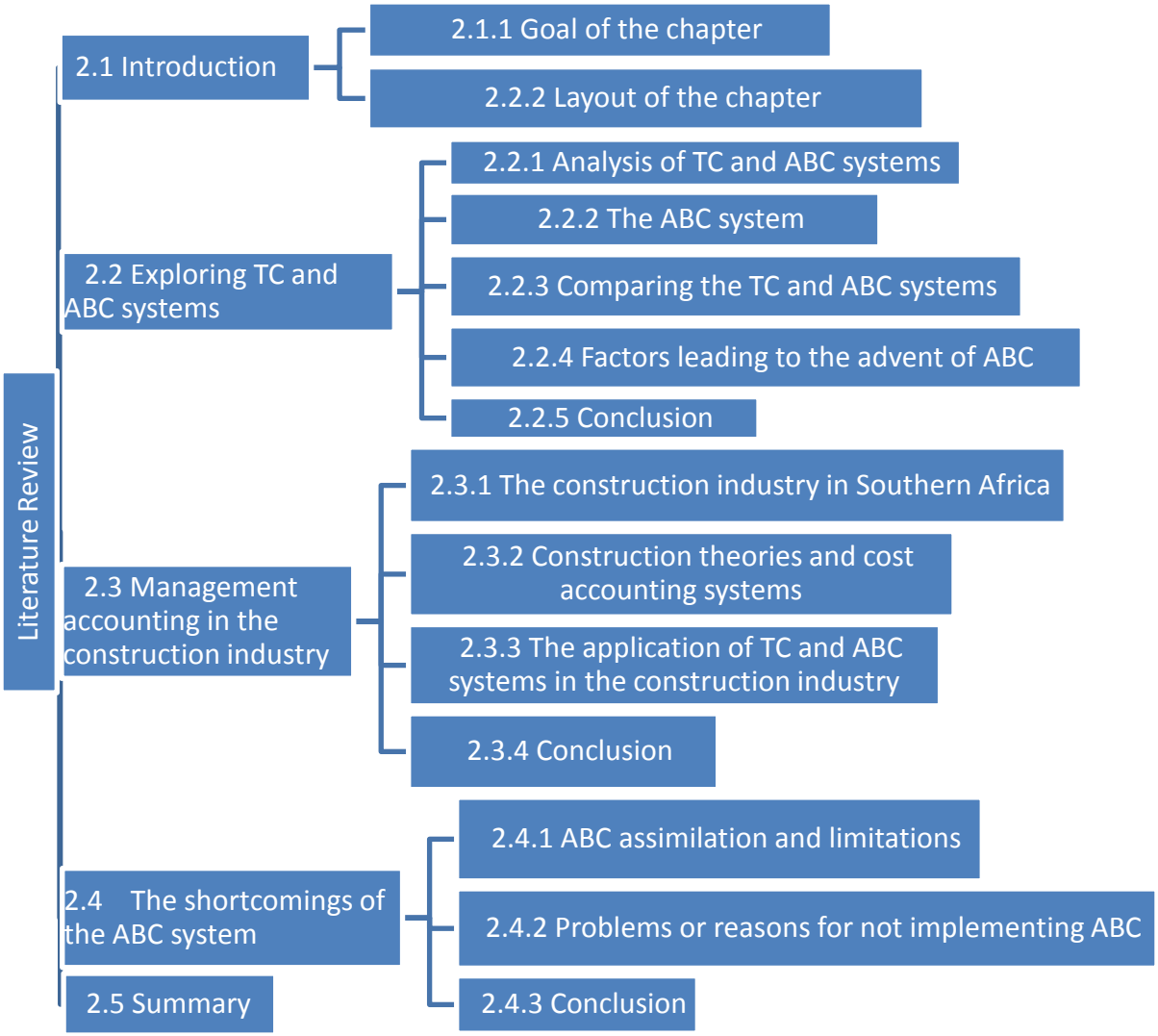
2.1.1 Goal of the chapter

The goal of this chapter is to provide more background to TC and ABC as a whole. Benefits and shortcomings are discussed to indicate what may be important in a cost allocating system for the construction industry.

2.1.2 Structure of Chapter 2

Figure 2.1 depicts the structure of this chapter.

Figure 2.1: Layout of Chapter 2



2.2 EXPLORING TC AND ABC SYSTEMS

In the following subsections the meaning of TC and ABC systems and their evolution is discussed. The two costing systems are also illustrated and compared.

2.2.1 An analysis of TC and ABC Systems

The problem outlined in this research study emanates from the need to trace costs to products so that product costs and hence selling prices are determined accurately and appropriate strategic decisions can be made. The two types of costs involved are classified as direct and indirect costs. Allocating direct costs to products is not difficult (Innes & Mitchell, 1998; Weetman, 2003) as specific identifications with the product line are possible through material issue records in the case of direct material and work time analysis for direct labour (Innes & Mitchell, 1998). However, indirect

costs, also called overhead costs, pose some challenges when an attempt is made to trace them to cost objects.

Indirect costs represent acquired resources whose consumption cannot be specifically linked to individual products since they are shared by more than one product and it is not feasible to establish a system to monitor their use (Innes & Mitchell, 1998). TC and ABC systems treat direct costs similarly. However, TC systems use an overhead absorption rate or a series of overhead absorption rates to absorb indirect overhead costs on the assumption that the products drive the costs directly (Fang & Ng, 2011; Mhamdia & Ghadhab, 2011).

According to Hansen (1985), the principal difference between a TC and an ABC system is the number of cost drivers used. ABC uses relatively more cost drivers in allocating overheads compared to the one or two volume based cost drivers used in TC (Hansen, 1985). However, both systems use a two stage costing system involving firstly, the allocation of overheads to cost centres, usually the production and service centres in the case of TC and activities in the case of an ABC system (Kostakis, Boskou & Palisidis, 2011). Secondly, the allocated overheads are assigned from production and service centres (TC systems) or activities (ABC) to individual jobs or products based on predetermined overhead absorption rates (OAR), according to Hansen (1985). In TC systems, the choice of an OAR for a particular cost centre depends on the cost centre's characteristics. For example, a machine intensive cost centre would use a machine hours OAR to allocate overheads while a labour intensive production cost centre would use a direct labour hours OAR.

The use of a direct labour hours OAR to allocate overheads is justifiable to some extent. As Innes and Mitchell (1998) argue, direct labour itself mostly varies with the production level such that it is plausible to view all overhead costs as ultimately driven by production volume. Innes and Mitchell (1998) therefore believe that the advocates of ABC systems would agree that traditional practice is largely satisfactory in its use of a volume based OAR, since production overheads relate primarily to production volume. However, they continue that in many modern manufacturing organisations, products and services are not homogenous in the way they consume overhead resources and the application of TC systems would only be valid for facilities producing less diversified products (Chiang, 2013). As a result, TC systems,

by using direct labour hours as an allocation base, over-cost high volume/low complexity products and under-cost low volume/high complexity products (Johnson & Kaplan, 1987). Consequently, the ABC system can be used to remedy these product cost distortions.

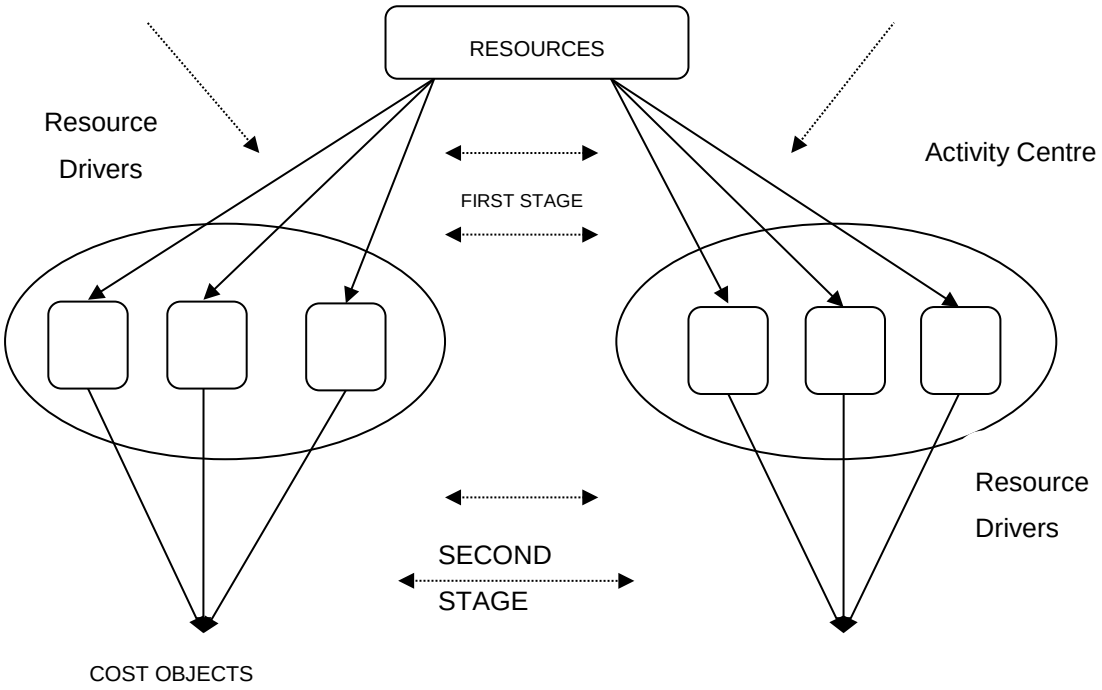
2.2.2 The ABC system

Akyol, Tuncel and Bayhan (2005) define ABC as a methodology that measures the cost and performance of activities and cost objects. Similarly, Reeve, Warren and Duchan (2012) define ABC as an accounting framework that is based on relating the cost of activities to final cost objects, such as products or customers. Its usage is believed to help service oriented companies to better understand the costs of meeting their customer needs (Krumwiede & Charles, 2014). Moreover, Zawawi and Hoque (2010) believe that it is a modern accounting system that measures the use of resources by activities while Horngren *et al.* (2002) indicate that it is an exercise that measures the cost of performing activities in order to generate the total costs of objects and information for decision-making. In an ABC system, the fundamental cost object is seen as the activities from which costs are assigned to other cost objects such as products, services or customers (Horngren *et al*., 2002). It is an economic model that identifies the cost pools or activity centres in companies and assigns costs to cost drivers based on the number of each activity used (Akyol *et al*., 2005) while an activity is an event, task or unit of work with a specific purpose (Horngren *et al*., 2002). Therefore, the distinctive feature of an ABC system is the multiple activity-based overhead absorption rates which may make the system more realistic and more applicable than a TC system.

According to Akyol *et al*. (2005) and Reeve *et al*. (2012), ABC is considered an alternative paradigm to TC systems. Itoriginated in the manufacturing sector as a result of dissatisfaction with the traditional management techniques that relied on volume based allocation systems when allocating overheads to products (Kont, 2012). Contrary to Akyol *et al*. (2005), however, Cokins (2002) finds that an ABC system does not replace the accounting system; rather, it reinstates the same data in order to support decision-making more effectively, while CIMA (2001) views ABC as a technique for managing companies effectively and not as a costing system. The view that ABC is not a system of costing may suggest that it may not therefore be possible to view it as an alternative to the TC systems.

However, the basic ABC system is very similar to a TC system as it involves a two stage procedure; firstly, charging overhead costs to ABC pools; and secondly, deriving and using a series of cost driver rates to trace the pooled costs to products (Raffish &Turney, 1991). Figure2.2 illustrates the cost assignment process in ABC as expressed by Weetman (2003) and Tsai and Kuo (2004). In the first stage of ABC cost accumulation, resources are allocated to activity centres and then the cost of the activity centre is reported (Benjamin, Muthaiyah & Marathamuthu, 2009). The second stage of ABC is the allocation of activity costs to cost objects after the selection of appropriate cost drivers has been made (Benjamin *et al*., 2009).

Figure 2.2: Cost assignment of an ABC system



Source: *Cokins (2002)*

The ABC methodology assigns indirect overheads through activities to the products and services provided to customers by the use of Activity Cost Drivers. Raffish and Turney (1991) define a cost driver as any factor or event that causes a change in the cost of an activity. In the ABC system, a cost driver is an allocation base of overhead costs to activities. Vigario (2007) defines ABC as a system of allocating production overheads to products in a manner that is more equitable than the traditional system of using a single allocation base such as labour hours. In this definition, the ABC system is declared superior to TC systems in allocating overheads equitably.

Therefore, there may be a need for construction companies to consider the use of activities to allocate overheads as this may produce more accurate project costs than using volume basis such as direct labour.

TC systems, on the other hand, assume a correlation between the incurrence of overheads and the volume of activity such as labour, whereas the ABC systems recognise that there has been a shift away from labour intensive production to capital intensive production (Benjamin *et al*., 2009). As a result, there has been a significant increase in indirect fixed costs compared to direct variable costs of manufacturing (Baxendale & Foster, 2010). A further change in recent manufacturing has been a shift away from single product manufacturing to multi-product manufacturing (Vigario, 2007). This shift from labour intensive to capital intensive production, coupled with the movement to multiproduct manufacturing, may have resulted in a significant increase in indirect costs.

According to Miller and Vollman (1985), these indirect overheads can be categorised into four transaction based categories:

- **Logistical transactions:** These include activities such as ordering, executing and confirming materials. Personnel performing these transactions include purchasing officers, clerks doing electronic data processing and accounting staff.
- **Balancing transactions:** Activities involve matching the supply of materials with orders, and labour and machines with demand. Purchasing, material planning, production control and scheduling personnel perform balancing transactions (Innes & Mitchell, 1998).
- **Quality transactions:** These are activities performed by staff in quality control, indirect engineering and procurement, which involves ensuring that production conforms to specifications.
- **Change transactions:** These are transactions performed by manufacturing, industrial and quality engineers involved in schedules, specifications, routings and standards.

These overhead classifications represent a series of activities or transactions undertaken to facilitate production. The cost of these transactions can therefore not be traced to a specific unit but should be allocated to the products using Activity Cost

Drivers (ACDs). Since these overheads are transaction (activity) driven, proponents of ABC see the use of ACDs as more accurate in allocating the overheads (Miller & Volmann, 1985). Hence, it is possible that construction companies may need to move away from their current costing systems and adopt the ABC system to benefit from more accurate product costing.

2.3 COMPARING TC AND ABC SYSTEMS

In multi-product manufacturing, the TC systems smooth over all overhead costs to products on an equal basis (Vigario, 2007; Kostakis *et al*., 2011; Shaikh, 2010). This occurs as the system assumes that products consume indirect costs in proportion to production volumes (Van der Walt, De Wet & Meyer, 2012). As a result, low volume products are under-costed and high volume products are over-costed (Horngren *et al.,* 2002). This distortion occurs because the TC system allocates indirect manufacturing costs using volume related formulae based on direct labour, direct material or machine utilisation, although these resources represent only a small percentage of the total cost of most products or services (Macintosh, 2011). Consequently, a company quoting on a cost plus basis may out-price itself on the high volume products and sell the low volume loss making products (Vigario, 2007). The ultimate consequence is a loss in sales (Reeve *et al.*, 2012) and a decline in profitability and international competitiveness (Macintosh, 2011). For this reason, the ABC system may be a more reliable costing system than TC systems.

Cokins (2002) views TC systems as producing not only inaccurate but also incomplete information or statements for management. He views the current reporting using a traditional approach as producing data in the form of a chart of accounts view, which is incomplete and unprocessed. In Cokins's (2002) view, ABC techniques are used to further process the data from a TC system into more useful information for management decision-making. This view is confirmed by Benjamin *et al*. (2009) who argue that ABC is essentially an extension of the TC systems. In other words, ABC may complement TC systems and, in this light, should not be seen as a substitute for TC systems.

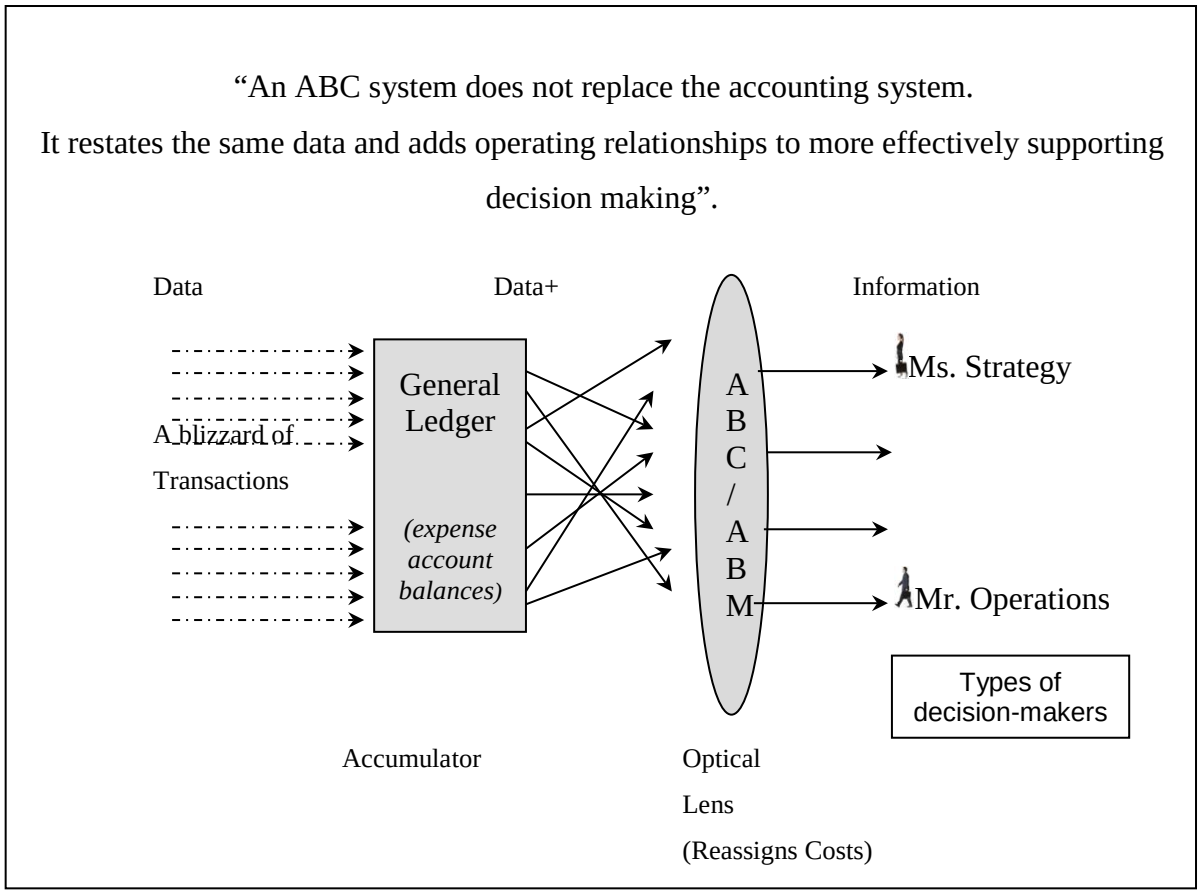
Table 2.1 shows the data from a TC system reported to management through the general ledger. These general ledger reports provide management with totals of expenditure but do not indicate how they can influence these expenses as they have

no insight into what caused them in the first place (Cokins, 2002). He argues that ABC resolves this deficiency of the general ledger view by focusing on the activities that drive the costs. Cokins (2002) adds that ABC is work centric whereas a traditional general ledger view is transaction centric. An ABC system resolves the structural deficiencies of the general ledger by converting the general ledger account balances into activity costs and assigning these to cost objects by use of an appropriate activity cost driver (Cokins, 2002). This is contrary to views of other researchers such as Vigario (2007) and Johnson and Kaplan (1987), who regard ABC as a substitute and not a complement to TC systems. Hence, companies may need to remove the limitations of TC costing systems by implementing ABC.

The further processing of the general ledger chart of accounts expenses into work activities that consume the financial general ledger‘s expenses helps to increase the finance manager’s insight into the costs (Cokins, 2002). Cokins (2002) also assigns more importance to the wording used to describe activities in an ABC system than those in a TC system. He points to the use by an ABC system of an action-verb-adjective-noun grammar convention as more powerful than the chart of accounts language of the traditional general ledger. This chart of activities language such as “inspect defective goods” or “analyse claims” is important to management as it suggests that the activities can be influenced favourably or terminated where they represent a waste (Cokins, 2002). The increased insight into what drives costs, coupled with the claim that ABC also reduces waste, may demonstrate that the system is more suitable to the construction industry than are TC systems.

As depicted in Figure 2.3, ABC uses data from a traditional general ledger system and processes this information into activity costs that are more useful to management strategic decision-making.

Figure 2.3: ABC uses data from a traditional general ledger system



Source: *Adapted from Cokins (2002)*

Figure 2.3 illustrates how the TC system processes raw data into general ledger accounts. These general ledger reports are not used for operational or strategic decisions. However, the ABC system further processes TC system accounts into information useful for strategic and operational decision-making. Therefore, the ABC system needs TC system data and it may complement rather than substitute TC systems.

A typical TC system as depicted in Table 2.1 shows management what has been spent under each expenditure head. Each expenditure head is an aggregate of all the transactions that have taken place during the period reported on. The aggregate is compared with what was budgeted for to determine variances. Management is content when the actual expenditure is less than the budget but dissatisfied when it exceeds the budget (Cokins, 2002). However, there may be less insight into these costs. For example, it may be known that the total cost incurred by the claims department for all the transactions is $914 500. If the budgeted figure was $880 000, a favourable variance of $34 500 is reported (Cokins, 2002). However, management

does not know how much it costs to perform the activities of the department, for example how much it costs to analyse claims or process a batch.

Without the knowledge of activity costs, it is difficult to comprehend how the budgeted figures are arrived at and whether or not they are subjective. As a result, some managers may not be convinced by the reported favourable variances. Cokins (2002) argues that for this reason an ABC system is required to translate the total general ledger account balances into their work activities. He believes that both TC and ABC systems have their place in accounting, although the general ledger information is too raw to be useful in decision-making. Unlike researchers such as Johnson and Kaplan (1987) and Vigario (2007), who view TC systems as obsolete in modern day management accounting, Cokins (2002) regards TC and ABC systems as complementary. Therefore, construction companies may need to use both systems for reporting and decision making.

A TC system reports costs but does not show the factors driving these costs. An ABC system, however, corrects this limitation by analysing the work activities responsible for causing the costs. In processing a TC system's reports or data into more useful activity costs, Cokins (2002) views ABC as a user interface that translates traditional reports into more useful information (Figure 2.2) in the same way that a machine user interface in a computer system translates the machine language to human language. Cokins's view may therefore moderate the belief that ABC is a better system than TC systems while also helping to explain why TC systems are still in use in management accounting.

in order to confirm Cokins's (2002) findings, Garrison *et al*. (2011) argue that ABC is ordinarily used to supplement a company's current costing system, and not as a replacement of the company's usual costing system. They found that many companies that use ABC have two costing systems: the official costing system that is used for external financial reporting, and the ABC system that is used for internal decision-making and for management activities .Moreover, De La Villarmois (2011) concludes that the TC systems are the most widespread, either used alone or in addition to other costing systems. It may therefore be necessary for construction companies to make use of a so-called hybrid system that is a combination of TC systems and the ABC system.

As Cokins (2002) and Garrison *et al*. (2011) observe, an ABC system should not be treated as a replacement of the TC system but as complementary to it. Hence, it could be said that neither system is superior to the other and therefore a company cannot work with either system alone as both are important to achieve the overall company objectives.

2.3.1 Factors leading to the advent of ABC

ABC has emerged as an important tool in business since the 1980s (Novak, Paulos & St. Clair, 2011). This is attributable to several factors, including the changes experienced in business environment (Kostakis *et al*., 2011). Global changes such as advances in technology, increased competition and the shift from a manufacturing-based to a service-based economy have influenced the management accounting techniques used by practitioners (Milne & France, 2012). Consequently, the design of cost systems must take cognisance of these changes if their suitability is not to be questioned (Wilson & Chao, 1999). Milne and France, (2012) observe that one hundred years ago, when costing systems were in the early stages of their development, the manufacturing environment was characterised by:

- inexpensive labour relative to other costs
- throughput rates of production that were controlled by direct labour
- slowly changing technology that resulted in long product life cycles and infrequent major designs
- a managerial focus on labour efficiency, and
- resources other than labour used to enhance the direct labour itself.

In a bid to suit the prevailing circumstances, the principal characteristics of TC were:

- direct labour costs played a prominent role
- the bulk of indirect manufacturing costs were closely related to direct labour
- cost centre activities revolved around direct labour
- direct manufacturing costs varied largely with throughput and hence with direct labour, and
- capital costs were long term and fixed (Wilson, & Chao, 1999).

However, several changes have affected businesses in all sectors and have rendered the design of many cost systems obsolete (Wilson & Chao, 1999).

According to Clarke and Mullins (2001), Horngren, *et al.* (2002), Duh, Lin, Wang and Huang (2009) and Kuma (2013), growing competition for existing services coupled with customers requiring a greater service choice forced a compression of profit margins in the service industry. Similarly, Reyhanoglu (2008:2) found that "increasing domestic and foreign competition, automation and changing cost structures is forcing manufacturers to look for a better understanding of their accounting system and to need real-time information systems". A need therefore arises to focus on the myriad activities that are performed in order to serve the customer (Clarke & Mullins, 2001). For this reason, an understanding of activities may help companies to reduce non-value adding activities and to supply services at lower prices.

Clarke and Mullins (2001) argue that the challenge for service industry entities is to make the less expensive services to be the preferred ones for customers. They gave an example of the Automated Teller Machine (ATM), which is not only a less expensive service for banks to offer clients but is also the preferred service option among customers. To this end, Clarke and Mullins (2001) remark that, for service oriented companies, there is an urgent need to use ABC to improve profitability through identifying and eliminating non-value adding activities and improving customer profitability.

However, strong competition and a new breed of customers have emerged not only in the service industry, but may be a feature of all industries alike, including the construction industry. Lehtonen (2001) argues that competitive bidding is deeply rooted in the construction tradition and the lowest priced project is awarded the contract. This competition may call for greater understanding of activities in order to eliminate wasteful activities and reduce project costs to make a company more competitive. ABC brings a better understanding of activities' driving costs. It follows, therefore, that costs may be reduced through an understanding of these activities, and in this way the profitability and competitiveness of the company may be enhanced.

According to Cokins (2002), knowledge of the actual costs of the company's products and the costs of serving channels and customers is now the key to survival. This survival cannot be achieved with TC systems alone. However, Cokins (2002) believes that with ABC visibility, companies can identify where to remove waste, low

value adding costs, and unused capacity and thus gain an insight into what drives their costs. According to Wu and Chen (2012), in the ever competitive world of business operations, quality has become the basic tool for fighting competition. Therefore, since ABC provides more accurate cost data, its implementation would enhance profitability and survival (Wu & Chen, 2012). The resultant effect could be a squeeze on the profit margins, which might eliminate uncompetitive players.

More weaknesses in the TC systems have been exposed by growing competition among companies in all sectors. According to Akyol *et al.* (2005), global competition has forced manufacturing services and companies to become more flexible, integrated and highly automated in an effort to increase their productivity. This increase in global competition has been complemented by shortened product life cycles and a new kind of consumer who understands quality and who is better informed than customers in the past (Sartorius & Kamala, 2007). Akyol *et al.* (2005), argue that the use of TC systems is regarded as inappropriate in satisfying this new breed of consumer since the system ignores the cost of activities in the provision of goods and services. Therefore, these changes in both products and consumer behaviour may have necessitated an improvement in management systems for companies to fight competition. As Akyol *et al.* (2005) observe, it is impossible for a company to sustain competition without a proper system in place for the purpose of cost calculation; thus reliable cost systems should be established to supply accurate project cost information for the construction industry.

On the other hand, Kroll (1996) established that TC systems found in many companies are used to measure the performance of the company in terms of profitability and return on investments. Such traditional financial statement reports are suitable for use by users such as existing and potential investors whose interest lies essentially in obtaining an insight into the historical performance of the company in order to project its likely future performance and its going concern status. He argues that financial statements are historical reports that provide lagging rather than leading indicators. However, in the construction industry leading indicators need to be available to assist in proper decision-making.

Another factor leading to the irrelevance of the TC systems is the proliferation of several product lines in most companies. Kroll (1996) observes that a company operating several decades ago could afford to offer only a few product lines to a

small number of customers. However, the same company today might make-to-order many products for a large client base. Decades ago the company could simply spread its overheads on a volume basis such as number of units produced or direct labour hours consumed. However, such allocation of overheads by the company today across dissimilar products would produce very inaccurate and potentially misleading product costs. This product proliferation has made it very difficult to pinpoint costs, such that spreading these costs across these products would produce misleading cost information (Kroll 1996). Similarly, construction companies execute many different projects at a time for disparate customers such that a system of overheads using a single OAR would present distorted project costs. Therefore the use of a blanket OAR may be inappropriate as it provides wrong product cost information in a modern company that supplies several distinct products and in construction companies undertaking many projects simultaneously.

Adding to the problems associated with the use of TC systems in modern day businesses are the technological changes that have affected many industries. Myers (2009) observes that the current manufacturing environment is characterised by an increasing use of advanced technologies such as robotics, computer aided manufacturing and flexible manufacturing systems. Automation has reduced the direct labour used in manufacturing, while the proportion of indirect overheads has increased (Kroll, 1996). Previously, production systems were largely labour intensive, hence the use of direct labour hours to allocate indirect overheads seemed appropriate. Furthermore, resources comprised mainly direct material and labour while indirect overheads were very low such that the use of some inappropriate volume basis to allocate overheads to products could have produced a less significant effect on total product cost than would be the case today (Kroll, 1996). In this regard, Sartorius and Kamala (2007) conclude that an increase in fixed costs as a result of investment in capital intensive technologies influences the need for a better system of allocating overheads. The construction industry may thus benefit from the adoption of a costing system that recognises technological changes in the industry.

Changes to the global business environment that have led to the development of ABC include the introduction of new management practices such as Just-in-Time (JIT) and Total Quality Management (TQM) (Sartorius & Kamala, 2007). These

changes have encouraged companies all over the world to adopt new strategies, innovations and more complex costing systems such as ABC in order to maintain a competitive advantage (Drury & Tayles, 2005). As Myers (2009) argues, a system's design element should be consistent with the prevailing technology and aligned with corporate commitment to total quality, JIT and increasing automation, and should promote the company's competitiveness with regard to cost, quality and lead time. The implementation of ABC is consistent with this view; the system is believed to reduce costs by between 3% and 5% while increasing revenue by between 5% and 15% (Sartorius & Kamala, 2007). Therefore, construction companies might be expected to adopt the ABC system in order to enhance competitiveness and increase profits.

In explaining the advent of ABC, Sartorius and Kamala (2007) propose a contingency theory approach. The contingent theory states that the need for an improved management system and structures is influenced by organisational and environmental factors, called contingent factors. These factors include deregulation, increasing global competition, reduced IT costs, increased privatisation, increased demand for more product brands, better product and service quality and the development of integrated information systems (Sartorius & Kamala, 2007). However, the contingent theory contradicts the findings of Brierley (2008) that environmental factors do not impact on the need to consider the adoption of the ABC system. Companies that do not move away from TC systems such as absorption costing in this environment are likely to make unsuccessful costing and management accounting decisions (Kaplan & Anderson, 2004). This research study set out to establish whether the use of TC systems does indeed lead to incorrect decisions.

2.3.2 Conclusion

TC and ABC are similar systems used to allocate overheads to cost objects. Both systems treat direct costs similarly by allocating them directly to products and services. They both use a two stage costing system involving firstly, tracing costs to activities in the case of an ABC system and to resource centres in the case of the TC systems. Secondly, they both allocate these costs to cost objects. It is in this second stage of allocating indirect overheads that the two systems differ. While ABC recognises that activities drive costs, TC systems on the other hand regard costs as influenced by volumes. Consequently, ABC systems use more cost drivers than TC

systems to allocate overheads to cost objects. For this reason the two costing systems produce different product cost results and researchers generally agree that the product cost results produced by a TC system are distorted.

This section has compared the two costing systems and outlined possible reasons for the development of the ABC system. The following section discusses the application of TC and ABC systems in the construction industry. Some common construction theories upon which costing systems should be based or aligned are described. The section concludes with a discussion of some financial reports, which suggest that TC systems would produce distorted project costs if used in the construction industry.

2.4 MANAGEMENT ACCOUNTING IN THE CONSTRUCTION INDUSTRY

One of the objectives of this research study was to investigate the applicability of ABC to the construction industry in Southern Africa. According to Bertelsen (2004), the construction industry in many countries accounts for 10% of the Gross National Product. The industry is therefore an important sector of the economy of many nations and a focus on improving the industry's performance would be beneficial. As Bertelsen (2004) observes, construction is an industry where a small improvement in performance may have a significant impact on the national economy. In this section, the need for research on ABC in the construction industry and the importance of the industry to economies of the region is explained. Unfortunately, the researcher has found that literature on ABC system implementation in Southern Africa is limited. That which is available has been reviewed focusing mainly on the system's application to the manufacturing sector and, to a lesser extent, to the service sector. The reason for this is probably that the ABC system itself has its roots in the manufacturing sector and its application to other business sectors is still less significant (Mabberley, 1992). Therefore, further research may be required to establish whether the use of the ABC system would yield similar benefits to the construction industry as has been reported in other business sectors.

2.4.1 The construction industry in Southern Africa

The construction sector is considered to be the pillar of many economies in the region, according to the Construction Industry Federation of Zimbabwe (CIFOZ, 2010). The industry accounts for a major share of economic activity and is also a catalyst for other sectors (Langston, 2014). In South Africa, for example, the industry has been the backbone of the economy in recent years, as observed by the Master Builders Association of South Africa (MBSA, 2009). This was further boosted by the country's bidding for and successful hosting of the 2010 FIFA World Cup soccer tournament. The event saw several stadiums being built and infrastructure renovated to the value of U.S. $660 million (Building & Woodworkers International, 2009). There is therefore scope for further research to ensure an efficient cost management system in the construction industry.

According to the MBSA (2009), the building and construction industry was worth a combined sector of nearly R123 billion. This made up over 38% of total gross fixed capital formation in 2007. Total building investment, according to the MBSA, rose by 14.4% in 2007. This shows the importance of the construction industry to the development of the South African economy and to job creation for its citizens. As Statistics South Africa (2010) reports, over 461 000 people were employed in the construction industry in December 2006. The impact of the construction industry is deeply rooted in the social wellbeing of human populations, as evidenced by various social housing projects (Garrido & Pasquire, 2011) such as the Mass Housing Project of Namibia (National Housing Enterprise, 2013) and the Reconstruction and Development Programme (RDP) housing project in South Africa (Greyling, 2009).

Whereas South Africa may have found itself in the fortunate position of having a booming construction industry, other regional countries have not enjoyed similar growth. In Zimbabwe, for example, the construction industry used to employ about 150 000 workers, but now has a workforce of fewer than 30 000 workers (CIFOZ, 2010), and in Namibia, the construction industry is struggling to survive (Heita, 2010). Heita (2010) observes that the construction industry in that country experienced a negative growth of 28 percent in terms of total value of contracts completed as of July 2010, compared to the same period in the previous year. The work completed during the period January to July 2010 added up to an insignificant N$76 million in total (Heita, 2010). Thus, in some countries in Southern Africa the

construction sector is experiencing difficulties and this may indicate a need for a change in the costing system employed.

Notwithstanding the importance of the construction industry as outlined above, the researcher found that studies in management accounting and ABC in particular in this sector are limited. The global interest in ABC may demand that more research be conducted into its applicability to the construction industry. The turbulence experienced in this industry outlined above may also call for reform in the sector. Changes such as JIT and Value Engineering systems may have rendered TC systems unsuitable for overhead allocation and project costing. The changes in manufacturing and production techniques have occurred in most business sectors, and Clarke and Mullins (2001) remark that it is important to note that ABC principles are applicable to all types of business sectors.

2.4.2 Construction theories and Cost Accounting Systems

This section investigates whether the costing techniques used in the construction industry have any relationship to or originate from construction theories. This is important since any costing techniques used in construction need to be aligned with construction production theory and should not conflict with theories that have been developed to achieve efficiency in the industry. In this regard, Zimina and Pasquire (2011) posit that traditional arrangements do not generally comply and hamper the full exploitation of lean construction. However, a close similarity may be observed between the underlying principles of the TC and ABC systems and some construction production theories. One important theory of construction production is lean construction, which has been widely explored by the International Group for Lean Construction (IGLC). Lean thinking was first established by Womack, Jones and Ross in 1991 (Womack& Jones, 1996; Bertelson, 2004).Lean construction was pioneered by Koskela who founded the IGLC and developed the transformation flow view (TFV) theory of construction (Ogunbiyi, Oladapo & Goulding, 2014).

Lean construction refers to the application of lean concepts to the construction industry. Lean concepts in manufacturing can be defined as “a management philosophy combined with a set of processes and methodologies which can eradicate and minimise the waste from the production process” (Khataie & Bulgak, 2013:751). These concepts were first introduced in the manufacturing industry

(Garrido & Pasquire, 2011). According to Howell and Ballard (1998), lean thinking redefines performance against three dimensions, namely, a unique customised product, delivered instantly and with nothing in stores. Ideally, this should maximise value and reduce wastage (Howell & Ballard, 1998). As confirmed by Kramer, Henrich, Koskela and Kagiolou (2002), lean construction attempts to manage and improve construction processes at low cost and with maximum value through a consideration of customer value. Similarly, ABC aims to add value and reduce wastage by eliminating non-value adding activities.

A parallel may be drawn between ABC principles and lean construction theory as they both focus on reducing wastage. Kramer *et al.* (2002) argue that lean construction emphasises the acceleration of activities to improve productivity and cost cutting through elimination of waste. Similarly, ABC emphasises the need for insight into the processes and the elimination of non-value adding activities to reduce costs. Waste is defined in lean construction as available costs within activities, which include reworking substandard products or delays and extended activity duration along the critical path (Howell & Ballard, 1998). Womack and Jones (1996) agree that lean thinking is mostly concerned with the elimination of waste. They define waste as any human activity that consumes resources without creating any value. Ohno (1978) identified seven sources of waste in production:

- Overproduction
- Waiting
- Transportation
- Inventory
- Movement
- Making defective products.

Thus, both lean construction and the ABC system focus on the elimination of non-value adding activities in the construction and production processes.

Both lean construction theory and ABC systems emphasise customer value additions and product quality. According to Howell and Ballard (1998), the primary objectives of lean thinking are the value to the customer and throughput. Lean thinking focuses on elimination of waste to improve productivity and client satisfaction, according to Jylhä and Junnila (2013) and Ibrahim, Roy, Ahmed and

Amtiaz (2010). Khataie and Bulgak (2013) add that lean manufacturing is focused on approaches that can help an organisation to reduce the waste factors in its processes. Similarly, one of the first steps in developing an ABC system, according to Garrison *et al*. (2011), is Process Value Analysis (PVA), which helps the manager to eliminate non-value added activities in the company and to improve quality. For example, a PVA analysis performed by Vaughn, Raab and Nelson (2010) showed that only 33.3% of the activities at a Las Vegas casino added value for the customer. Vaughn *et al*. (2010) recommended that management should examine the 66.7% of non-value added activities to determine whether cost savings could be achieved. Therefore, the ABC system could be used by contractors to complement lean construction.

Construction production has evolved over the years. According to Koskela (2000), production in the construction industry has been seen from several different viewpoints since the nineteenth century. Initially, it was viewed as a series of activities, each adding value to the project. Since World War II it has been regarded as a flow taking a time aspect into consideration and later as a value generating effort (Bertelsen, 2002). Koskela (2000) believes that construction is understood in terms of the transformation view, with the lowest prices for the operation, service or job being expected to reduce the total project cost. The transformation view means that production is a series of discrete steps, each independently adding to the value of the product (Bertelsen, 2002). It is clear that the contractor's perception of production may influence his choice of costing system to apply in the allocation of overheads.

TC systems are based on the transformation view of production, which regards production as a conversion of inputs to outputs (Kim & Ballard, 2001; Kramer *et al*. 2002). This view may have led to the tracing of resources directly to outputs as if output varies with resource consumption. However, resource consumption varies with demand for activities, which is made by the products (Hicks, 1999; Horngren *et al*., 2002; Bhimani *et al*., 2012). In other words, products do not exert demand for resources but for activities which consume resources. By taking a transformation view of resource allocation, TC systems assume that all resources have been consumed by products. In fact, not all resources are converted to output; some resources are consumed as waste (Picchi & Granja, 2010; Kim & Ballard, 2001).

Hence, TC systems may produce distorted cost information since they are premised on an incorrect view that production varies with resource consumption.

2.4.3 The application of TC and ABC systems in the construction industry

Traditionally, construction companies use resource based costing (RBC) and volume based allocation to deal with the problem of allocating indirect costs to cost objects (Kim & Ballard, 2002). Resource based costing is a system of allocating overheads directly to cost objects by resource, whereas volume based allocation refers to a system of cost allocation in which costs are assigned to products or services using direct labour hours consumed or contract value. The difficulty with the current system is that companies do not obtain accurate project costs because they fail to allocate overhead costs, or they use a uniform cost driver to assign overhead costs to work divisions (Kim & Ballard, 2002). This makes it difficult to find where money is being made or lost because progress payments for each work division contain overhead costs according to Kim and Ballard (2002). Therefore, using the current system of overhead allocation, contractors may be unable to reduce or influence profitability since the system does not pinpoint how much the contractor has spent on each section of the project.

A job costing system is central to construction project accounting (Kim & Ballard, 2001). In a job costing system a product, service or a batch, which is called a job, constitutes the cost object (Horngren *et al*., 2002). A job costing system captures project expenses as they occur and allocates them to the elements of a project. TC allocates costs directly to project sections or work packages defined in the works contract or bill of quantity as if the costs incurred in the production of these projects or works have any bearing on those works (Kim & Ballard, 2001). The result is a report to management such as that illustrated in Table 2.1. However, there may be no direct relationship between work packages executed and the indirect costs, and such arbitrary allocation of overheads results in inaccurate job costs. Kim and Ballard (2001) argue that this traditional one stage costing, where resources are allocated to products or services directly, is undertaken from the transformation view that conceives production as a conversion of inputs to outputs. They believe that a production process involves a series of activities, some of which are non-value adding and do not transform inputs to outputs but are in fact waste. In a conventional RBC system, costs are assigned to the job, which is sub-divided into cost accounts.

Each resource, such as a supervisor, is a distinct cost account, as reflected in Table2.1.

Kim and Ballard (2001) illustrated the typical reports of a TC system and the problems associated with it in a construction set-up. Their presentation of DEF Construction Inc.'s reports helped them to analyse the problems associated with a TC system's reports. The company had an industrial project, D-890, which had five buildings. Table 2.1 shows the shortcomings of a TC system. The system classifies costs into each resource type such as labour, superintendent and manager. However, management may understand where money has been spent, for example on materials or labour; however, they do not know the cost of the activities or processes that the resources have performed. By reporting costs in terms of resource by resource, the current system provides management with little information on activities and processes that make up the construction project (Kim & Ballard, 2001). Moreover, the costs are not usually assigned to each building with the result that there are no accurate costs for each building (Kim & Ballard, 2001). Hence this costing system is not useful in the management of costs within construction projects.

Table 2.1: DEF Construction cost reporting using RBC (Project D-890)

JOB	DESCRIPTION	COSTS $
10	Form, Foundation Building 01	11,000
20	Form, Foundation Building 02	6,000
30	Form, Foundation Building 03	3,800
40	Form, Foundation Building 01	10,400
50	Form, Foundation Building 02	5,200
60	Form, Foundation Building 03	3,800
	Subtotal	**40,200**
160	Supervisor (1)	5,500
170	Project Engineer (2)	9,000
180	Project Manager (1)	7,500
190	Warehouse guard (1)	3,500
200	Helper	4,000
	Subtotal	**29,500**
	Total	**69,700**

JOB	DESCRIPTION	COSTS $
10	Form, Foundation Building 01 (Material)	3,000
20	Form, Foundation Building 02 (Material)	2,000
30	Form, Foundation Building 03 (Material)	1,500
40	Form, Foundation Building 01 (Material)	8,000
50	Form, Foundation Building 02 (Material)	4,000
60	Form, Foundation Building 03 (Material)	3,000
	Subtotal	21,500
100	Form, Foundation Building 01 (Labour)	8,000
110	Form, Foundation Building 01 (Labour)	4,000
120	Form, Foundation Building 01 (Labour)	2,300
130	Form, Foundation Building 01 (Labour)	2,400
140	Form, Foundation Building 01 (Labour)	1,200
150	Form, Foundation Building 01 (Labour)	800
	Subtotal	18,700
160	Supervisor (1)	5,500
170	Project Engineer (2)	9,000
180	Project Manager (1)	7,500
190	Warehouse Guard (1)	3,500
200	Helper (2)	4,000
	Subtotal	29,500
	Total	**69,700**

Source: *Adapted from Kim and Ballard (2001)*

Table 2.1 and Table 2.2 show cost reports using an RBC system. The reports in Table 2.1 are similar except that the one on the right shows material and labour resources separately.

It is important to note that direct material is similarly allocated to buildings in both RBC and ABC costing systems. Whereas the RBC system allocates direct labour directly to cost centres, in their model of ABC, Kim and Ballard (2001) include direct labour as an indirect overhead that should also be allocated based on a relevant activity cost driver. The rationale behind this classification is that direct labour costs in construction often include activities that can be categorised as manufacturing overheads, such as material handling. Direct labour costs in construction conceal non-value adding activities such as re-workings that are not available in manufacturing (Kim & Ballard, 2001). Therefore, it is possible that ABC may provide an opportunity for management to consider whether their costs are driven by output or particular activities.

Table 2.2: Overhead assignment – Allocation base: Direct labour 9D-890

	BUILDING 01	BUILDING 02	BUILDING 03	TOTAL
Direct Material	$11,000.00	$6,000.00	$4,500.00	$21,500.00
Direct Labour	$10,400.00	$5,200.00	$3,100.00	$18,700.00
Total Direct Costs	$21,400.00	$11,200.00	$7,600.00	$40,200.00
Total Overhead				$29,500.00
Assignment (%)	55.61%	27.81%	16.58%	
Overhead	$16,406.42	$8,203.21	$4,890.37	$29,500.00
TOTAL	$37,806.42	$19,403.21	$12,490.37	$69,700.00

Source: *Kim and Ballard (2001)*

Table 2.2 shows the typical overhead allocation using a TC system basis. Direct costs and material have been allocated to each building. However, overheads totalling $29 500 were allocated in proportion to the amount of direct labour each of the three buildings consumed. On the other hand, Table 2.3 shows the detailed cost drivers, and the resulting cost driver rates obtained using an ABC system.

Table 2.3: DEP Activity data D-890

			The Number of Activities							
Process Costing	**Cost Driver**	**Hierarchy**	**Bld01**	**Bld02**	**Bld03**	**Bld01**	**Bld02**	**Bl03**	**Total**	**Unit Rate**
			(Form)	**(Form)**	**(Form)**	**(Rebar)**	**(Rebar)**	**(Rebar)**		
Setup (Mobilise)	No. of Setup	Task Batch	2	1	1	2	1	1	8	$100
Receive Form	No. of Receipt	Procurement Batch	1	1	1				3	$350
Receive Rebar	No. of Receipt	Procurement Batch				2	1	1	4	$320
Form Moving (Warehouse to Site)	No. of Moving	Delivery Batch	3	2	1				6	$67
Rebar Moving (Warehouse to Site)	No. of Moving	Delivery Batch				3	2	1	6	$50
Forming	Direct Labour hour	Unit	190	90	30				310	$41
Insert Rebar	Direct Labour hour	Unit				60	30	15	105	$32
Rework (Form)	Direct Labour hour	Unit	0	0	30				30	$41
Rework (Rebar)	Direct Labour hour	Unit				0	0	10	10	$32
Inspection (Rebar)	No. of Inspection	Hand-off Batch	2	1	2				5	$240
Inspection (Rebar)	No. of Inspection	Hand-off Batch				2	1	2	5	$180
Procurement	No. of Purchase orders	Procurement Batch	0.33	0.33	0.33	0.33	0.33	0.33	2	$1,400
Progress Payment	No. of Payment	Procurement Batch	0.33	0.33	0.33	0.33	0.33	0.33	2	$1,100

			The Number of Activities							
Process Costing	**Cost Driver**	**Hierarchy**	**Bld01**	**Bld02**	**Bld03**	**Bld01**	**Bld02**	**Bl03**	**Total**	**Unit Rate**
			(Form)	**(Form)**	**(Form)**	**(Rebar)**	**(Rebar)**	**(Rebar)**		
Q/A Quality Assurance	No. of NCR (Non Conformance Reports)	Hand-off Batch	0	0	1	0	0	1	2	$2,750
RFI (Request for Information)	No. RFI	Task Batch	2	0	0	1	0	1	4	$1,050
General Supervision	Proportional to Direct Labour Hour	Project	43%	21%	12%	13%	6%	4%		

Source: *Kim and Ballard (2001)*

Table 2.3 demonstrates that in ABC systems, process (activity) costs and the cost driver units are identified for each building and section. Using these cost driver rates, an activity based cost report is generated in Table 2.4. This table reflects the accumulation of costs using cost driver rates to allocate the $29 500 of indirect overheads.

Table 2.4: Cost report D-890

	Bld01 - Form	Bld02 - Form	Bld03 - Form	Bld01 - Rebar	Bld02 - Rebar	Bld03 - Rebar	Total
Direct Material (1)	$3,000	$2,000	$1,500	$8,000	$4,000	$3,000	$21,500
Process Costing							
Setup (Mobilise)	$200	$100	$100	$200	$100	$100	
Receive Rebar	$350	$350	$350	-	-	-	
Receive Form	-	-	-	$640	$320	$320	
Form Moving (Warehouse to Site)	$200	$133	$67	-	-		
Rebar Moving (Warehouse to Site)				$150	$100	$50	
Forming	$7,790	$3,690	$1,230	-	-	-	
Insert Rebar	-	-	-	$1,920	$960	$480	
Rework (Form)	-	-	$1,230	-	-	-	
Rework (Rebar)	-	-	-	-	-	$320	
Inspection (Form)	$480	$240	$480	-	-	-	
Inspection (Rebar)	-	-	-	$360	$180	$360	
Procurement	$417	$417	$417	$417	$417	$417	
Progress Payment	$333	$333	$333	$333	$333	$333	
Q/A (Documentation)	-	-	$1,750	-	-	$1,750	
RFI	$2,100	-	-	$1,050	-	$1,050	
General Supervision	$5,335	$2,667	$1,530	$1,597	$795	$528	
Process Costing Total (2)	$17,205	$7,930	$7,487	$6,667	$3,205	$5,706	
Total (1) + (2)	$20,205	$9,930	$8,987	$14,667	$7,205	$8,706	$69,700

Source: *Kim and Ballard (2001)*

Both Table 2.2 and 2.4 show the total costs of buildings 1, 2 and 3. A significant problem is that the total costs of each building reported by the TC system in Table 2.2 differ from those reported in Table 2.4 under the ABC system. These differences are summarised in Table 2.5.

Table 2.5 reflects a comparison of the total job cost results reported by a resource based costing system on the one hand, and by an ABC system on the other. The cost disparities between the two systems are distinctive. For example, the total costs for buildings 1 and 2 are 8% and 13% higher respectively when reported by an ABC system than by an RBC system, whereas building 3's total costs are 41% higher under the RBC system. This is because an RBC system over-costs projects with a higher volume of direct labour and under-costs those with a low volume of direct labour.

Table 2.5: A comparison of RBC and ABC cost results D-890

	RBC				**ABC**		
	Direct Material	**Direct Labour**	**Overhead**	**Total**	**Direct Material**	**Process Costs**	**Total**
Building 01	$11,000.00	$10,400.00	$16,406.00	**$37,806.00**	$11,000.00	$23,872.00	**$34,872.00**
Building 02	$6,000.00	$5,200.00	$8,203.00	**$19,403.00**	$6,000.00	$11,135.00	**$17,135.00**
Building 03	$4,500.00	$3,100.00	$4,890.00	**$12,490.00**	$4,500.00	$13,193.00	**$17,693.00**
Total	$21,500.00	$18,700.00	$29,500.00	**$69,700.00**	$21,500.00	$48,200.00	**$69,700.00**

Source: *Kim and Ballard (2001)*

The variances in the total costs reported by the TC system and the ABC system highlight the need to determine which of these cost systems is more appropriate for the construction industry. The results summarised in Table 2.5 confirm the view of Horngren *et al.* (2002) that, by using an inappropriate allocation base, TC systems cause product cross-subsidisation by over-costing a product with a high resource consumption and under costing one with a low resource consumption (Mabberley, 1992).

Further testimony to the cost distortions brought about by the use of RBC is revealed in a case study by Hicks (1999). Hicks's analysis is based on Small Manufacturing Ltd's costing systems. This company won 10 contracts and management wanted to know the cost of the contracts using TC systems and using the new system, ABC.

The contract costs are summarised in Table 2.6. This table excludes throughput or direct labour costs since these are charged similarly by both costing systems (Hicks, 1999). The results reflected in Table 2.6 reveal a marked disparity in total costs for each of the 10 contracts. Contract four, for instance, is under-costed by $42,881, or 33.1%, when costed by TC systems. Since the TC system used direct labour hours to allocate overheads, contract four's machine cost was undercharged when using the TC system. Contract six, however, costs $31,765 or -20.7% less under ABC than the TC system, because contract six had higher assembly hours than machine hours, and the former were over-costed by the TC system (Hicks, 1999). Therefore, it appears that TC systems tend to over-cost high volume labour intensive contracts while under-costing low volume machine intensive contracts.

Table 2.6: Cost reports of Small Manufacturers Ltd

	Traditional Costing	Activity based Costing	Cost Difference
Contract 01	103,899	107,743	3.7%
Contract 02	86,142	101,664	18.0%
Contract 03	234,699	252,406	7.5%
Contract 04	129,722	172,603	33.1%
Contract 05	102,874	118,293	15.0%
Contract 06	153,783	122,018	-20.7%
Contract 07	127,464	126,910	-0.4%
Contract 08	246,776	217,502	-11.9%
Contract 09	181,239	162,742	-10.2%
Contract 10	165,330	151,291	-8.5%

Source: *Adapted: Hicks (1999)*

Table 2.6 reveals that in some instances a TC system produces accurate results of product costs (Hicks, 1999). For example, contract seven in Table 2.6 above shows that there is a difference of only -0.4% in the total costs computed by TC systems and ABC; contract seven had machine hours amounting to 7.5% of the company's resources and labour hours of 6.7%. Contracts with such an average mix of the

company's resources will produce nearly accurate contract costs notwithstanding the over-generalised costing systems used (Hicks, 1999). Hicks argues that such contracts are unusual since contracts are different in the way they consume the company's overhead resources. Over-generalised costing systems will therefore almost always produce distorted costing results (Hicks, 1999).

2.4.4 Conclusion

This section has demonstrated that TC and ABC systems both have some relevance to construction production theories. The traditional transformation view of production explained in this section may be the basis for applying TC systems in construction project costing whereas the modern construction theory, lean construction, may be more suitable to the application of the ABC system. Furthermore, the section also explained how the use of TC systems in construction project costing can produce distorted product cost results. Although ABC systems on the other hand may produce more accurate project costing, there are several problems related to their implementation. Researchers such as Innes and Mitchell (1998) and Sartorius and Kamala (2007) have found a number of weaknesses in ABC implementation. In the following section the problems associated with the ABC system are explained.

2.5 THE SHORTCOMINGS OF THE ABC SYSTEM

ABC has been hailed for removing the product cost distortions of conventional costing systems (Kim & Ballard 2001; Raab, Mayer, Shoemaker & Ng, 2009). Literature abounds with descriptions of ABC bringing great benefits to companies, ranging from accurate product costs, cost savings, and improvements in operational efficiency, to increases in profitability and cash flows (Cooper & Kaplan, 1992; Kim & Ballard, 2001; Cokins, 2002; Turney, 2010). The system is credited for giving accurate cost per customer (Coulter, McGath & Wall, 2011) and reducing costs (DeFreitas, Gillett, Fink & Whitney, 2013). The ABC system provides a better understanding of net margins, which according to Coulter *et al.* (2011), is invaluable for portfolio optimisation.

The ABC system as the basis for activity-based budgeting (ABB) has also been credited with providing a useful basis for the budgeting process, while combining ABC with an establishment of standard costs is said to allow detailed variance analysis, activity capacity profiling and utilisation assessment (Innes & Mitchell,

1998). These authors however noted that a few limitations were reported about the ABC system. This arises from the fact that much of the available literature on the system emanates from those with a vested interest in the system, such that success stories on the system dominate publicly available information (Innes & Mitchell, 1998). As Drury and Tayles (2005) observe, the use of ABC in the 1990s may have been exaggerated as some companies claimed to use it in the expectation that this would improve their image. This section discusses some of the limitations of ABC that may have limited its adoption by some companies.

2.5.1 ABC assimilation and limitations

A very useful survey on the implementation of ABC is discussed by Innes and Mitchell (1998). The survey was initiated by the Chartered Institute of Management Accountants (CIMA) and involved over 187 companies as respondents. Of these companies, over half (95) had not seriously considered ABC, one third (60 companies) were vetting it, six percent (11 companies) had commenced implementation while nine percent (seven companies) had totally rejected it. These statistics further confirm that ABC has not been widely embraced and that companies have treated the advantages with which it is associated with caution. Caplan (2010) also found no evidence of ABC assimilation as 50% of companies used variable costing and 50% used absorption costing for internal reporting purposes. Similarly, Mclellan and Moustafa (2013) have found that companies in the Gulf-Cooperation Council (GCC) still rely on traditional management accounting practices rather than the more recently developed tools such as activity based management (ABM). However, the survey by Innes and Mitchell (1998) is significant as it highlights the practical problems faced by companies that have implemented ABC and those that have rejected it. These limitations are briefly explained in the paragraphs below.

The companies rejecting or considering an ABC system experienced several problems or potential problems with the system. According to Innes and Mitchell (1998), staff concerned with accounting in these companies had attended ABC courses and some had sourced the services of ABC consultants to assess the system. The problems discussed below were thus raised by people who had an understanding of the system and had invested in it. The commonest problem experienced with ABC as expressed by respondents was the amount of work

involved in installing the system. The interviewees stated that too much detail was required and they foresaw a heavy workload being required to identify activities, select cost drivers and collate the raw data relating to these cost drivers and to link them to specific products. This finding is supported by Sartorius and Kamala (2007) whose respondents also stated that the implementation of ABC involved the collection of a great deal of data. For this reason, it is plausible to assume that construction companies that implement the ABC system are also confronted with the same challenges.

Further drawbacks of the ABC system have been raised by researchers. For instance, the most significant complication of ABC lies in the fact that the information generated by the system provides an entirely new cost database, making the previous one obsolete (Doyle, 2002). He argues that modifying the cost information may have a considerable impact on organisational culture, something for which management may not be ready. Furthermore, Innes and Mitchell (1998) found that ABC systems use cost data from traditional accrual-based costing procedures and this means that cost information generated by an ABC system is affected by the arbitrary nature of temporal allocations such as depreciation and other provisions and amortisations. Innes and Mitchell (1998) also argue that some overheads such as rent, rates and insurance belong to more than one cost pool and need to be apportioned among them. The need for this apportionment brings more arbitrariness to the ABC system and reduces the accuracy of the information it generates (Innes & Mitchell, 1998). For this reason, ABC may suffer from the same inaccurate product costs as conventional costing systems.

However, the proponents of ABC systems agree that the system is not itself precise. For example, Cokins (2002) observes that the motto of ABC is that it is better to achieve almost accurate cost information than to provide completely inaccurate product cost information as is the case with TC systems. The ABC system may not be regarded as a perfect system but rather as a suitable system with which to replace the current system that provides incorrect cost information. Moreover, with sufficient support from management the ABC system could succeed in providing relevant cost information for the organisation (Byrne, 2011).

On the other hand, Sartorius and Kamala (2007) highlight important information regarding the implementation of ABC in South Africa. Their research shows both the

benefits and limitations of ABC. According to their findings (Sartorius & Kamala, 2007), ABC implementation rates in South Africa are still very low, with only 21 or 12% of the 181 responding JSE-listed companies having implemented the system. The research reveals that ABC implementation has been most widespread in the non-cyclical consumer goods sector, followed by the mining and then the banking sectors. Unfortunately, Sartorius and Kamala (2007) do not show the extent of ABC implementation in the construction industry in South Africa; it is thus assumed that ABC assimilation in the industry could still be low as is the case in other sectors. The findings of Sartorius and Kamala (2007) therefore contradict the declaration by Kuo and Yang (2012) that ABC has spread among many industries in many countries, as well as the findings of Abbas and Wagdi (2014), who claim that many Egyptian companies are adopting ABC. Abbas and Wagdi (2014) found that 56% of the companies were using the ABC system, with only 5.3% applying resource consumption accounting and 38% other systems.

According to Sartorius and Kamala (2007), respondents gave various reasons for the adoption of ABC in South Africa. Most respondents indicated that consultants had revealed that clients who had implemented ABC wanted the benefit of accurate product costs in order to control and minimise costs, to allocate costs accurately and to gain a better understanding of costs and cost setting activities. Other reasons included to:

- conduct customer and product profitability
- make profit related decisions, a result of pressure from suppliers and competitors
- enhance pricing decisions,
- simplify negotiations,
- support the pricing of contracts, and
- improve the budgeting process.

These reasons are consistent with those given for adopting ABC in developed countries (Sartorius & Kamala, 2007) and also mirror the findings of Vij (2012) that the hotel sector in India implemented ABC in order to benefit from improved cost allocation, higher levels of accuracy, customer profitability analysis and cost reductions. There are several reasons for this similarity. Sartorius and Kamala

(2007) argue that, firstly, many JSE-listed South African companies originated in developed countries and may have therefore adopted ABC for the same reasons as companies in developed countries. Secondly, there are similarities in the changes that have occurred in the business environment in South Africa and abroad, including advances in IT automation, product diversification, deregulation and globalisation, all of which create similar demands for companies worldwide. Therefore, the implementation of the ABC system may be feasible in both developed and developing countries.

According to Sartorius and Kamala's (2007) findings, several reasons were given by South African companies for not implementing ABC. Chief among these was the lack of management support (Sartorius & Kamala, 2007; Cinquini, Vitali, Pitzalis & Campanale, 2009). Other problems cited include the fact that ABC gives rise to difficulties associated with the collection and accumulation of data and the determination of cost pools, cost drivers and the level of detail. Also significant in the research by Sartorius and Kamala (2007) is their findings regarding the five key success factors in ABC implementation in South Africa, which are:

- A commitment from top management
- Adequate training of personnel
- Use of cross functional teams during implementation rather than teams from accounting departments only
- Adequacy of high quality resources
- Selection of an appropriate ABC model, software, systems and reliable data.

Notwithstanding the contribution made by Sartorius and Kamala (2007), their research may be limited in that it does not indicate the extent of success or failure of the ABC system in those companies where it has been adopted. It may be insufficient to deduce the extent and reasons for implementing or not implementing ABC without establishing to what extent the system has fared in those companies that have adopted it. Such information could be of paramount importance to companies that are considering implementing ABC and would probably explain why there is a low implementation of ABC in South Africa. In addition, researchers in some developed countries (e.g. Rabia, 2013) have discussed the extent of the success or failure of ABC in companies where it has been adopted.

2.5.2 Reasons for not implementing ABC

According to Sartorius and Kamala (2007), the following are reasons for not implementing ABC.

Table 2.7: Summary reasons for not implementing ABC

Technical	Top Clients
1. Too expensive including cost of IT 2. Does not add value 3. Too detailed, time consuming 4. Lack of skills, high staff turnover (ABC skills) 5. Difficulties with data. 6. Difficulty configuring ABC with other systems, IT 7. Difficulty identifying suitable cost drivers 8. Difficulty defining cost pools, cost 9. Lack of adequate systems	1. ABC only suited to manufacturing 2. Inadequate marketing of ABC 3. Negative publicity about ABC 4. Takes time to assess, be accepted **5.** High expectations of clients
Misconceptions about ABC	**Satisfaction with other systems**
1. ABC only suited to manufacturing 2. Inadequate marketing of ABC 3. Negative publicity about ABC 4. Takes time to assess, be accepted **5.** High expectations of clients	1. Satisfaction with current system 2. ABC not suited to business sector

Source: *Sartorius and Kamala (2007)*

The technical difficulties identified by Sartorius and Kamala (2007) have been found in other studies. For example, Chiarini (2012) found that despite ABC being the best accounting system for SMEs, it is not easy to operate compared to other systems and requires investment in IT throughout the company. Similarly, Lopez (2013) concluded that the ABC is very accurate but consumes a great deal of resources.

Similarly, Wegmann (2011) and Raeesi and Amini (2013) listed other pitfalls of ABC systems:

- ABC systems are costly to implement, time consuming and inflexible.
- Failures have been observed, particularly in the service industry.
- Many users believe that the ABC system is too complex.

Garrison *et al*. (2011) also identified problems with the system. According to these authors, the ABC process of collecting information and identifying activities is rigorous and time consuming. They argue that ABC can be very expensive to implement. Garrison *et al*. (2011) and Stout and Popri (2011) confirm that implementing an ABC system is a project that requires a substantial investment of the company's resources. Similarly, Nassar, Al-Khadash, Sangster and Mah'd (2013) conclude that the greatest barrier to the adoption of the ABC system in Jordanian companies is its high cost of implementation and the high cost of ABC consultancy and computer staff time. The system was abandoned by many users in France because of its complexity, according to Levant and Zimnovitch (2013). Despite being more precise in allocating overheads, the ABC system is a costly alternative to the TC system (Lelkes & Deis, 2013); as a result research has established that some managers are not persuaded by the effectiveness of the system according to Cohen, Venieris and Kaimenaki (2005).

A significant drawback of ABC is that its benefits in the form of improved cost information may not outweigh its costs (Garrison *et al.*, 2011). Furthermore, reports generated by the ABC system do not comply with the generally accepted accounting principles, which means that a company using the ABC system still needs to have a TC system (Garrison *et al.*, 2011). As a result, consultants and practitioners as well as academics have realised over the past few years that activity-based costing systems have yielded less than the desired results (Stratton, Desroches, Lawson & Hatch 2009).

The ABC system has thus not been widely adopted since its introduction in the 1980s, notwithstanding its perceived technical viability (Velmurugan, 2010), owing to several factors. The number of companies considering ABC implementation fell in the first decade of the 21st century, at the same time as the number of companies that quit ABC after analysing the costs and benefits rose (Wnuk-Pel, 2010). As a

result, refined overhead costing systems such as ABC are wasteful and their narrow focus on local performance measures hampers the organisation in its efforts to reach its ultimate goal, according to Krishnan, Mistry and Narayanan (2012). The majority of companies that have adopted the ABC system are only using it tentatively, according to Velmurugan (2010). However, it is evident that there is a contradiction among researchers regarding the adoption of the ABC system. For instance, Fischer (2013) declares that ABC works and advocates such as Cooper and Kaplan (1992); and Caplan (2010) have recorded growing interest in the ABC system.

2.5.3 Conclusion

This section has shown that there appear to be as many problems associated with ABC as there are benefits to be gained from the system. Although the system produces accurate product costs, gives a better understanding of costs and what influences them, it has also been seen as difficult to implement, time consuming and requiring a certain degree of staff skill and turnover stability. However, researchers have also found that the problems associated with the ABC system arise not from the system itself, but from factors such as lack of commitment by senior management and poor training in the system. As a result, it may be necessary to established whether the benefits of ABC really outweigh its limitations.

2.6 SUMMARY

The literature provides an explanation of the problem of allocating indirect overheads to products. Indirect overheads do not vary with activity level and would still be incurred even if construction activity was stopped. Kim and Ballard (2001) found that construction companies use resource-based costing and volume-based allocation to deal with the problem of allocating indirect costs to cost objects. However, the use of volume-based OARs in allocating overheads distorts product costs, according to Horngren *et al.* (2012) and causes product cross-subsidisation as projects with a high volume of direct labour are over-costed while those with a low volume are under-costed (Hicks, 1999; Kim & Ballard, 2001).

In response to the product cost distortions that result from the use of TC systems, ABC has been developed. The system removes the cost distortions since it uses multiple cost drivers (Hansen, 1985). Moreover, the system accepts that it is activities that drive costs and traces overheads to activities before allocating them to

products. As a result, the system produces more accurate product costs, which has led companies to move away from TC systems in favour of the ABC system (Charaf & Bescos, 2013).

Difficulties with TC systems emanated from several environmental changes affecting businesses (Milne & France, 2012). Organisations now manufacture heterogeneous products that consume resources differently (Innes & Mitchell 1998). Other changes in business include advances in technology, increased competition and a shift from a manufacturing-based to a service oriented economy (Milne & France 2012). Moreover, growing domestic and foreign competition (Horngren *et al.,* 2002; Duh *et al.,* 2009; Kuma, 2013) has shortened product life cycles (Sartorius & Kamala 2007) and changing cost structures have forced manufacturers to search for a better understanding of their accounting systems (Reyhanoglu, 2008). With global changes affecting businesses in all sectors, the design of TC systems has been rendered obsolete (Wilson & Chao, 1999).

As TC systems became less useful, the ABC system emerged as an important tool in business (Novak *et al.,* 2011). The ABC system was credited with providing greater insight into what drives costs (Cokins, 2002) and eliminating non-value adding activities and wastage (Garrison *et al*., 2011). The system gives accurate product costs and supports the pricing of contracts (Sartorius & Kamala, 2007). With improved cost allocation and cost reduction, profitability of the organisation improves with the implementation of the ABC system (Vij, 2012).

Another benefit of the ABC system is its alignment with construction production theory. The literature reveals that ABC aligns with Lean Construction (LC) theory. Both LC and ABC take the flow view of production, which views production as a series of value adding and non-value adding activities (Bertelsen, 2002). LC and ABC emphasise elimination of non-value adding activities and waste. On the other hand, TC systems are based on the transformation view which perceives production as a conversion of inputs to outputs (Kramer *et al.,* 2002). This system views all inputs and activities as value adding and therefore ignores wastage. Consequently, TC systems are inconsistent with modern construction production theory and may hamper the full implementation of lean construction (Zimina and Pasquire, 2011).

Notwithstanding the benefits of the ABC system, the literature shows that the system has not been widely adopted. The argument of Weetman (2003) and Charaf and Bescos (2013) that companies are moving away from TC systems in favour of the ABC systems is contradicted by several researchers. For example, Adamu and Olotu (2009) and Wegmann (2011) found that more companies still use TC systems than the ABC system despite the former's cost distortions. Cohen, *et al* (2005) also found that managers are not persuaded by the effectiveness of the ABC system, while Kroll (1996) maintains that TC systems are still relevant. Subsequently, a study by De la Villarmois (2011) established that TC systems were the most widespread, used alone or with the ABC system.

The literature review revealed that assimilation of the ABC system has been slow because of the weaknesses inherent in the system. ABC is difficult to operate compared to other systems (Chiarini, 2012); it is too complex, time consuming and inflexible (Wegmann, 2011; Raeesi & Amini, 2013; Innes & Mitchell, 1998); and it requires a substantial investment of the company's resources (Stout & Popri, 2011). As a result, its implementation in Jordanian companies was hampered by the high costs of consultation (Nassar *et al.,* 2011) and in France by its complexity (Levant & Zimnovitch, 2013). In South Africa, Sartorius and Kamala (2007) found that only 12% of JSE listed companies had implemented ABC, while Mclelland and Moustafa (2013) found that most companies in the Gulf Cooperation Council still relied more on traditional management accounting practices than on the ABC system.

It appears, therefore, that TC systems are still relevant and Cokins (2002) has established that ABC systems and TC systems are complementary. He argues that TC systems produce incomplete information. An ABC system, however, rectifies this deficiency by converting the general ledger balances produced by TC systems into activity costs and assigning the activity costs to cost objects (Cokins, 2002). Consequently, Garrison *et al.* (2011) established that many companies that use the ABC system have two costing systems. One can thus conclude that both TC and ABC costing system are essential and that organisations would be advised to use an ABC system for internal reporting and decision-making and a TC system for external reporting. The following chapter outlines the research design and explains the methodology of collecting primary data from respondents.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

TC systems may distort project cost results when used in the construction industry in Southern Africa, whereas the use of ABC systems may prevent these distortions. Distorted project cost results arise when volume-based OARs are used to allocate indirect overheads to projects. However, the use of multiple activity cost drivers to allocate indirect overheads may produce more accurate project costs. For the purpose of tracing overhead costs to projects, construction companies have used both TC and ABC systems. Therefore, the need arises to determine which of these costing systems provides the best results regarding a project's cost and performance for management's information and decision-making purposes. The following research questions are the basis of this study:

- Do TC systems produce distorted cost results when used in the construction industry in Southern Africa?
- What are the causes of cost distortions in TC systems?
- Does the ABC system prevent cost distortions when used in the construction industry?
- To what extent has the ABC system been adopted by construction companies in Southern Africa?
- Which costing system is most suitable for the construction industry?

in order to answer the above research questions, a proper research strategy was implemented. In Section 3.2 the research technique is highlighted and a justification of the instrument used in this research project is provided. The data collection process for the study is explained and the methods of analysing data are summarised in Section 3.3. This part of the study was qualitative in nature and for this reason a questionnaire was used as the data collection instrument. Section 3.4 covers the advantages and limitations of this questionnaire. The use of both textual and statistical techniques to analyse the data resulted in the use of a mixed method approach. This chapter concludes with the ethical considerations and a summary of this research in Sections 3.5 and 3.6.

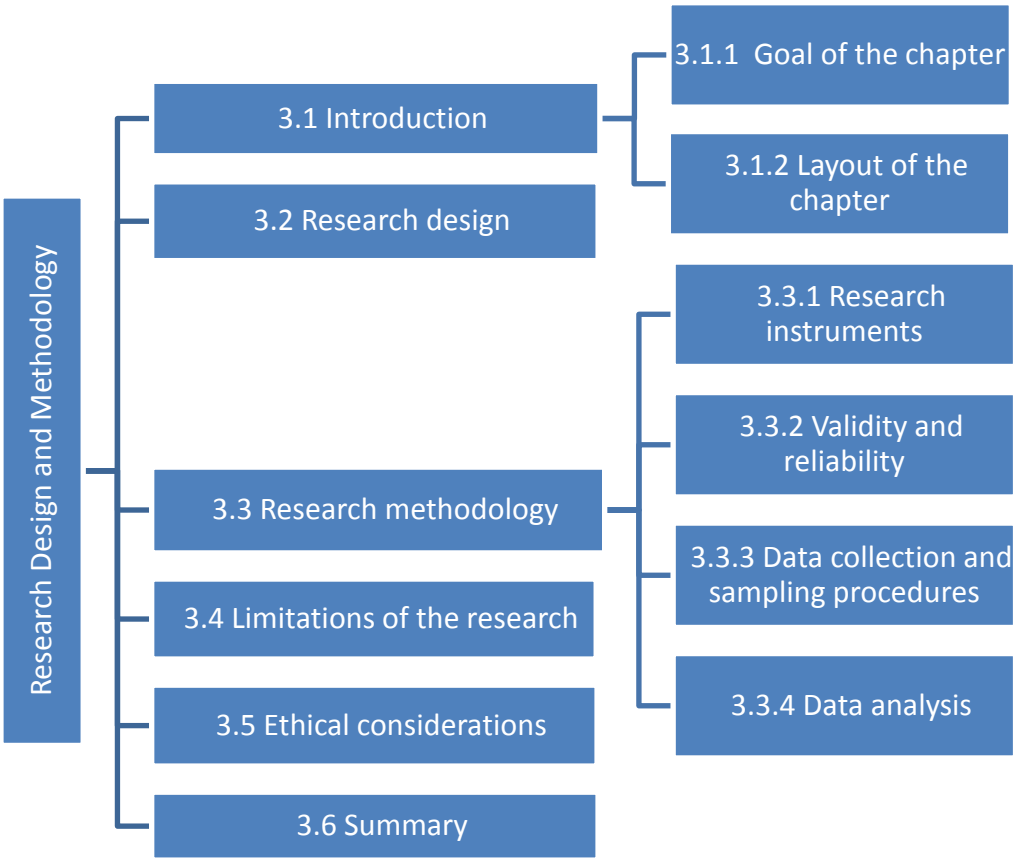
3.1.1 Goal of the chapter

The goal of this chapter is to discuss the research methods that were employed in the study.

3.1.2 Layout of Chapter 3

Figure 3.1 depicts the layout of this chapter.

Figure 3.1: Layout of Chapter 3



3.2 RESEARCH DESIGN

An extensive review of the literature from the past 5 years was conducted in order to sketch the background of the study and to ascertain what research had been done in the past. Academic articles were accessed from Google Scholar and the Unisa library. Academic textbooks were also used to inform the discussion of the theoretical background. This research included a survey research which adopted the questionnaire as the prime data collection instrument. Questionnaire surveys involve the gathering of information from individuals using a formally designed schedule of questions called a questionnaire or interview schedule (Veal, 2005). The surveys

may be interviewer completed or respondent completed. In the case of interviewer completed questionnaires, the interviewer reads the questions to the respondent and fills in the questionnaire or records the response. However, when the questionnaire is respondent completed, respondents complete the questionnaires in the interviewer's absence. In the case of this study, a link to the Lime Survey questionnaire was sent electronically to the respondents.

This research adopted the questionnaire method for a number of reasons, namely:

- The use of questionnaires involves transparent research procedures. With questionnaire surveys, how the information has been collected and how it has been analysed is clear for everyone to see (Veal, 2005). Transparency is particularly important in this research study to enable the findings and recommendations to be used to influence the choice of costing systems in the construction industry.
- The population for this study was distributed over a very large geographical area of three countries. With respondents so widely dispersed, a research method was required which would ensure contact between the researcher and respondents, without necessarily being face-to-face. The distribution of the questionnaires by email ensured that a large sample of this dispersed population could be reached. Moreover, given the dispersion of the respondents, an economical research technique in terms of both time and resources was required. Distribution of questionnaires and the analysis of data is less time consuming and less costly than other investigation methods (Clarke & Mullins, 2001).
- Questionnaires allow respondents more time to reflect on the questions and possibly to look up records so that they can give carefully deliberated or more precise answers (Clarke & Mullins, 2001). It was conceivable that respondents needed to access references regarding some issues such as TC and ABC systems. This ensured that reliable data was provided, and that valid conclusions were drawn.
- This research required particular information about some entities that may be regarded as sensitive or confidential. For example, whether or not an entity has implemented ABC or the benefits an entity has enjoyed from a particular costing system may be regarded as business confidential

information. The issue of confidentiality, therefore, arose and a technique was required that assured the respondent that the information supplied would be treated as confidential. The questionnaire method guarantees greater confidentiality to the respondent a face-to-face interview.

Although the questionnaire was regarded as the most suitable technique for this research study, it has its own setbacks. For example, the information provided by respondents depends on their ability to recall issues, their honesty and the nature of the questions included in the questionnaire (Veal, 2005). However, the criticism that questionnaires depend on the honesty of respondents and the nature of questions may apply to many research techniques, including face-to- face interviews.

Another weakness of the questionnaire technique is that respondents are affected by the urge to be helpful and friendly (Veal, 2005). Respondents may, therefore, exaggerate the benefits they receive from a costing system while downplaying its weaknesses, in order to influence the research. Therefore, the researcher and user of the results should always bear in mind the nature and source of data and should not be led to believe that information presented in numerical form and in large numbers represents an immutable truth (Veal, 2005). An example of this would be data collected from management consultants who may already have an interest in a particular costing system.

3.3 RESEARCH METHODOLOGY

In this section the research instrument, measures to ensure reliability and validity, the data collection and sampling techniques and the data analysis are discussed.

3.3.1 Research instruments

The data was collected by means of questionnaires addressed to construction companies and consultants. The purpose of this study was to establish whether or not ABC would produce more accurate project costs in the construction industry. The questionnaires were designed to provide answers to the research questions. Questions were grouped in sections in order to establish:

- Whether or not the use of TC systems in the Southern African construction industry distorts project cost information
- The causes of cost distortions in project costing

- Whether or not the use of ABC in project costing removes cost distortions in construction projects
- Establish the extent of ABC assimilation in the construction industry in Southern Africa
- Determine the most suitable costing system for the construction industry in Southern Africa.

The questionnaire was chosen for its efficient method of collecting reliable data that can be quantitatively analysed. The research made use of two structured questionnaires containing both close and open-ended questions. Structured, in this case, means that the questionnaire was presented in exactly the same wording and order to all the respondents. Structured questionnaires have the advantage of being simple to administer and relatively inexpensive to analyse (Kothari, 2004). Although structured questionnaires cannot collect a very wide range of data in the respondent's own words, they provide alternative replies which further help the respondent to understand the questions clearly. An alternative to this would be the use of unstructured questionnaires.

Unstructured questionnaires provide the interviewer with a general guide to the type of information to be obtained; however, there are no specific questions outlined, and the responses should present as far as possible in the respondent's own words (Kothari, 2004). Unstructured interviewer completed questionnaires would have the advantage of capturing the answers in the respondent's own words through the use of voice recorders. However, interpretation of what was said may be difficult and this becomes costly in terms of both time and resources. Furthermore, respondents may feel that they are not protected when information that is collected can be easily traced back to them, especially in cases where voice recorders are used.

The questionnaire was dominated by close ended questions and included fewer open ended questions. Close ended questions avoid ambiguity in the responses and can therefore be easily interpreted. They are also more likely to elicit responses from the interviewee, who sees them as easy and less time consuming than open ended questions. However, the nature of this research demanded the use of some open ended questions. For example, the comments on the success or failure of a costing system can hardly be established through close ended questions. Although such

open ended questions invariably achieve a low response they remain the best option in obtaining responses requiring expansive answers (Veal, 2005).

The questionnaire was addressed to management accountants and senior managers of construction companies and consultants since these individuals have the expertise and knowledge of the system in use. Accompanying the questionnaire was an introductory letter (Appendix A) explaining the purpose of this study. The letter also explained how important it was for the respondents to complete the questionnaire. Details of respondents were accessed on websites of regulatory bodies of construction companies. The researcher obtained the email addresses from these websites and emailed the links to the questionnaire to these. The questionnaire for consultants was sent directly to the auditors or accountants at the construction companies.

3.3.2 Validity and reliability

The validity of a measuring instrument is the extent to which it measures the variable it is designed to measure. It answers the question of whether or not the methods of collecting data are actually collecting what one intends to collect (Wagner, Kawulich & Garner, 2012). Reliability, on the other hand, refers to how consistently a measuring instrument produces the same results each time the instrument is administered. Reliability establishes the dependability of the instrument while validity suggests truthfulness (Neuman, 2011). Validity, therefore, comes before reliability as there would be no need to test the reliability of an instrument if its validity was suspect. This indicates that an instrument is inappropriate if it produces consistent results but does not measure the constructs for which it is intended.

However, both reliability and validity are important to the researcher. They “are ideas that help to establish the truthfulness, credibility, or believability of findings” (Neuman, 2011:208). Consequently, the questionnaires used in this study were designed to obtain both valid and reliable measurements. According to Kashora (2006:56), the following questions should be asked about each question in a questionnaire:

- Should the question be included at all?
- Is the question of proper scope?
- Can the participant answer the question adequately?

- Will the participant willingly answer the question?

Answers to these questions improved the quality of the questionnaires. in this study, questions that did not help to answer the research questions were excluded from the questionnaire. The questions were also designed to cover only one aspect at a time and there were no double-barrelled questions in the questionnaires. Table 3.1 summarises how the validity and reliability of the questionnaires were established.

Table 3.1: Validity and reliability

Characteristic	Method used
Validity	• Phrasing the questions concisely to avoid ambiguity • Checking appropriateness of responses to structured questions • Asking of each question: does it help to answer the objectives? • Including questions that covered generally agreed views about costing systems • Asking how well each question related to the findings in the literature
Reliability	• making questions easy enough for respondents to comprehend them easily • Covers only one aspect in each question • providing clear instructions in the questionnaire • Avoiding leading questions

Source: *Own*

All necessary steps were taken to achieve validity and reliability of the findings in this study.

3.3.3 Data collection and sampling procedures

This section explains how the population was identified, as well as the procedures that were adopted to draw a representative sample of the population. A population "is the abstract idea of a large group of many cases from which a researcher draws a sample and to which results from a sample are generalized" (Neuman, 2011:241).

According to Castillo (2009), a research population consists of individuals or objects with a common, binding characteristic or trait. For example, building contractors are a research population in that the members of this group have homogenous characteristics as they are all engaged in the business of building contracting. There are two types of populations in research, namely a target population and an accessible population.

Castillo (2009) observes that a target population is the entire group of individuals on which the findings of the research are generalised. From this definition, it is clear that owing to resource and time constraints some members of this population may not be accessible. The population which the researcher can reach is called the accessible population or study population. It is therefore a subset of the target population (Castillo, 2009) whose nature depends on the availability of time and resources to the researcher (Yount, 2006).

From the accessible population a sample is drawn. This sample should be a representation of the population from which it is drawn and should be of sufficient size to enable statistical analysis (Castillo, 2009) “otherwise the results of the population will be misleading when applied to the population as a whole” (Yount, 2006:72). Specific steps should therefore be taken in selecting the sample. According to Yount (2006), these steps are:

1. Identification of the target population
2. Identification of the accessible population
3. Determining the size of the sample
4. Selecting the size of the sample.

The data for this study was obtained from finance managers, accountants, consultants and other officers in the construction industry in Southern Africa. For the purpose of this study Southern Africa referred to the 15 Southern Africa Development Community (SADC) member states. The sample was drawn from three of the 15 countries, namely Namibia, South Africa and Zimbabwe. This represents an accessible population of one fifth or 20% of Southern Africa.

The three countries were chosen as they have divergent systems and their construction industries are in different developmental stages. South Africa is widely

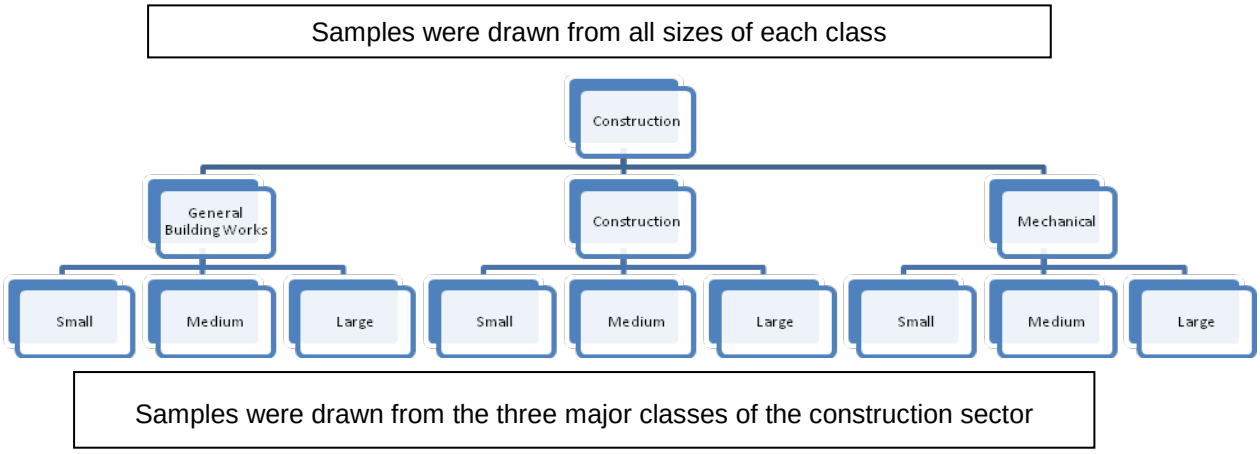
considered the economic powerhouse of the SADC region, according to the Southern African Regional Universities Association (SARUA, 2014) with buoyant construction activities, whilst Namibia represents an average Southern African country with construction projects valued at N$76 million for the 12 months up to July 2010 (Heita, 2010). However, other Southern African states have encountered several political challenges in recent years which may have resulted in subdued economic activities and also hampered the development of the construction industry. Construction activity in some Southern African states has been curtailed. These countries are represented by Zimbabwe whose industry has been restricted by problems such as securing guarantees from banks, which fear the high risk in these countries (The Herald Zimbabwe, 2010).

The construction industry is very wide-ranging. The Construction Industry Development Board (CIDB, 2012), for example, classifies construction work into six basic classes. These are Civil Engineering works (C.E.); Electrical Engineering works Infrastructure and Buildings (E.P. and E.B); General Building works (G.B.); Mechanical Engineering works (M.E.) and sundry Special Works (S.W.). Samples were randomly drawn from the three major sectors of the construction industry, namely G.B., C.E. and M.E. The CIDB (2012), like other regulatory bodies, makes all records of contractors available to the public on their website. Contractors were retrieved from regulatory and other professional websites such as the Master Builders Association (MBA, 2012) and the Construction Industry Federation of Zimbabwe (CIFOZ, 2010), and stratified according to their area of specialty. From each stratum, a sample was randomly drawn. This stratification ensured that all types of contractors were included in the sample.

The construction industry is a highly regulated industry in which all contractors are required by statute to be registered with a regulatory board and to be graded according to size or capacity. In South Africa, for instance, all contractors are registered and graded by the CIDB from Grade 2 to Grade 9, with Grade 2 representing a small emerging contractor of a particular class and Grade 9 being a well-established contractor of a particular class (CIDB, 2012). A contractor may therefore be classified as 5GB, meaning an average size contractor of Grade 5, specialising in General Building works. In this study, each class of contractors was further classified by size of the contractor in order to obtain responses from small,

medium and large construction companies. Large contactors were most important for this research as they generally have a greater need for more comprehensive management accounting systems and they have the resources that enable them to implement advanced systems (Clarke & Mullins, 2001). Moreover, studies indicate that large companies tend to take the lead in adopting new management accounting techniques and are therefore more likely to have implemented or at least considered implementing an ABC system (Clarke & Mullins, 2001).The regulatory bodies' websites (CIDB, 2012; MBA, 2012; CIFOZ, 2012) show the grade level of each registered contractor and this information is available to the public and need not be obtained from the contractors themselves. Figure 3.2 shows how the sample population was drawn.

Figure 3.2: The sampling process



3.3.4 Data Analysis

The questionnaire elicits both close and open ended responses. This requires that both quantitative and qualitative techniques of data analysis be applied to allow valid conclusions to be reached. With regard to quantitative data, appropriate frequency tables were used to represent the findings. Computers were used to ensure accurate and speedy processing of the data. Qualitative data were analysed and presented in compilation sheets and diagrams or tables. There is an inherent risk in research studies of reaching conclusions that are based on erroneous responses such as coincidences; for this reason Excel spread sheets were used to increase the accuracy of data analysis.

3.4 LIMITATIONS OF THE METHOD

According to Hofstee (2006), a method's limitations are those factors which prevent doing the study using the method from perfection. This study focused on the construction industry in Southern Africa. The researcher wanted to draw representative samples of contractors from all 15 states. However, time and resource constraints made it necessary that only the most representative sample of this population could be drawn. Moreover, this study used questionnaires to obtain data. Face-to-face interviews might have enhanced the data collection as this would have allowed respondents to seek clarification on some questions. However, to ensure that the results of this study were as reliable as possible and that they could be generalised across Southern Africa, a large sample was drawn from three countries, representing 20% of the population. Moreover, the sample comprises major sectors of the construction industry, as illustrated in Figure. 3.2.

3.5 ETHICAL CONSIDERATIONS

Ethics are the norms and standards of behaviour that guide moral choices about necessary behaviour (Cooper & Schindler, 2014). The importance of ethical considerations has been highlighted in previous studies in which human subjects were used and their rights violated. Wagner *et al.* (2012) have noted that some studies in the past created a public awareness which led to the formation of ethics committees at universities and codes of ethics for some disciplines. The researcher should take great care in the design of the research to avoid harm to the subjects. Therefore, Wagner *et al.* (2012) argue that ethics should be considered at each stage of the research design and implementation process.

The researcher took due consideration of the basic international ethical principles as stated in the Belmont report (1979) and the Declaration of Helsinki (2008). The Belmont report identifies three key aspects that should be addressed in ethical research involving humans; the principles of respect for persons, beneficence and justice.

Principle 1, the respect for persons, presumes that persons should be treated as autonomous individuals capable of making decisions and conversely, that not every person is capable of self-determination (Gillon, 2012). The presumption that not all

persons are capable of self-determination envisages that some people may be restricted as in the case of minors, prisoners, and persons in the military.

According to Gillon (2012), beneficence is the maximising of benefits and the making of every effort to secure the well-being of participants. Researchers may expose participants to harm, especially where the researchers perceive the ultimate outcomes of their research as being beneficial to society at large. On the other hand, the principle of justice requires that participants be treated fairly and be given what is due to them. Table 3.2 summarises how the three principles were observed in the planning and design of the questionnaire used in this research study.

Table 3.2: Application of the ethical research principles

Principle	Method
Respect for persons	• Participants took part in the questionnaire voluntarily. • Adequate information about the research was provided to the participants. • Participants were advised to leave blank any questions that they found inappropriate. • Participants were informed that the survey was anonymous.
Beneficence and non-maleficence	• Participants took part as company officials and not in their personal capacity. Therefore, participants were not exposed to any psychological, social or financial risk.
Justice	• No personal benefits arose from the research and participants were not rewarded in any way.

These three principles guided the conduct of this study from research planning and designing, through questionnaire design and up to the reporting phase. Respondents to the questionnaire were guaranteed confidentiality regarding the information they provided. No mention of names of people or corporations is made anywhere in this dissertation. Conclusions have been generalised across Southern Africa to ensure that respondents are secure. Moreover, the questionnaire did not ask sensitive or

business confidential questions regarding how contractors tender or win their projects or how much profit or loss they earn from these projects.

3.6 SUMMARY

In this chapter the research design was explained. The research employed questionnaires to gather the data. The questionnaire was chosen as a data gathering instrument for its efficiency in collecting data and its confidentiality. The chapter also explained the sampling process. The sample was drawn from three classes of contractors. The sample was considered fairly representative to justify generalisation of the findings over the entire Southern African region. In Chapters 4 and 5, the findings obtained from the analysis of the data obtained from the questionnaires are presented.

CHAPTER 4: RESEARCH FINDINGS AND DATA ANALYSIS: MANAGERS AND ACCOUNTANTS

4.1 INTRODUCTION

This chapter analyses the data collected from managers and accountants of construction companies. The data was obtained from a sample which was drawn from three countries, namely South Africa, Zimbabwe, and Namibia. A total of 229 questionnaires were distributed to accountants of construction companies and consultants working with construction companies in the three countries. This chapter explains the response rate in Section 4.2 and the data analysis procedures in Section 4.3. The research findings from the analysis of responses by accountants and consultants are discussed in Section 4.4 and the comments from respondents in Section 4.5. The chapter concludes with a summary of the findings from the data from accountants and senior managers.

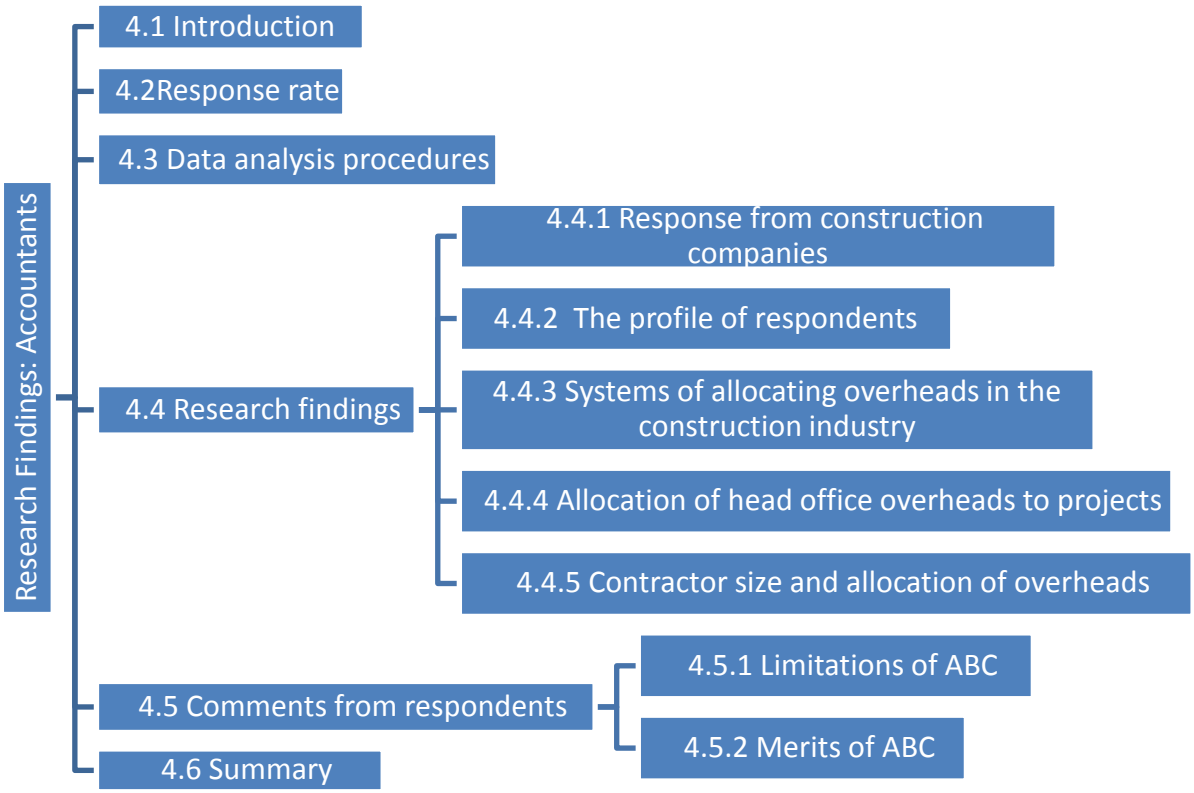
4.1.1 Goal of the chapter

The goal of this chapter is to discuss the results obtained from the data from the questionnaires that were sent to the managers and accountants of construction companies.

4.1.2 Layout of Chapter 4

Figure 4.1 depicts the layout of this chapter.

Figure 4.1: The layout of Chapter 4



4.2 RESPONSE RATE

One setback in this study was the apathy of the respondents. Initially, 98 questionnaires were emailed to randomly selected respondents in the three countries. Unfortunately, only 12 responses were obtained from accountants and two from consultants. The researcher noted that according to Israel (2012), a poor response rate to a survey can render a study valueless. According to Israel (2012), causes of non-responses include:

- Refusals
- Not at homes/unavailable
- Unable to answer
- Not found

Non-response is very problematic for the researcher and Israel (2012) observes that a poor response rate can result in a biased sample which reduces a probability sample to essentially a convenience sample, resulting in weaker conclusions than could be reached from a larger group of responses.

There are, however, some strategies to deal with the respondents' apathy. In this case the strategy taken was to increase the sample size and mail more questionnaires. An additional 131 questionnaires were sent from which a response of 30 questionnaires was obtained. This brought the response rate to 19%. To increase the response rate still further, reminder emails were sent. Consequently, the response peaked to 85 respondents. This is a response rate of 33%. These responses are summarised in Table 4.1.

Table 4.1: List of responses

Responses	Number Obtained
Completed questionnaires	85
Incomplete questionnaires	4
Policy of non-participation	2
Respondents refraining	102
Undelivered e-mails	23
Out of office	13
Total	**229**

Table 4.1 shows that 85, or 33%, of the 229 questionnaires were fully completed and returned, while the rest (124 or 67%) were returned incomplete or not returned at all.

4.3 DATA ANALYSIS PROCEDURES

Data collected in the questionnaires was analysed using Microsoft Excel™ spread sheet package. The data analysis followed three distinct steps:

- Capturing the data in an Excel™ database
- Cleaning the data
- Analysing the data.

The data was in coded form with a number assigned to each response item. The first task was therefore to decode the data and assign an identity number (ID) to each question in the questionnaire. This ensured that each question could be related to the raw data. Care was taken to ensure that the correct digit code was placed next to the right ID. Upon completing the data entry, the data was cleaned for accuracy.

With clean data available, the researcher proceeded to analyse it using MS Excel™'s statistical tools. This entailed running frequencies and percentages for each ID. The subsequent data analysis results are explained and illustrated with tables and graphs in the following sections and sub-sections.

4.4 RESEARCH FINDINGS: ACCOUNTANTS AND SENIOR MANAGERS

This section analyses the findings from accountants and senior managers of construction companies. These are the officers who design and implement costing systems for their companies. The findings in this section are thus important since they represent the experience of people who are knowledgeable in both management accounting and its application in the construction industry.

4.4.1 Response from construction companies

Of the total of 85 respondents, 52 were accountants or managers working for construction companies. The majority of respondents were contractors, representing 61%, while consultants accounted for the remaining 39%. The distribution of these respondents by contractor size is shown in Section 4.4.2.1, while Sections 4.4.2.2 and 4.4.2.3 discuss the distribution by class and average number of contracts executed at a time, respectively.

4.4.2 The profile of respondents

The distribution of respondents is presented in the following three sub-sections. This includes: the distribution of contractors by size, the distribution by class and the distribution by volume of work executed at a given time.

4.4.2.1 Distribution of contractors by size

Table 4.2 shows the distribution of contractors by company size. This distribution was important since large companies would be expected to take the lead in the implementation of new costing systems. The distribution of contractors by size was also important in determining whether or not the size of the contractor had influenced the adoption of an ABC system over another system.

Table 4.2: Analysis of responses by contractor size

Contractor Grade	Common Grading	Number of respondents	Response Rate (%)
1-3	Small contactor	6	11.5
4-6	Medium	11	21.2
7-9	Large	31	59.6
Uncompleted		4	7.7
Totals		**52**	**100%**

The highest response rate (59.6%) was from large contractors, followed by medium contractors (21.2%) and small contractors (11.5%). Therefore, it is possible that large contractors have greater interest in or knowledge of costing systems than small and medium contractors.

4.4.2.2 Distribution of responses by contractor class

The common classes or areas of specialty of contractors are general building works, construction engineering, mechanical engineering, civil engineering and electrical engineering. The distribution by area of specialty helped to determine whether different costing systems were applicable to particular construction fields. Table 4.3, shows the distribution of responses by area of specialisation.

Table 4.3: Responses by contractor class (specialisation) and size

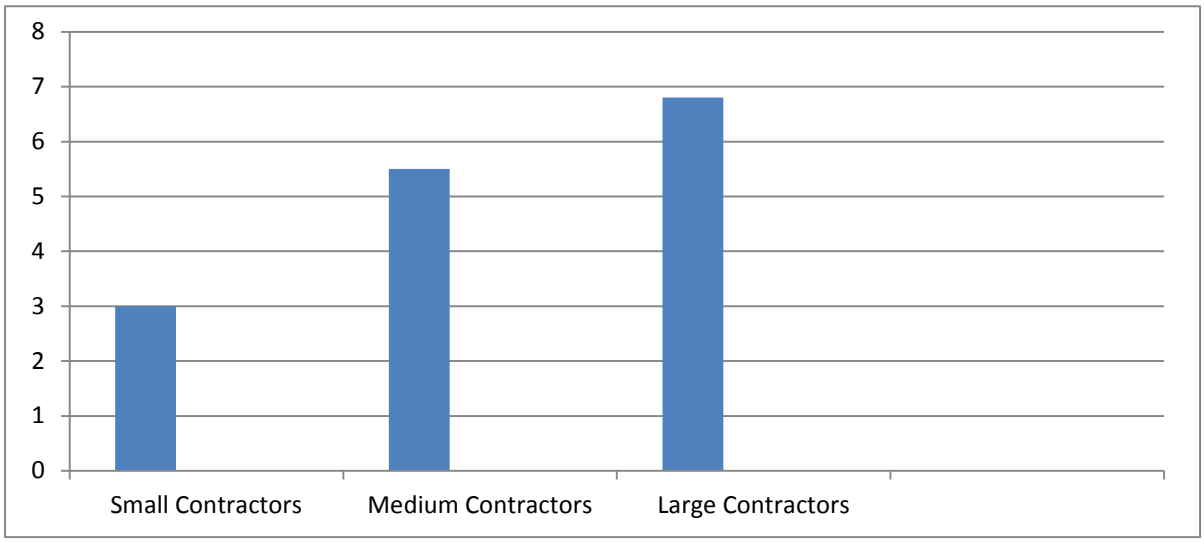
Field of specialisation	Number of respondents	Response Rate (%)
General building works	27	51.9
Construction engineering works	12	23.1
Mechanical engineering works	6	11.5
Other	7	13.5
Totals	**52**	**100**

Most respondents came from businesses that specialised in general building works (51.9%), followed by construction engineering works (23.1%), mechanical engineering works (11.5%) and other (13.5%).

4.4.2.3 Average number of contracts

The number of contracts a contractor executes at any given time may be important in determining the need for overhead allocation. If a contractor works on a single project at a given time, for example, he/she will simply allocate the period costs for the company to that particular project. Similarly, if a contractor works on very few projects at a time, the effect of arbitrarily allocating overheads will be negligible. Therefore, a contractor who works on several projects at one time may require an equitable system for allocating overheads. Figure 4.2 depicts the distribution of respondents by size and number of projects.

Figure 4.2: Distribution by size and number of projects at a time



The graph shows that small contractors normally run fewer projects than medium sized contractors. Large contractors undertake the highest number of projects at a particular time. The need for efficient allocation of overheads may therefore be greater for large contractors than for small contractors. This is consistent with the findings of Brierley (2008) who found that unit size has a significant impact on the level of consideration for ABC. Consequently, the effect of improper allocation of overheads might be more severe for large contractors than for small contractors since large contractors execute many projects at a given time.

4.4.2.4 Conclusion

In Section4.4.2 the distribution of the respondents was explained. The section found that most respondents were large contractors (60%), followed by medium contractors (21%) and small contractors (12%). The section also showed that the

largest responses were general building works (52%), followed by construction engineering works 23%, mechanical engineering works (12%) and other contractors (7%). Above all, the section found that large contractors execute the highest number of projects at a given time, followed by medium contractors. Probably as a result of capacity constraints, small contractors execute only up to three projects at a time. Therefore, efficient systems of allocating overheads may be more necessary for large and medium sized contractors than for small contractors that manage only one to three projects at a time.

The following section analyses the data on the effectiveness of TC and ABC systems.

4.4.3 Systems of allocating overheads in the construction industry

Data was collected on the use and effectiveness of TC and ABC systems. This section presents the findings on the allocation of overheads and assimilation of an ABC system in construction. The section shows the objectives of allocating overheads, the costing systems used and their effectiveness.

4.4.4 Allocation of head office overheads to projects

Respondents were asked whether or not they allocated head office overheads to projects. Of the 52 respondents, 28 (53.8%) stated that they allocated head office overheads to projects. Twenty respondents, representing 38.5% of the sample, indicated that they did not allocate head office overheads to projects. It may be that most contractors allocate head office overheads to projects. These results contradict findings by Cokins (2002) that most companies do not make an attempt to allocate overheads to cost objects. This may be because of the need by construction companies to determine the total cost and profitability of each project.

4.4.5 Contractor size and allocation of overheads

The research established that 53.4% of the respondents allocated head office overheads to projects. Of those respondents who allocated head office overheads to projects, 22 or 78.6% were large contractors, while four respondents or 14.3% were medium size contractors. Only one respondent from the sample of small contractors allocated head office overheads to projects. It thus appears that most large contractors attempted to allocate overheads to projects while most small contractors did not. Figure 4.3 represents the distribution of these results.

Figure 4.3: Allocation of overheads

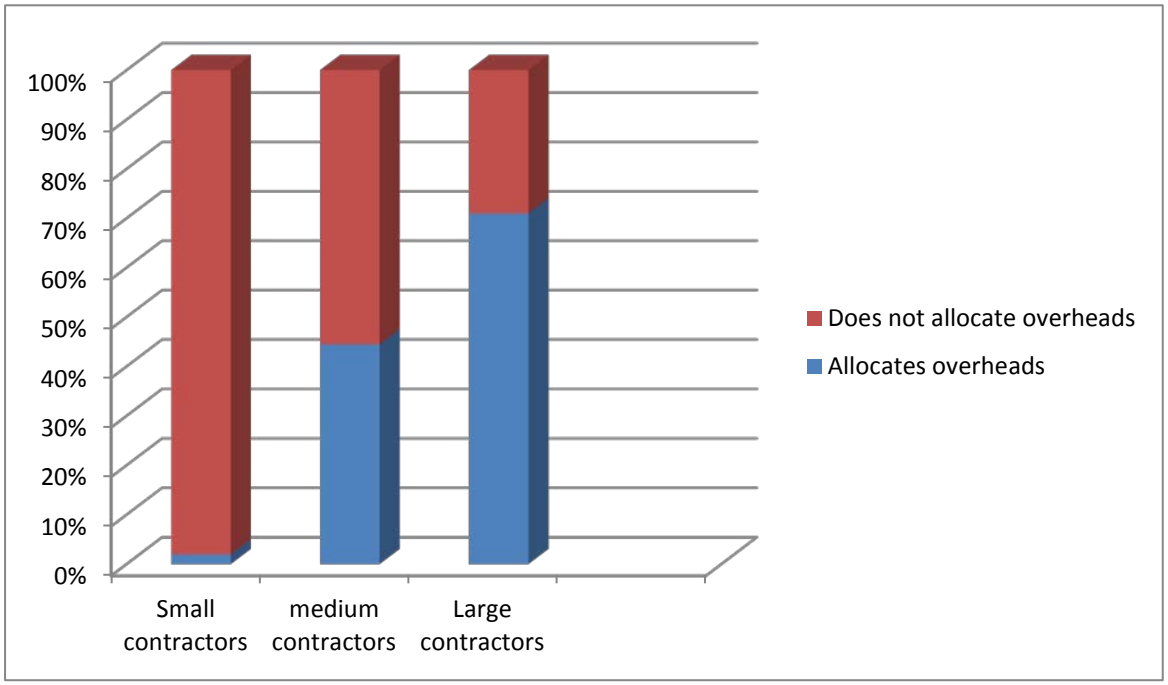


Figure 4.3 indicates that most small and medium size contractors did not allocate head office overheads to projects, while only a small proportion of large contractors did not. Table 4.4 reflects the details of these results.

Table 4.4: Contractors allocating overheads to projects

Contractor size	Allocate overheads		Do not allocate	
	Number	Percentage	Number	Percentage
Large	22	75.9%	9	29.0%
Medium	4	44.4	5	55.6
Small	2	28.6	5	71.4

4.4.5.1 Objectives of allocating head office overheads to projects

Twenty-two of the 46 respondents to the question on objectives of allocating overheads (47.8%) chose 'to obtain accurate project costs' and 'to measure supervisors' performance' as two reasons for allocating overheads. Twenty-four respondents (52.2%) named other objectives. Table 4.5 summarises these results.

Table 4.5: The objectives of allocating head office overheads to projects

Objective	Number	Percentage
Obtain accurate project costs	22	47.8%
Measure supervisors' performance	22	47.8
Other	24	52.2

Respondents suggested that there were other important objectives for allocating head office overheads to projects other than to obtain accurate project costs and to measure supervisors' performance. These other objectives, named by 24 respondents, are reflected in Table 4.6.

Table 4.6: Other objectives for allocating head office overheads to projects

Objective	Percentage
Measure project performance	65%
Evaluating and invoicing completed works	45%
TOTAL	**100%**

4.4.5.2 System of allocating head office overheads to projects

Twenty-nine respondents, representing 58% of the respondents, answered the question on how head office overheads were allocated to projects. Their responses indicated that various criteria were used to allocate these overheads. Table 4.7 summarises these responses.

Table 4.7: Criteria used to allocate head office overheads to projects

Criteria	Number of respondents	Percentage
Value of work completed	2	6.9%
Administration costs incurred	3	10.3
Time taken on project	2	6.9
Total cost of project	1	3.0
Value of contract basis	11	37.9
Management salaries allocated per project	1	3.0
Number of people involved in a project	1	3.0
Turnover of each contract	2	6.9
Activity based costing system	1	3.0
Machine hours consumed	1	3.0
Direct labour hours consumed	2	6.9
Direct material consumed	1	3.0
Overheads spread equally to all projects	1	3.0
TOTAL	**29**	**100%**

The responses summarised in Table 4.7 show that most contractors (97% – all but the last response in the table) used traditional volume based overheads allocation systems or some arbitrary system to allocate head office overheads to projects. Using such varied systems of arbitrarily allocating overheads, may result in contractors not obtaining reliable information for decision-making. These results support Kim and Ballard's (2001;2002) findings, that construction companies use resource based costing and volume based allocation, as well as the literature that reveals most companies still use TC systems instead of the ABC system (Sartorius & Kamala, 2007). Similarly, Caplan (2010) found that 50% of companies used variable costing and the other 50% used absorption costing for internal reporting purposes. This observation, however, contradicts the findings of Cooper and Kaplan (1992),

that most companies have reduced their dependency on TC systems by developing ABC management systems.

4.4.5.3 Effectiveness of the current costing system

The research aimed to establish how users rated their system of allocating head office overheads to projects. These responses are summarised in Table 4.8.

Table 4.8: Effectiveness of the current system of allocating overheads

Responses	Number of respondents	Percentage of respondents
Poor	9	32%
Satisfactory	11	39%
Good	7	25%
Very good	1	4%

The majority of users of TC systems were impressed with their system, as only 32% of indicated that they thought its effectiveness was poor. This is contrary to the findings of Cokins (2002), that managers were not satisfied with their current systems. But Cokins (2002) fails to explain the reasons for some companies still using TC systems.

4.4.5.4 Allocation of project overheads to work sections

In order to determine the total cost of each work section and hence its profit or loss, project indirect overheads should be allocated to the sections using an equitable basis. Examples of project indirect overheads are foremen's salaries, health officers' salaries and warehouse costs. Typical project sections in a general building project would be earthworks, masonry, roofing, electrical, painting, carpentry and ceiling. The responses, as summarised in Table 4.9, indicate that most contractors (53%) did not allocate project overheads to their work sections.

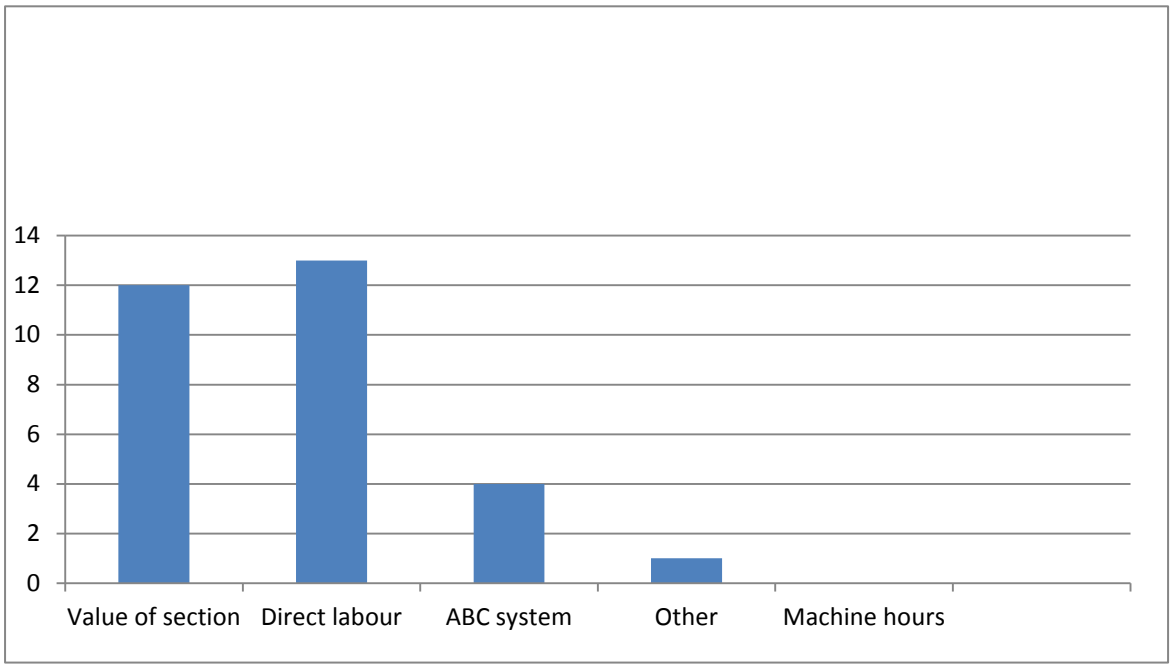
Table 4.9: Allocation of project overheads to works (project) sections

	Yes	No
Do you allocate project indirect overheads to work sections?	23	25
	47%	53%

4.4.5.5 Basis of allocating project overheads

Only four of the 30 participants who answered this question indicated that they allocated project overheads using the ABC system. Thirteen respondents (43%) used direct labour hours, 12 respondents (40%) used the value of each section while only one respondent used another basis. These responses are illustrated in Figure 4.4.

Figure 4.4: Allocation of indirect project overheads



More contractors (26 respondents or 87%) used volume based costing systems to allocate indirect project overheads to the work sections than those who used the ABC system (four respondents or 13%). These findings are consistent with findings in the literature (Innes & Mitchell, 1998; Cokins, 2002; Caplan, 2010) that most companies use volume based OAR to allocate indirect overheads to cost objects.

4.4.5.6 Overall effectiveness of the costing systems

This question interrogated whether the costing systems were effective or not. Of the 31 respondents to the question, thirteen (42%) stated that their system was satisfactory, seven (23%) said it was good, and two (6%) that it was very good. Only nine respondents (29%) regarded their current system as poor.

Table 4.10: Perceptions of the current system of allocating project overheads

	Number	**Percentage**
Poor	9	29%
Satisfactory	13	42
Good	7	23
Very good	2	6
	31	**100**

These responses show that contractors perceive their current costing system of allocating project overheads to work sections as effective. These results are similar to those discussed in Section 4.4.5.3, where contractors were found to be satisfied with their current system of allocating head office overheads to projects.

4.4.5.7 Objectives of allocating project overheads to work sections

Respondents who allocated project overheads to work sections did so mainly in order to measure their project's performance (75%). The remainder allocated overheads so that they could value completed works (8%) or obtain project costs (5%). These results are summarised in Figure 4.5.

Figure 4.5: Objectives of allocating project overheads to work sections

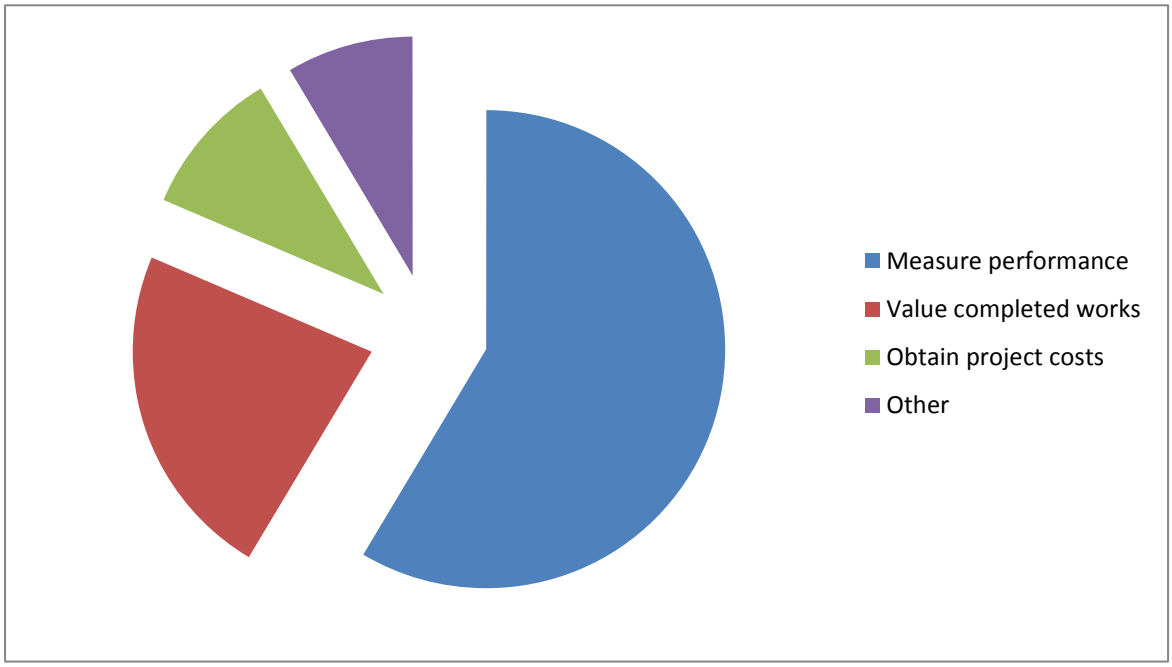


Figure 4.5 shows that the main reasons for contractors allocating project costs were to measure project performance and to determine the value of completed works.

4.4.5.8 Companies using ABC systems

Of the 52 respondents, only five indicated that they used an ABC system while 47 (90%) used TC systems. Twenty-one respondents (60%) had considered implementing an ABC system but had abandoned the idea, while 14 respondents (40%) had never considered implementing one. It thus appeared that the ABC system had not been widely adopted in the construction industry in Southern Africa. This coincides with the findings that ABC assimilation is still very low in these countries (Sartorius & Kamala, 2007).

4.4.5.9 Which costing system produces accurate project cost results?

Forty-four participants responded to the question "Which costing system do you think produces accurate project cost results?" Of these, 40 respondents (91%) indicated that ABC produces more accurate project cost results than conventional costing systems; the remaining four respondents (9%) indicated that TC systems produce more accurate project cost results than ABC system. Table 4.11 summarises the most prevalent reasons provided for choosing an ABC system as an effective costing system.

Table 4.11: Summary of reasons for ABC producing more accurate project cost results than TC systems

Reason	Number of respondents
"If implemented properly and reconciled to a suitable revenue measuring system, this method can effectively monitor contracts and improve profitability".	1
"Well supported backup. When the system is loaded with data, it is very functional".	1
It captures all the activities involved and then allocates costs based on the level of activity.	2
ABC uses multiple OAR.	17
It helps assess profitability of the whole project.	3
ABC provides more insight into costs of performing activities in a construction company.	1
It considers the activities that drive costs.	9
Its basis for allocating overheads is more reflective of cost behaviour.	3
ABC uses activities rather than volume to allocate overheads.	2
ABC gives more accurate project costs and a better understanding of the cost causes.	3
It is company procedure to use ABC.	1
ABC allows one to analyse costs and to allocate them better.	1
By using ABC systems, you are able to consider cost drivers not volumes.	1

It is therefore plausible that ABC produces more accurate project cost results than TC systems since it uses multiple activities to allocate overheads to projects.

4.4.5.10 Benefits of the current costing system

Contractors mentioned several benefits that they were enjoying from the current costing system. The most named of these were that the system helped to assess projects accurately, was simple to use and less expensive than others to implement. These responses suggest that although contractors perceive the ABC system as

providing more accurate project cost results, they also see several benefits in their current costing systems. These benefits are presented in Table 4.12.

Table 4.12: Summary of the benefits of the current costing system

Benefit	Number of respondents
Simple and easy to use.	7
"Simplicity is our current choice over one requiring detailed analysis. Less cumbersome resulting in less cost of implementation".	1
"We have quick and accurate costs to compare with the revenue. The costs are not in great detail but cover the main components that need to be controlled and can direct what items need to be corrected and attended to."	1
Provides an accurate assessment of project profitability.	1
Accurate costing of specific projects.	2
"Staff can understand it and are familiar with it."	3
"Real time reporting."	1
"Very integrated system if the resources are allocated up front. At a click of a button you can have the following: reports, histograms, programmes."	1

Thus contractors may be enjoying several benefits from their current system of allocating overheads and therefore they may not want or need to change.

4.4.5.11 TC systems produce misleading project cost results

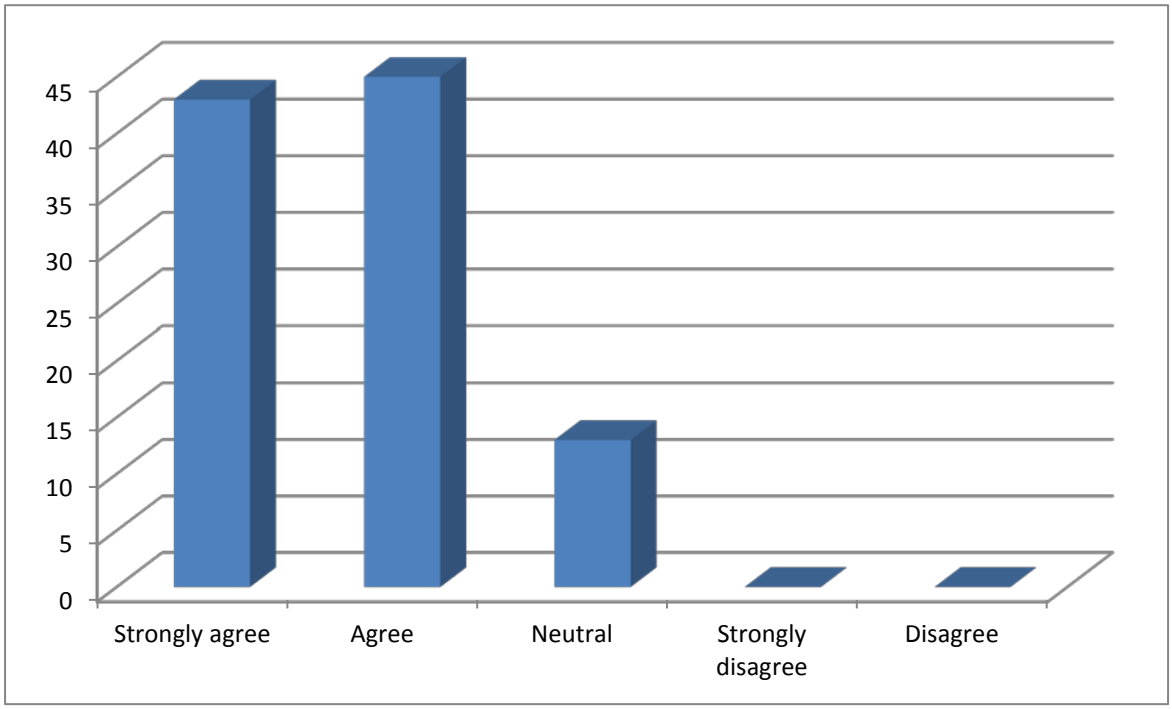
This part of the questionnaire aimed to establish whether TC systems produced inaccurate and misleading costing information. The responses revealed that 16 contractors (34%) strongly agreed that TC systems produced misleading project costs. Twenty-three contractors (50%) agreed, three (6%) were neutral while five contractors (10%) disagreed that TC systems produced distorted project costs. Therefore, as in the case of the literature (Cokins, 2001; Cooper & Kaplan, 1992) it was found that many contractors (84%) believed that TC systems produced misleading project costs. These results are summarised in Table 4.13.

Table 4.13: Do TC systems produce misleading cost results?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
TC systems produce misleading cost results	16	23	3	5	0
	34%	50%	6%	10%	0%

TC systems produce misleading cost results because they use a single OAR such as direct labour to allocate indirect overheads (Horngren *et al*., 2002). This research found that 20 respondents (43%) strongly agreed and 21 (45%) agreed that the use of a single OAR in TC systems causes distorted project cost results. These results are shown in Figure4.6. However, this finding seems to contradict the findings in Sections 4.4.5.3 and 4.4.5.6, where contractors expressed satisfaction with their current costing systems, as well as the findings in Section 4.4.5.10, which found that contractors were enjoying several benefits from their current costing system. This contradiction suggests that some respondents may have improved their current costing systems, making them multiple OAR systems and for this reason they were enjoying benefits similar to those of ABC systems.

Figure 4.6: Use of a single OAR causes cost distortions



This graph reveals that most respondents (87%) confirmed that using a single OAR in TC systems produces misleading cost information.

4.4.5.12 The effect of using TC systems on construction projects

Researchers have found that TC systems under-cost low volume or low cost high complex products while over-costing high volume or high value but less complex products (Myers, 2009). This was confirmed by the findings in this study, where 36% of the respondents strongly agreed and 33% agreed that TC systems over-costed high volume projects while under-costing low volume projects. Sixteen percent of respondents were neutral on this issue while 13% and 2% disagreed and strongly disagreed, respectively. Therefore, as Horngren *et al.* (1999) and Bhimani *et al.* (2012) have illustrated, the use of TC systems to allocate overheads to projects may result in project cross-subsidisation, as losses from small but high complex projects are shielded by large but less complex projects.

4.4.5.13 ABC is a good substitute for TC systems

This study aimed to determine whether ABC could be regarded a substitute for TC systems. Respondents to the question: "ABC is an alternative to or substitute for TC systems" were as follows:

Table 4.14: Is ABC a substitute for TC systems?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
ABC is an alternative to or substitute for TC systems.	19	23	2	1	1
	41%	50%	4%	2%	2%

The above table shows that 91% of the respondents perceived ABC as an alternative or substitute for TC systems while only 4% did not.

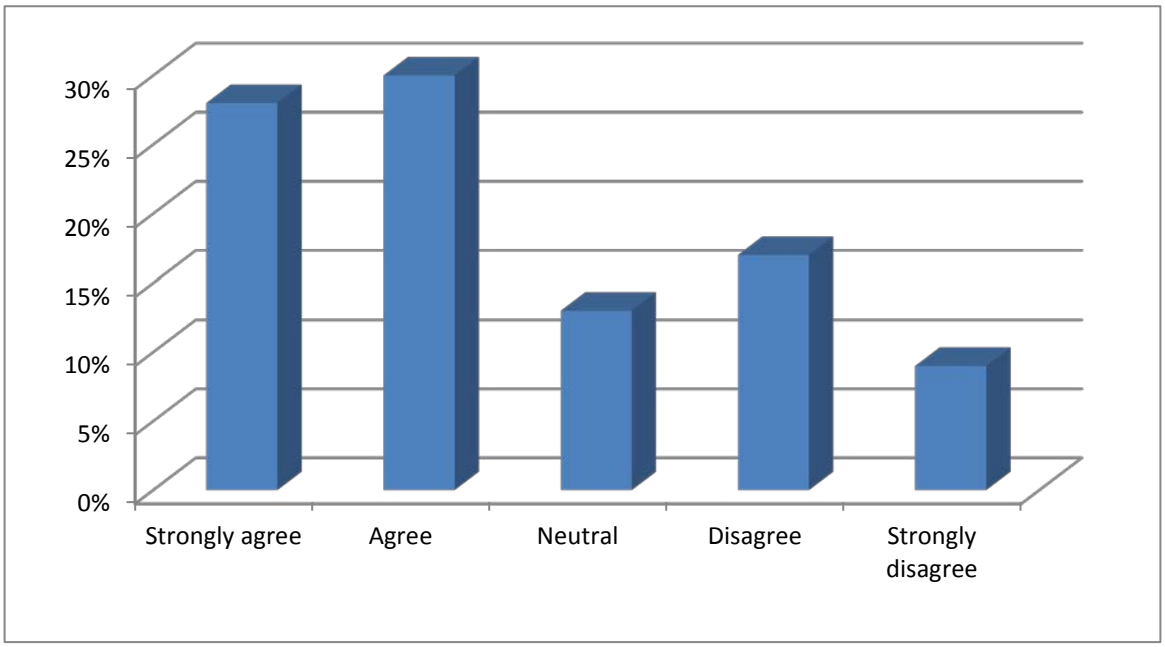
4.4.5.14 Does ABC provide a greater insight into costs?

The literature review revealed that ABC provides a greater insight the TC into costs and what drives costs (Cooper & Kaplan, 1992). Consequently, ABC provides more insight into the costs of performing activities in a company and the costs of serving customers. Respondents to the questionnaire strongly agreed that ABC provided greater insight into costs (43%) while 46% agreed. Only 11% of the respondents were neutral on this question, while none of the respondents disagreed or strongly disagreed with it.

4.4.5.15 Should ABC be used as a supplementary system to a TC system?

TC and ABC systems should be used complementarily to each other since neither system completely covers the needs of all stakeholders. The responses to this statement indicated that 13 respondents (28%) strongly agreed and 14 respondents (30%) agreed that ABC should be used as a supplement to TC systems. Seven respondents were neutral while eight disagreed (17%) and four strongly disagreed (9%) to using ABC as a supplementary system to TC. These results are represented in Figure 4.7.

Figure 4.7: ABC should be used as a supplementary system to TC systems



The figure reveals that more respondents felt that ABC should be used as a supplementary system to TC systems (58%) than those who disagreed with this question (32%).These results emphasise Cooper and Kaplan's (1992) observation that companies need different reporting systems: one for periodic financial statements showing the cost of activities supplied each period and an ABC system showing the quantity and actual cost of activities used in the period. Similarly, Cokins (2002) argues that ABC cannot replace the existing accounting system.

4.4.5.16 Effect of ABC on profitability

Five respondents (11%) strongly agreed and 23 respondents (49%) agreed that the use of ABC system improves the profitability of a company. Eleven respondents (23%) were neutral on this issue while six (13%) disagreed and two respondents

(4%) strongly disagreed that ABC improves the profitability of a company. These results are summarised in Table 4.15.

Table 4.15: ABC improves profitability

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
ABC improves a company's profitability	5	23	11	6	2
	11%	49%	23%	13%	4%

The above results confirm the findings of Sartorius and Kamala (2007) and Turney (2010) that companies using an ABC system have experienced increased profitability in their operations. This occurs because ABC enables the company to achieve its goals with a reduced demand on resources (Kaplan & Cooper, 1997).

4.4.5.17 ABC and wastage

Thirteen percent of the respondents strongly agreed and 57% agreed that ABC reduces non-value adding activities. Nine respondents (20%) were neutral on this point. Only five respondents (11%) disagreed and none strongly disagreed that ABC reduces non-value adding activities. These results are summarised in Table 4.16.

Table 4.16: ABC reduces non-value adding activities

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
ABC reduces non-value adding activities	6	26	9	5	0
	13%	57%	20%	5%	0%

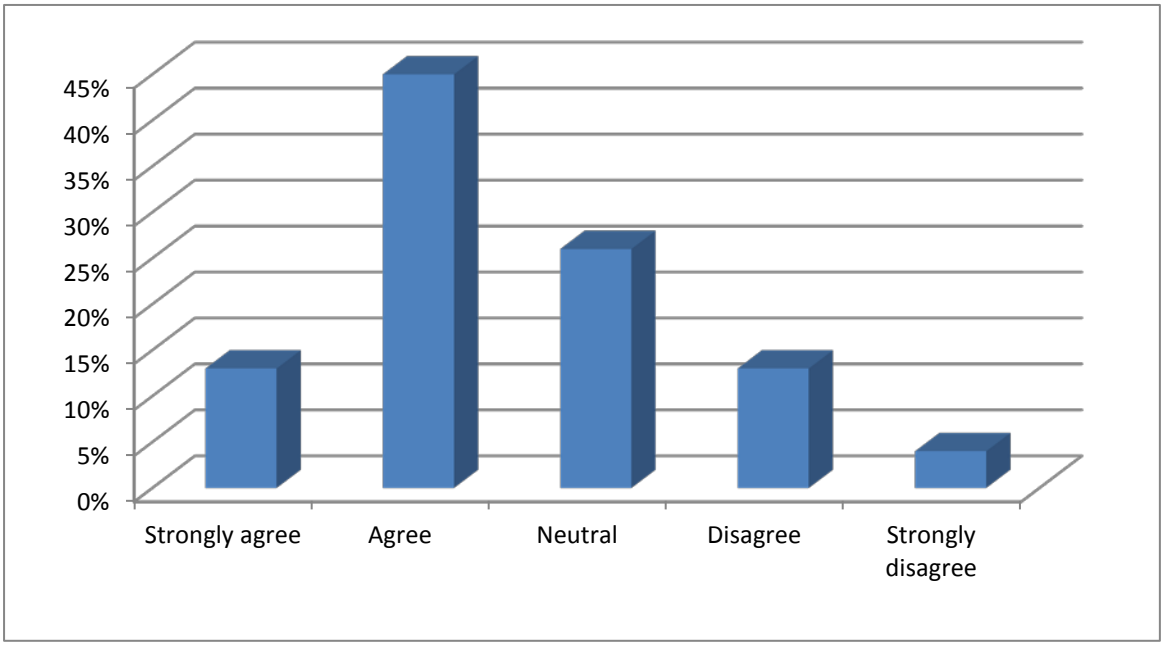
By eliminating non-value adding activities, ABC reduces wastage and improves the company's profitability. These findings are consistent with those of Horngren *et al*. (2002) and Sartorius and Kamala (2007).

4.4.5.18 Can ABC be used in project pricing and bidding?

This research aimed to establish whether ABC would benefit project pricing and bidding. If the ABC system is a good basis for allocating office and project level overheads, it could be useful in pricing and determining a project's preliminaries and general fees for the contractor. Of the 47 respondents, six strongly agreed (13%) and 21 agreed (45%) that ABC could be used for competitive project pricing and

bidding. Six respondents (13%) disagreed and two respondents (4%) strongly disagreed while 12 respondents (26%) were neutral. These results are summarised in Figure 4.8.

Figure 4.8: Should ABC be used in project pricing and bidding?



Most contractors (58%) believed that ABC could be used for project pricing and bidding. Only 17% of the respondents did not hold this belief. This finding suggests that the ABC system may be useful to both accountants and quantity surveyors involved in pricing of construction projects.

4.5 COMMENTS FROM RESPONDENTS

This section discusses some useful comments made by respondents regarding the costing systems.

4.5.1 Limitations of ABC

Commenting on why they had not implemented ABC, one contractor stated:

“Activity based approach falters under all the usual questions. Conventional modern internet-based systems are essential for data collection on location, i.e. on site.” This statement indicates that TC systems may have been modernised to suit the accounting requirements of contractors on site. Consequently, contractors may derive unique benefits from their current system, such that one contractor who used TC systems to allocate overheads commented:

“Very integrated system; if the resources are allocated up front at a click of a button you can have several reports, histograms and graphs.” This indicates that contractors experienced efficient reporting from their current system.

Other than these benefits, a number of contractors remarked that TC systems were inexpensive, easy to use and required little accounting training or expertise. Thus contractors regarded TC systems as cost effective. One contractor observed that the KISS-principle, which states that a system works best if we Keep-It-Simple-and-Straightforward should be the guiding principle in project costing. To this end, some contractors had not even considered ABC and are not conversant with the system. One contractor even remarked that “we cannot really comment on ABC since we have not studied it in depth yet”.

Contractors viewed an ABC system as an expensive system of allocating overheads. ABC is perceived as both time consuming and requiring expensive software. Commenting on this disadvantage of the system, a contractor noted that “we would only change our system if we worked country wide or the turnover put us into the CIDB (2012) CE9 grading”. Small and medium contractors may therefore not view the system as suitable for their size but more appropriate for large contractors such as construction engineering contractors at CIDB (2012) Grade 9 (CE 9) level.

4.5.2 Merits of ABC

Several merits of ABC were mentioned when contractors explained why they would discontinue their current systems. One contractor stated that his business would discontinue their current system “because they need a more accurate system of allocating overheads” that would ensure “improved financial control and information to assist in future tendering”. This view supports findings that managers are dissatisfied with their current TC system of allocating overheads since it provides inaccurate cost information (Cokins, 2002; Myers, 2009; Bhimani *et al.,* 2012). Contractors may believe that the use of an ABC system would produce accurate cost information that would be useful when bidding for new projects. Ultimately, the use of ABC is seen as impacting on profitability, as one contractor expressed it: “If implemented properly and reconciled to a suitable revenue measuring system this method can effectively monitor contracts and improve profitability and prevent loss making contracts”. This perception is confirmed in the literature where studies have

found that the use of an ABC system improves a company's profits and revenues (Cooper & Kaplan, 2001: Akyol *et al.,* 2005). Other merits of ABC mentioned by respondents are listed in Table 4.17.

Table 4.17: Merits of the ABC system.

- It captures all the activities involved and then allocates costs based on the level of activity.
- It helps in the assessment of the profitability of the whole project.
- ABC allows more insight into the costs of performing activities in a construction company.
- ABC provides greater insight into costs.
- Its basis for allocating overheads is more reflective of cost behaviour.

Thus the implementation of the ABC system could result in several benefits to contractors.

4.6 SUMMARY

In this chapter the contractors' responses were analysed. This analysis revealed that most contractors (53%) attempted to allocate head office overheads to projects. The process of allocating head office overheads follows the TC system of using volume bases such as value of work done, direct labour consumed, number of people involved and turnover of contract. Contrary to the finding in the literature that management are dissatisfied with their current systems, in this study the majority of contractors (70%) regarded their current system as effective. This satisfaction might help to explain the low assimilation of ABC in the construction industry, where only one contractor was found to be using the system. Despite their satisfaction with the current system, however, most contractors (98%) agreed that ABC was a better system of allocating overheads but one that should be used as a supplement to TC systems.

The following chapter analyses responses from consultants working with construction companies.

CHAPTER 5: RESEARCH FINDINGS AND ANALYSIS OF DATA: CONSULTANTS

5.1 INTRODUCTION

This chapter presents the findings from the questionnaire which was sent to consultants. The chapter begins with a presentation of the profile of the respondents in Section 5.2. This is followed by an analysis in Section 5.3 of the data on the allocation of indirect overheads. The chapter concludes with an analysis in Section 5.4 of the data collected from the Likert scale.

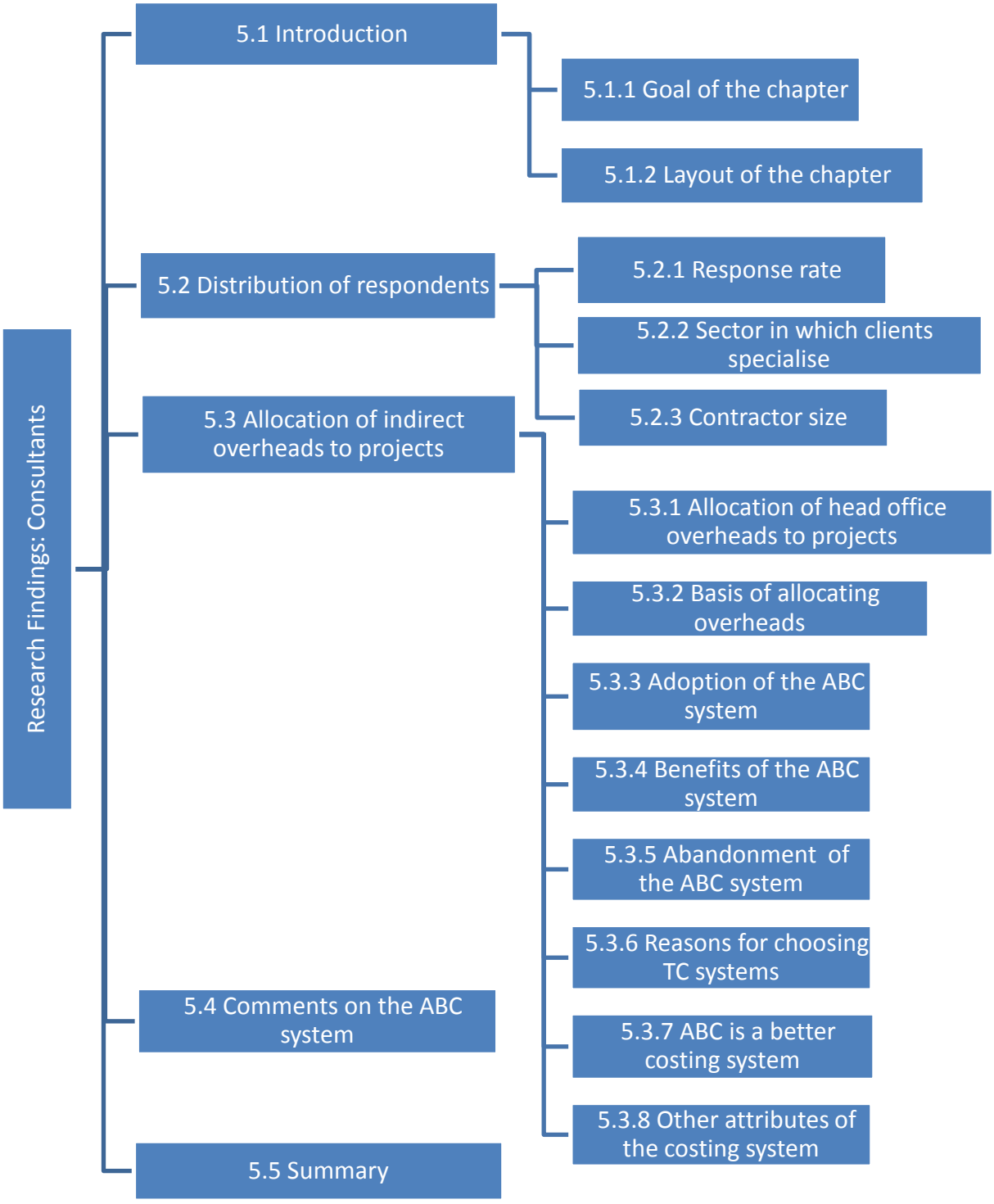
5.1.1 Goal of Chapter 5

The goal of this chapter is to discuss the responses to the questionnaires that were sent to consultants to construction companies.

5.1.2 Layout of Chapter 5

Figure 5.1 depicts the layout of this chapter.

Figure 5.1: The layout of Chapter 5



5.2 DISTRIBUTION OF RESPONDENTS

This section explains the distribution of respondents by area of specialisation and contractor size.

5.2.1 Response rate

A total of 77 emails were sent to consultants to construction companies. There were twenty-three responses, which represents a response rate of 30%. Of these 23 responses, 22 were fully completed and one was not. All 22 respondents had clients in the construction industry.

5.2.2 Which sector of the construction industry does your client specialise in?

Thirteen respondents (59%) worked with contractors in the general building sector, eight respondents (36%) worked with contractors in the construction engineering sector and only one respondent had clients in the mechanical engineering sector. Therefore, most respondents (59%) had clients in the general building and construction engineering sectors (36%).

5.2.3 Contractor size

The respondents had clients classified as small contractors (5%), medium contractors (50%) and large contractors (45%). Most respondents' clients were graded as medium contractors (Grades 4 to 6) or large contractors (Grades 7 to 9). The fact that most respondents had more clients in the medium to large contractor class may suggest that small contractors do not often hire the services of consultants.

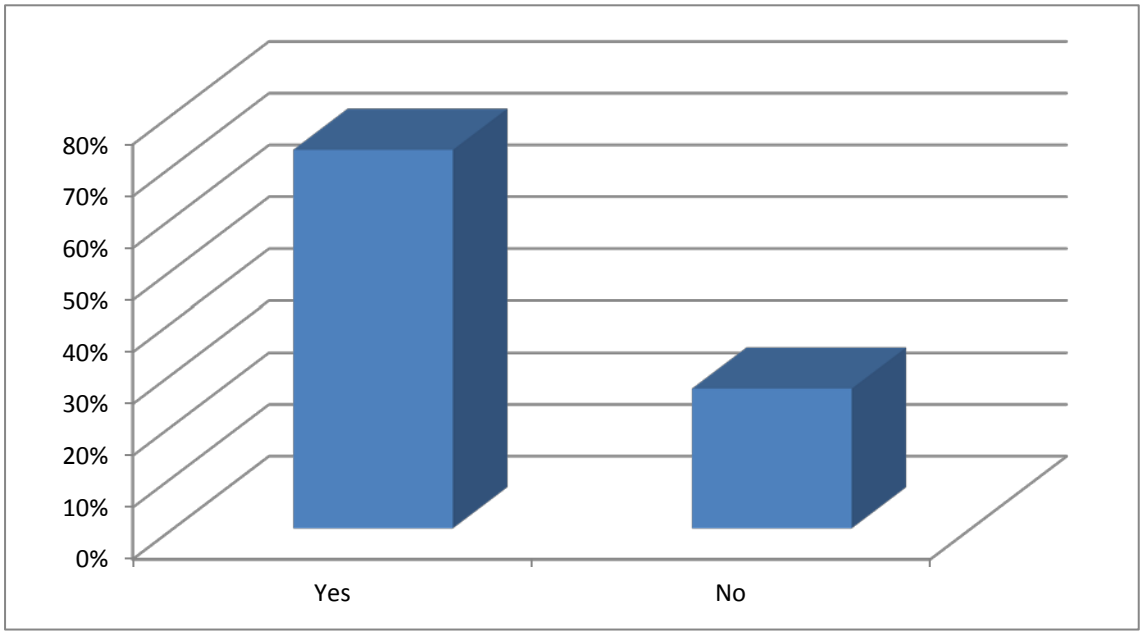
5.3 ALLOCATION OF INDIRECT OVERHEADS TO PROJECTS

This section analyses the findings on questions covering the allocation of head office overheads.

5.3.1 Allocation of head office overheads to projects

This research aimed to establish whether head office overheads were allocated to projects. Of the 22 respondents, 16 (73%) indicated that clients allocated head office overheads to projects, while six respondents (27%) indicated that their clients did not do so. The results are summarised in Figure 5.2.

Figure 5.2: Allocation of head office overheads to projects



This indicates that most contractor clients of these consultants (73%) allocated head office overheads to projects. This may indicate that contractors attempted to find the total cost of a project by including the project's share of overhead resources in the project's costs.

5.3.2 Basis of allocating overheads

Respondents were asked to describe how head office overheads were allocated to projects. The responses are indicated in Table 5.1.

Table 5.1: Bases of allocating overheads

Bases	Number of respondents
Contract/project value	17
Activity based drivers	1
Direct labour cost	2
Time spent on each project	2

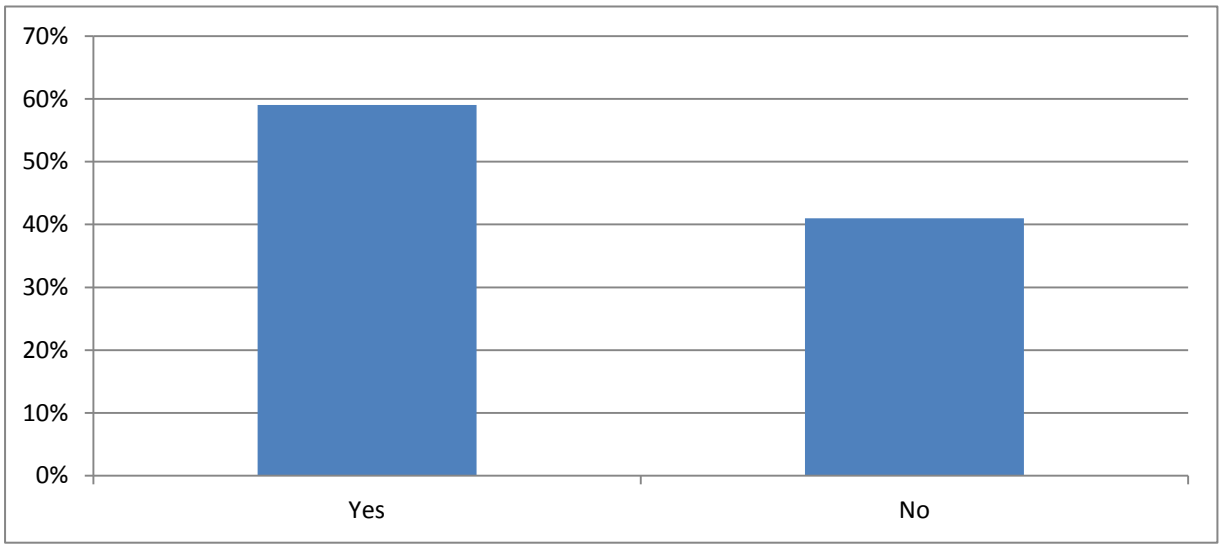
The respondents also named some rare allocation bases used by contractors. One respondent indicated that their client used "administration costs of that particular project" to allocate overheads. This may be difficult since administration costs themselves cannot be traced directly to a particular project and are in fact part of the indirect overheads. Another respondent noted that clients used time spent on a

project to allocate overheads. Although indirect overheads are time related costs, allocating them to projects on the basis of time spent on the project may not reflect the incurrence of the overheads by each particular project. The bases used to allocate overheads, however, demonstrated that most contractors (95%) used volume based TC systems to allocate head office overheads to projects.

5.3.3 Adoption of the ABC system

One of the aims of the study was to establish whether any respondent had clients who had adopted an ABC system; the analysis revealed that 13 respondents (59%) did have clients who had adopted an ABC system while nine respondents (41%) had no such clients. Figure 5.3 illustrates these results.

Figure 5.3: Clients adopting the ABC system



These results indicate that almost two thirds of clients (59%) had experience with an ABC system while fewer than half (41%) had never adopted the system. This may indicate that most contractors had experience using the ABC system.

5.3.4 Benefits of ABC system

Respondents named several advantages and benefits their clients had experienced from implementing an ABC system. Some benefits listed included:

- Reduction in costs
- Competitive pricing of projects
- Cost control of projects
- Better understanding of cost drivers
- Quality improvement
- Accurate measurement of each project
- Accurate estimate of the total cost of project.

This suggests that contractors who adopted ABC enjoyed several attendant benefits.

5.3.5 Abandonment of the ABC system

According to Cokins (2002), some companies adopted ABC, only to discontinue it later after encountering problems with the system. The responses in this study are similar in that 19 respondents indicated that some of their clients had abandoned an ABC system, while three had not had such clients. It can thus be inferred that clients of most respondents (86%) had abandoned ABC after encountering difficulties with the system.

5.3.6 Reasons for choosing TC systems

There were only a few reasons given for the use of TC systems to allocate overheads. All 23 respondents stated that TC systems were chosen because they were less expensive and easier to use. The respondents did not think that TC systems were used because they provided reliable information but rather because of their simplicity. This suggests that respondents may consider that ABC systems are more expensive and more complicated than TC systems.

5.3.7 ABC is a better costing system

The research aimed to establish whether ABC was a better costing system to use than TC systems. All 22 respondents answered in the affirmative. The reasons given for this choice are summarised in Table 5.2.

Table 5.2: Why ABC is a better costing system

- ABC gives more insight into costs.
- Its basis for allocating costs is more realistic.
- It uses multiple bases to allocate overheads.
- ABC enables profitability analysis of projects.
- ABC gives accurate project costs.
- ABC leads to elimination of wasteful activities.
- ABC can lead to increased profitability.

These responses are consistent with findings in the literature that suggest that ABC has several advantages that ultimately lead to increased profitability for companies that adopt the system (Cooper & Kaplan, 1991; Blattner, 2008).

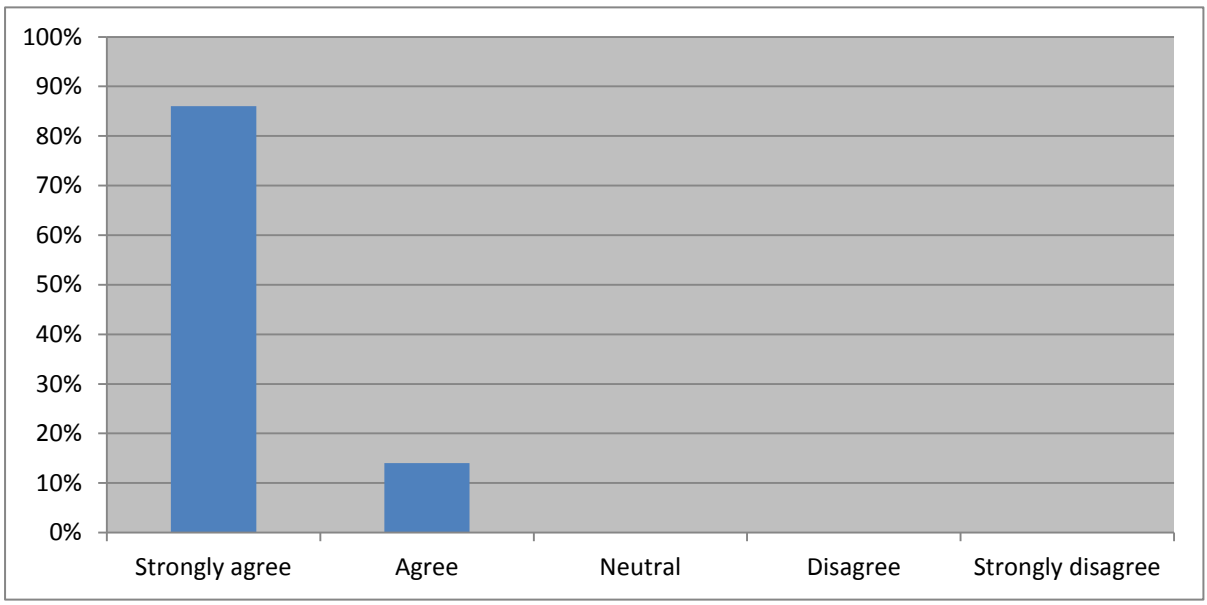
5.3.8 Other attributes of these costing systems

In order to determine certain aspects of TC and ABC systems, various statements were made. These were presented using a Likert scale of 5, which required respondents to choose options ranging from *strongly agree* to *strongly disagree*. The results of the analysis of these questions are presented as Items 18.1 to 18.16.

Item 18.1:TC systems produce misleading project cost results

The results of this question are presented in Figure 5.4.

Figure 5.4: TC systems produce misleading cost results

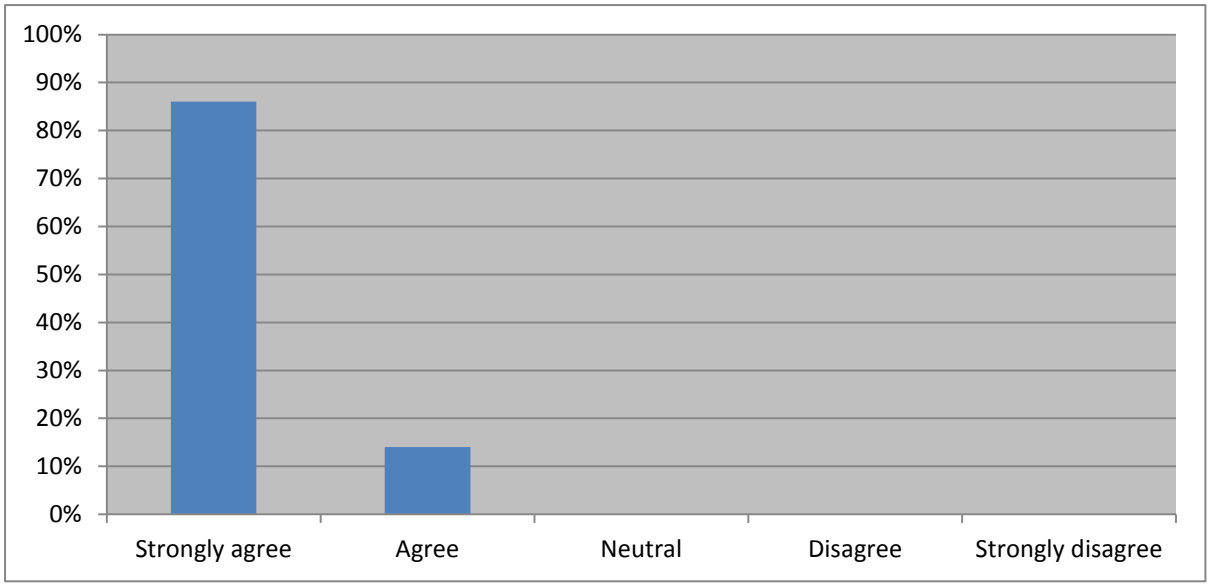


These results indicate that the majority of respondents (71%) strongly agree that TC systems produce misleading project cost results. Under a quarter (24%) of the respondents agreed while only 5% were indifferent. None of the respondents disagreed or strongly disagreed. These responses suggest that the perception of most consultants is that TC systems are not reliable systems. These responses are similar to those in Section 4.4.5.11, where 34% and 50% of the respondents respectively, strongly agreed and agreed that TC systems produce misleading cost results. The results are consistent with findings in the literature that the use of TC systems causes product cost distortions (Mabberley, 1992; Weetman, 2003; Bhimani *et al.,* 2012).

Item 18.2: ABC produces more accurate project cost information than TC systems

The majority of the respondents (81%) strongly agreed that ABC produces more accurate project cost information than TC systems, while a (19%) agreed. None of the respondents were neutral and none disagreed nor strongly disagreed. These results are depicted in Figure 5.5.

Figure 5.5: ABC produces accurate project cost results



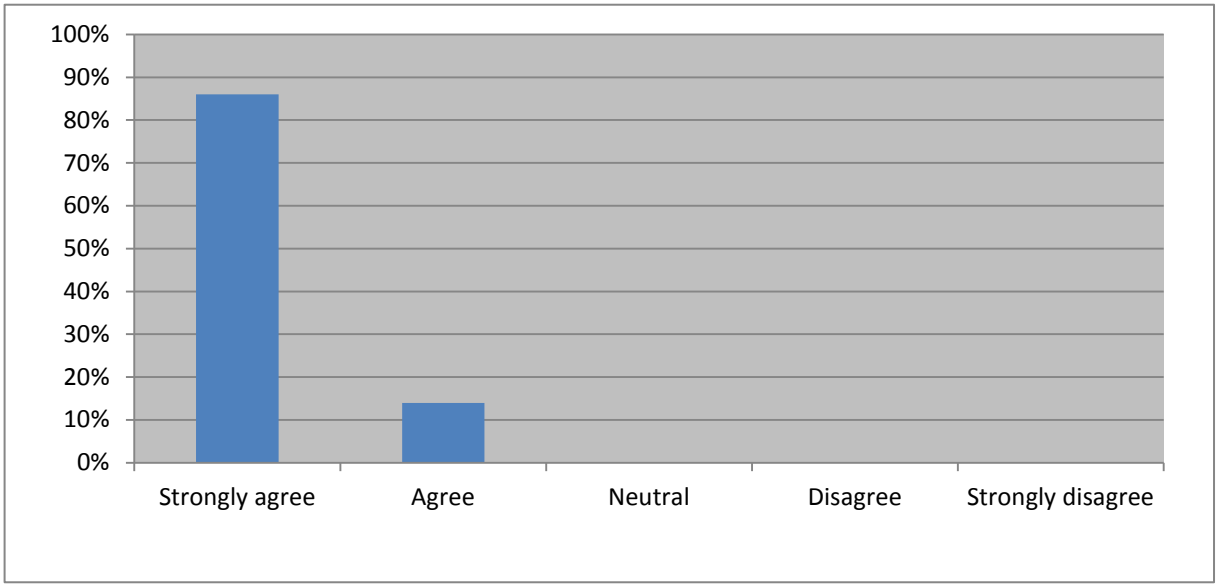
The results above imply that most respondents regard ABC as a superior system to TC systems and think that it should be used in place of a TC system. These results

are also consistent with the findings of Wegmann (2011), that ABC systems produce more accurate project cost information than TC systems.

Item 18.3: The use of a single overhead absorption rate results in project cost distortions

Respondents were unanimous in their belief that using a single OAR is the cause of product cost distortions, with 86% strongly agreeing and 14% agreeing. Figure5.6 illustrates these responses.

Figure 5.6: Using a single OAR causes project cost distortions



These results show that respondents believe that using a single OAR to allocate indirect overheads results in incorrect total project costs. This may imply that using TC systems to allocate indirect overheads to projects results in inaccurate total project costs. The finding that TC systems produce distorted project costs since they use a single overhead absorption rate is consistent with the literature (Mabberley, 1992; Horngren *et al*., 2002).

Item 18.4: TC systems over-cost high volume projects

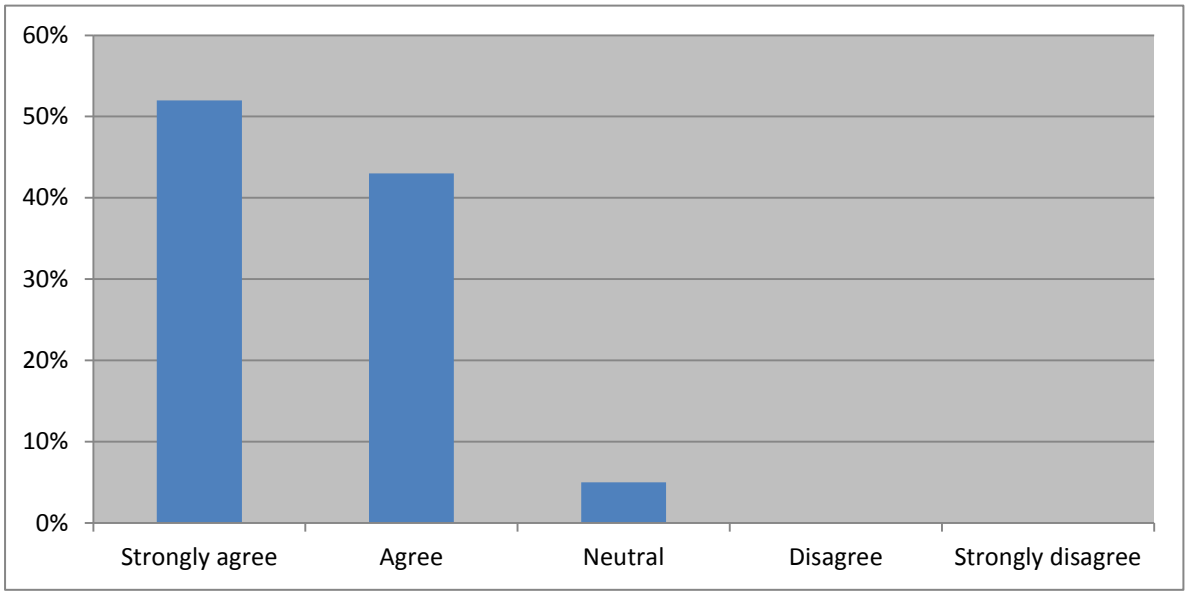
The majority of the respondents answered that they strongly agreed with this statement (76%) or that they agreed (14%). Only 10% were neutral and none of the respondents disagreed or strongly disagreed. The response to this question may suggest that TC systems are unreliable. The use of a single OAR might cause

project cost distortions since large projects would be allocated higher costs of overheads even though they do not necessarily demand higher office overheads than smaller projects (Bhimani *et al.,* 2012).

Item 18.5: TC systems over-cost less complex projects

The majority of the respondents strongly agreed (71%) that TC systems over-cost low complex projects. Five percent of the respondents agreed while 10% were neutral, 5% disagreed and 10% strongly disagreed. These results are reflected in Figure 5.7.

Figure 5.7: TC systems over-cost low complex project



The results above suggest that it may be the case that TC systems over-cost low complex projects. These findings can be compared with the findings on Item 18.4, that TC systems over-cost high volume projects. These findings imply that TC systems may over-cost high volume, low complex projects (Horngren *et al*., 2002; Bhimani *et al*., 2012).

Item 18.6: TC systems under-cost low volume projects

The majority of the respondents (71%) strongly agreed that TC systems under-cost low volume projects while 10% agreed. Only 10% of the respondents disagreed while another 10% was neutral on this issue. Thus the majority view of the respondents was that TC systems under-cost low volume projects. This view may

stem from the fact that low volume projects use fewer resources such as direct labour with the result that they are allocated lower indirect overheads when a volume OAR is used. These findings are consistent with those of Cokins (2002) who found that the use of TC systems resulted in high volume low complex products being over-costed by up to 200%, while low volume but high complex products were under-costed by up to 1000%.

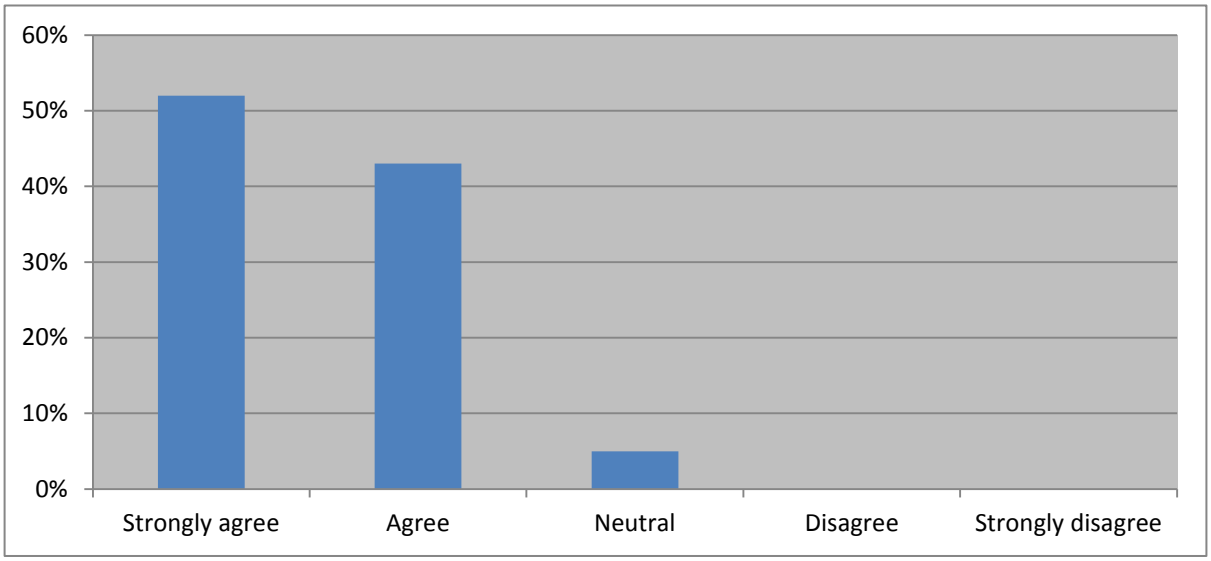
Item 18.7: TC systems under-cost high complex projects

The responses to this item indicated that the majority of the respondents (71%) strongly agree that TC systems under-cost high complex projects. Of the remainder, 5% of respondents agreed, 10% were neutral, 5% disagreed and 10% strongly disagreed. When these results were compared to the findings for Item 18.6, it appeared that the majority of respondents strongly believed that TC systems under-cost low-volume, high complex projects. This is consistent with the findings of Horngren *et al*. (2002) who maintain that low volume products are allocated fewer overheads than they actually demand, given their complexity.

Item 18.8: ABC is an alternative or substitute for TC systems

According to Innes and Mitchell (1998), ABC provides an alternative to TC systems. One of the aims of the study was to establish whether an ABC system could be considered an efficient alternative to TC systems. Most of the respondents (52% and 43%) strongly agreed or agreed respectively; 5% remained neutral. These results are illustrated in Figure 5.8.

Figure 5.8: ABC is an alternative to TC systems



Therefore, most of the respondents (97%) believe that ABC could be used as an alternative to TC systems in the construction industry.

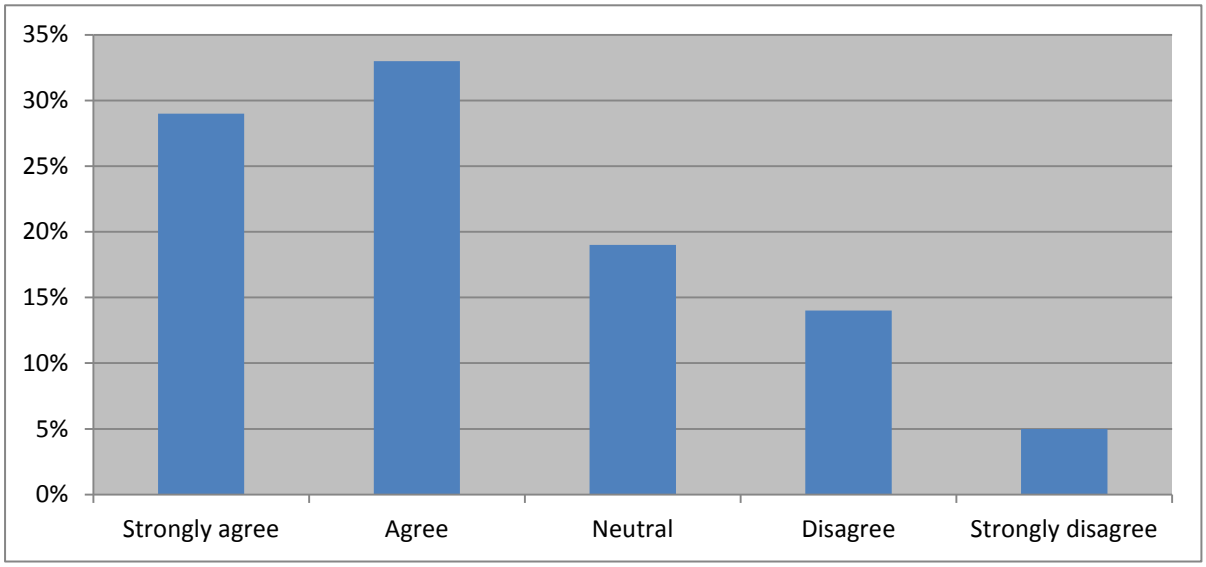
Item 18.9–18.11: ABC allows greater insight into costs.

One of the aims of the study was to establish whether the use of the ABC system leads to a better understanding of expenses and thereby reduces costs. The results revealed that the majority (90%) of the respondents strongly agreed that ABC provides greater insight into costs and what drives them. Ten percent agreed and none of the respondents disagreed with this statement. This suggests that the construction industry may need to take the implementation of an ABC into account when greater insight into costs is required.

Item 18.12: ABC should be used to supplement TC systems

This statement was prompted by the literature review which found that some researchers (Cooper & Kaplan, 1992; Cokins, 2002) felt that ABC should be used to complement TC systems. The responses to this item are summarised in Figure 5.9.

Figure 5.9: ABC is a supplement to TC systems



Twenty-nine percent of the respondents strongly agreed and 34% agreed with this statement. Thus more than half of the respondents (63%) concurred with this statement. However, just above a third (37%) were neutral, disagreed or strongly disagreed (18%, 14% and 5% respectively). Thus those who believed that ABC should be used to complement TC systems rather than replacing the current system made up the majority. This suggests that the construction industry may be aware that TC and ABC systems are there to complement each other.

Item 18.13: The use of an ABC system improves a company's profitability.

Most of the respondents strongly agreed (48%) or agreed (33%) with this statement. Only 10% of the respondents were neutral while another 10% disagreed. The results of this item are in agreement with those of Items 18.9–18.11, which showed that respondents believed that the use of an ABC system could lead to a reduction in a contractor's costs. By reducing the cost of carrying out activities, ABC would lead to increased profitability.

Item 18.14–18.15: ABC reduces costs/wastage.

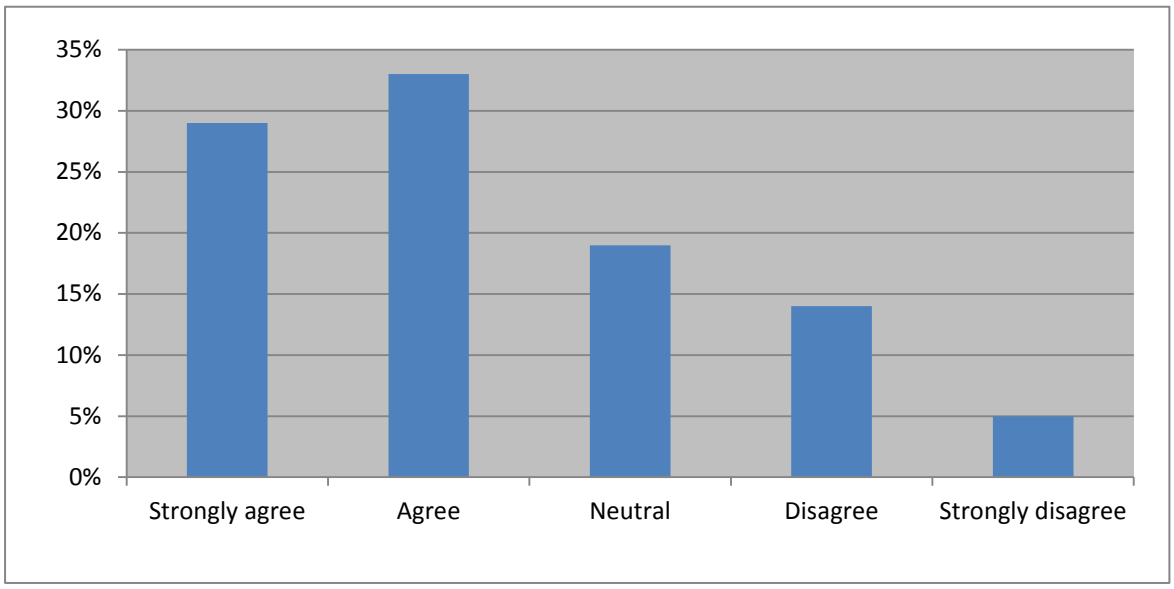
According to Cooper and Kaplan (1992) and Horngren *et al.* (2002), the use of ABC reduces or eliminates non-value adding activities. Elimination of such activities reduces costs and increases profits. The majority of respondents strongly agreed (43%) or agreed (43%) that an ABC system reduces non-value adding activities.

Only a few respondents (5%) were neutral while 10% strongly disagreed. When the results of Items 18.13, 18.14 and 18.15 were compared, it was apparent that many respondents believed that the use of ABC reduces wastage by eliminating unnecessary activities, leading to reduction in costs and increased profitability.

Item 18.16: ABC can be used for competitive project pricing and bidding.

This item aimed to establish whether respondents believed that ABC could be used for the purpose of pricing projects and tendering for new projects. The results are summarised in Figure 5.10.

Figure 5.10: ABC can be used in competitive bidding for projects



Most respondents strongly agree (29%) or agree (33%) that ABC can be used on competitive bidding for new projects. Nineteen percent were neutral on this point while 14% disagreed and 5% strongly disagreed. These results suggest that ABC can be used to determine the level of Preliminaries and General (P and Gs) which cover the site overheads and also a mark-up, which covers the project's fair share of office overheads.

5.4 COMMENTS ON THE ABC SYSTEM

Respondents gave reasons for adopting an ABC system as well as the reasons companies had abandoned or not implemented the system. These reasons and comments are summarised in Table 5.3.

Table 5.3: Summary of comments on the ABC system

Reasons for adopting ABC	Reasons for abandoning or not adopting ABC
• It gives more insight into costs of activities. • Allocates costs accurately. • It gives better assessment of each project's performance. • Helps in project profitability analysis. • Improves cost control. • Its allocation of overheads is more reflective of cost behaviour. • Increases profitability.	• ABC is too complicated. • It is time consuming to implement. • Lack of knowledge about ABC and personnel who know the system. • "ABC needs experienced accountants who are expensive to employ. It is too advanced." • Implementation is too expensive. • ABC software is expensive.

These consultants may believe that the implementation of an ABC system would lead to more accurate project costs and hence greater profitability analysis in all projects. The use of an ABC system is believed to give more insight into the costs of activities; this insight would bring about greater cost control and hence improved profitability of projects.

On the other hand, several contractors had not adopted the ABC system and many had abandoned it after implementation. The low assimilation of the ABC system can be explained by the drawbacks of the system that were identified by these consultants. Foremost of these is the fact that ABC is seen as demanding a great deal of work and as being too complicated to implement. As a result, the system is believed to require experienced accountants to operate it, which is expensive for contractors. One consultant responded that the system requires expensive software.

Other factors explaining the low assimilation of the ABC system may be the perceived advantages of TC systems given by respondents. Eighteen or 90% of the respondents noted that TC systems were easy to use, while 20% stated that they were inexpensive. Therefore, if the TC systems were perceived as inexpensive and easy to use, contractors could be expected to continue to use them, explaining the low assimilation of the ABC system.

5.5 SUMMARY

This section presented and analysed the data collected from consultants to construction companies. The analysis revealed that, according to consultants, contractors attempt to allocate head office overheads to projects (73%). The common basis of allocating head office overheads is the traditional volume based systems. The use of a single volume OAR was found to be the main cause of cost distortions. Respondents also indicated that TC systems over-cost high volume and less complex projects while under-costing low-volume and more complex projects because of the use of volume related overhead absorption rates.

In answer to the problem of cost distortions caused by the use of TC systems, the research found a number of advantages in using the ABC system, including a reduction in costs, quality improvement and accurate estimates of projects' total costs. Consequently, all respondents were unanimous that ABC is a better costing system than TC systems since it offers greater insight into costs, reduces waste and increases profitability.

Despite the commonly held view that ABC is a better costing system than TC systems, the study found low assimilation of the system in the construction industry, consistent with the literature (Sartorius & Kamala, 2007). The reasons for this low assimilation might be explained by comments from respondents, including the view that an ABC system was time consuming and expensive, whereas TC systems were believed to be easy to use and affordable.

The following chapter summarises the findings of this study. The chapter also offers recommendations and suggestions for future research.

CHAPTER 6: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This research sought to establish whether TC systems produce distorted project cost results when used in the construction industry in Southern Africa. The research was premised on the thesis statement that the use of the ABC system in the construction industry would remove the cost distortions that arise from the use of TC systems to allocate indirect overheads to projects. The problem the research investigated was that using an inappropriate costing system produces inaccurate project costs upon which inappropriate decisions are made. Therefore, this study was important as the determination of accurate project costs is key to the contractor's decision-making process and contract profitability analysis.

In order to provide a context for the research, a literature review was conducted. Two questionnaires were emailed to consultants and accountants of construction companies to collect primary data. The literature was discussed in Chapter 2 and the data from the questionnaires was analysed in Chapters 4 and 5. The following sections therefore summarise the findings of the study and draw conclusions.

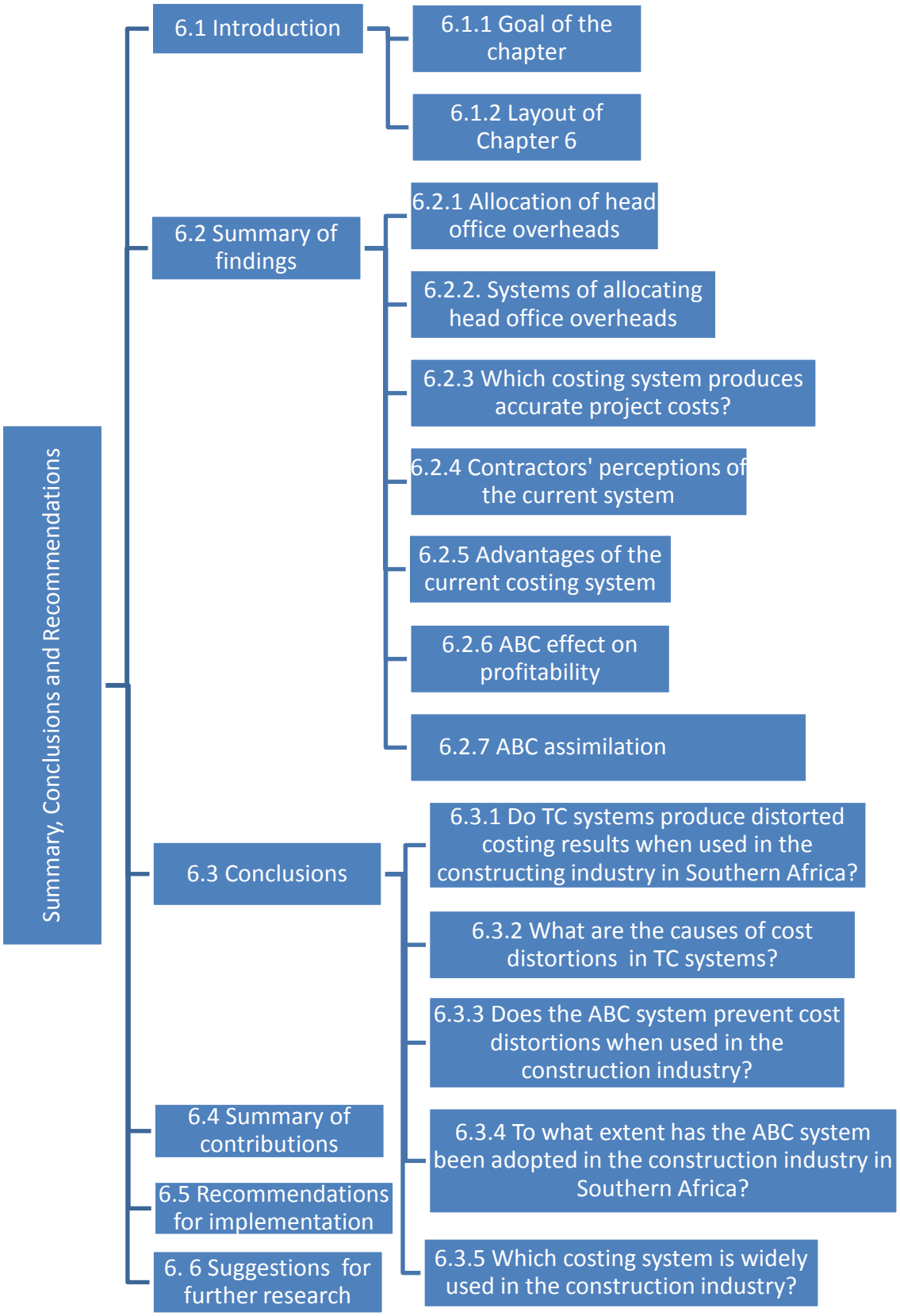
6.1.1 Goal of the chapter

The goal of this chapter is to discuss the results and findings and to draw conclusions, aligning the findings with the objectives of the study.

6.1.2 Layout of Chapter 6

The layout of this chapter is illustrated in Figure 6.1.

Figure 6.1: The layout of Chapter 6



6.2 SUMMARY OF THE FINDINGS

This section recaps the findings of the literature review and Chapters 4 and 5.

6.2.1 Allocation of head office overheads

The study established that most contractors allocate head office overheads to projects. Responses from accountants and managers showed that 53% of the respondents allocated head office overheads to projects while 73% of consultants indicated that their clients allocated head office overheads to projects. Therefore, most contractors appear to allocate head office overheads to projects.

6.2.2 Systems of allocating head office overheads

The majority of the respondents (98%) used traditional volume based systems to allocate overheads to projects. The analysis revealed that the most popular basis of allocating overheads was the value of contracts. According to Kim and Ballard (2001), Horngren *et al*. (2002) and Bhimani *et al*. (2012), when using the value of contract basis, an OAR would be calculated as follows:

$$\text{OAR} = \frac{Value\ of\ the\ project}{Total\ value\ of\ all\ projects}$$

such that the overheads allocated to a project would be determined as:

Indirect home office overheads

$$= \frac{Value\ of\ the\ project}{Total\ value\ of\ the\ project} \text{ x total office overheads for the period}$$

Similarly, indirect site overheads were allocated to the sections of the project using TC systems. The most common bases used were direct labour hours (43%) and value of section (40%).This corresponds with findings by Kim and Ballard (2002), which established that contractors used traditional volume-based overhead absorption to allocate overheads.

6.2.3 Which costing system produces accurate project costs?

The majority of the contractors (91%) and consultants (95%) agreed that the ABC system produces more accurate project costs than TC systems. This is because the ABC system uses activity cost drivers and multiple OAR to allocate overheads (Cooper & Kaplan, 1991). TC systems produce distorted project cost results because they use a single OAR. The resulting effect is the under-costing of low volume or low cost complex projects while high value less complex projects are over-costed

(Bhimani *et al*., 2012). Consequently, it appeared that an ABC system might be a better system with which to allocate overheads since it removes the project costs distortions that arise from the use of TC systems.

6.2.4 Contractors' perceptions of the current system

The study found that contractors were satisfied with their current costing systems. They regarded the TC systems as effective both in allocating indirect office overheads to projects and in allocating project overheads to the project work sections. This perception of the current costing system may also have accounted for the low ABC assimilation discussed in Section 6.2.7. The finding that management was satisfied with the current system is contrary to findings in the literature such as those of Reeve *et al*. (2012), who observed that management was not satisfied with their current system because it distorted product costs.

6.2.5 Advantages of the current costing system

The respondents identified a number of benefits of the current system of allocating overheads. Notably, the responses revealed that respondents believed that TC systems were easy to use and easily understood by staff. Some contractors remarked that "they enable real time reporting" and give accurate project costs. On the other hand, 84% of respondents stated that TC systems produced distorted project costs. Thus, despite the fact that contractors regarded TC systems as producing distorted project costs, they did not appear to have considered this to warrant the adoption of an ABC system.

6.2.6 ABC's effect on profitability

The research confirmed the findings of Cokins (2002) that ABC provides a greater insight into what drives costs; Most respondents (89%) in this study also believed this. Similarly, Bhimani *et al.* (2012) maintain that ABC assists management in understanding their costs, while Cooper and Kaplan (1992) contend that understanding what drives costs leads to increased profits.

6.2.7 ABC assimilation

The research confirmed the findings of Sartorius and Kamala (2007) that ABC assimilation in the region under study has been very low. It was found that more contractors were still using TC systems (95%) than those who were using an ABC

system (5%). The low adoption of ABC in the region is comparable to the low ABC adoption in developed countries. Innes and Mitchell (1998) found that fewer than 10% of the companies they interviewed had implemented ABC, with 50% having rejected it. More recently, Wegmann (2011) explained that ABC diffusion in Western countries is still very low because of the high level of detail, increased paperwork and problems of identifying cost drivers which arise from the use of ABC. Moreover as many as 60% of those companies that had adopted ABC had abandoned the system and a significant 40% of the respondents had never implemented the ABC system. This was unanticipated, considering that both contractors and consultants had indicated that ABC produces accurate project costs and removes project costs distortions of TC systems. The findings also suggested that ABC alone is insufficient to provide the cost information for the company; it should be used as a supplement to TC systems (Cokins, 2002; Garrison & Noreen, 2011). Therefore, TC and ABC systems may be more efficient if used they are used to complement each other.

6.3 CONCLUSIONS

This research study set out to establish which costing system was most appropriate to the construction industry in Southern Africa. It sought to answer the following questions:

- Do TC systems produce distorted costing results when used in the construction industry in Southern Africa?
- What are the causes of cost distortions in TC systems?
- Does the ABC system prevent cost distortions when used in the construction industry?
- To what extent has the ABC system been adopted by construction companies in Southern Africa?

The research was premised on the thesis statement:

- The use of the ABC system in the construction industry in Southern Africa would reduce the cost distortions in construction project costing that arise from applying TC systems of allocating overheads. The implementation of an ABC system in the construction industry would result in greater efficiency and better elimination of waste, resulting in cost cutting from reduced wastage, leading to an increase in profitability of projects.

Therefore the following conclusions were drawn from the data analysis:

6.3.1 Do TC systems produce distorted costing results when used in the construction industry in Southern Africa?

The research established that TC systems produce inaccurate project cost results since they use a single overhead absorption rate. The majority of contractors agreed (50%) or strongly agreed (34%) that TC systems produce misleading cost results. All the consultants stated that TC systems produced distorted cost results. On the other hand, most contractors (91%) and consultants (95%) agreed that the ABC system produces more accurate project cost results than TC systems since it uses multiple activity rates to absorb overheads. The activity rates used in ABC reflect the fact that it is activities that demand overheads, not the products. This conclusion corresponds with studies that have found that TC systems produce distorted product costs results (Cooper & Kaplan, 1992; Clarke & Mullins, 2001; Bhimani *et al.,* 2012).

6.3.2 What are the causes of cost distortions in TC systems?

The literature review revealed that the use of volume related OAR is inappropriate as resource consumption varies with activities and not volume (Charaf & Bescos, 2013). This study has established that there are two factors that cause distorted project cost results in TC systems: the use of a single OAR and the use of volume related OARs. The majority of the consultants (86%) strongly agreed with this and 14% indicated that the use of a single OAR causes project cost distortions. Therefore, the analysis has established that using a single, volume based OAR rate to allocate overheads causes project cost distortions.

6.3.3 Does the ABC system prevent cost distortions when used in the construction industry?

The responses to the questionnaire confirmed the findings of studies in this area (Hansen, 1985; Nassar *et al*., 2011; Charaf & Bescos, 2013) that the use of the ABC system to allocate indirect overheads can eliminate the cost distortions that result from the use of TC systems. All 22 consultants believed that ABC is a better system than the TC systems, and the majority (81%) indicated that ABC produces more accurate cost information than TC systems. Most managers and accountants (40 or 91%) also confirmed that the ABC produces more accurate project cost results. Thus, the majority of the respondents (86%) supported the claims of Cooper and

Kaplan (2002) that the use of an ABC system would eliminate waste and increase profitability.

6.3.4 To what extent has the ABC system been adopted in the construction industry in Southern Africa?

ABC has not been widely adopted in the construction industry in Southern Africa, where TC systems are still used to allocate home office and project overheads to projects. This research found that contractors were satisfied with their system of allocating overheads, despite the fact that these were reported to produce distorted project costs. Although the ABC system produces accurate project costs it was regarded as complementary to TC systems and not as an independent system. Very few respondents (10%) used the ABC system, with over 90% still using traditional volume based allocation systems to allocate indirect overheads to projects. This suggests that the construction industry is unaware of the benefits of using ABC as a complementary system to the TC system.

6.3.5 Which costing system is widely used in the construction industry?

The findings indicated that most construction companies (90%) were using TC systems to allocate overheads to projects. The most common basis of allocating overheads was the value of contract basis for allocating home office overheads to projects. Similarly, the basis most used to allocate project overheads to their work sections was the value of the section basis. The section of the project with the highest value therefore absorbs the greatest share of the project overheads.

6.4 SUMMARY OF CONTRIBUTIONS

This research study has contributed new knowledge to that which currently exists in the area of overhead allocation in the construction industry in Southern Africa. Contrary to the widely held view that TC systems have no place in modern management accounting, this research found that TC systems are still popular in this industry in Southern Africa, and that users of TC systems were generally satisfied with their system's performance.

The finding that TC systems users were satisfied with their current systems has implications in the light of the current view that TC systems are dysfunctional. The study revealed the benefits of TC systems reported by their users, such the fact that they produce accurate costs, are simple to use, and allow real time reporting. TC

systems may thus have been improved by computer systems to the point where they are able to provide reliable cost data and efficient reporting. Thus this study has found that continued calls by advocates of ABC to implement this system because of its ability to provide more accurate product costs than TC systems may be misplaced and may not in fact increase the assimilation of ABC.

6.5 RECOMMENDATIONS FOR IMPLEMENTATION

The following recommendations are made, based on the findings of this study:

- Contractors should use two costing systems since TC and ABC systems are complementary to each other. A company needs a TC system with the primary role of supplying information to external users; it also requires an ABC system, which focuses on internal reporting and providing management with information for decision-making.
- An ABC system should be used in project pricing and bidding, allowing the contractor to incorporate office overheads into the price of each section of the project. In addition, the ABC system should be used to determine the project overheads and allocate them to the project sections. When site overheads are allocated to project sections, each section is properly priced and profit analysis can be accurately conducted.

6.6 SUGGESTIONS FOR FURTHER RESEARCH

According to Hofstee (2006), a good answer to a research question may prompt several good questions. The findings of this research have exposed some loose ends that could not be answered conclusively by the data. Therefore, further research is recommended on the following aspects:

1. The cost effectiveness of employing two costing systems, namely TC and ABC, in a company.
2. The extent to which improvement in computer software has enhanced the performance of TC systems.

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APPENDIX A: COVERING LETTER

Costing and traditional costing systems in the construction industry in Southern Africa

University of South Africa

Pretoria.

Dear Participant

I am a Masters of Commerce (Management Accounting) student at UNISA doing research entitled 'A comparative analysis of the applicability of Activity Based Costing and traditional costing systems in the construction industry in Southern Africa'. In fulfilment of this degree, I am required to complete a dissertation and for that purpose I have designed a questionnaire which I request you to kindly take time to complete.

I have attempted to make the questionnaire as brief as possible and I estimate that about 15 minutes of your time would be required to complete it. Though I shall appreciate it if you could answer all the questions, you are however under no obligation to answer the questions, hence you may omit any question you may feel uncomfortable to answer.

Please note that you do not need to divulge your name or that of your organisation and your responses to this questionnaire shall be treated confidentially. Your position, name or that of your organisation shall not appear in my research. Please be assured that the information you give shall be used solely for this research and will not be passed on to any third parties except with your express consent.

Your participation represents a valuable contribution to the debate, research and continuous improvements which we seek in cost and management accounting issues. I am therefore most thankful for your participation.

Yours Sincerely,

Evans Mushonga

APPENDIX B: QUESTIONNAIRE – MANAGERS AND ACCOUNTANTS

There are 27 questions in this survey

SECTION A: MANAGEMENT

1 [1 General Informatio]

Which sector of construction do you specialise in ? *

Please choose **only one** of the following:

- ○ General Building Works
- ○ Construction Engineering Works
- ○ Mechanical Engineering Works
- ○ Other [ ]

2 [1 General Informatio]

What is the size of your company? *

Please choose **only one** of the following:

- ○ Small Contractor (Grade 1 to Grade 3)
- ○ Medium Contractor (Grade 4 to Grade 6)
- ○ Large Contractor (Grade 7 to Grade 9)

3 [1 General Informatio]How many jobs or projects are you currently working on? *

Please choose **only one** of the following:

- ○ 1 to 2
- ○ 3 to 4
- ○ 5 to 6
- ○ 7 and above

4 [1 General Informatio]
Please state below what exactly is involved in each of your major projects.e.g. office renovations, housing construction, civil works.
*

Please write your answer here:

5 [2 Head Office Overhe]
Do you allocate head office overheads to your projects?
*

Please choose **only one** of the following:

- ○ Yes
- ○ No

6 [2.1]Comments if any

Please write your answer here:

7 [2b]
briefly describe how head office overheads are allocated to projects
*****

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '5 [2 Head Office Overhe]' (Do you allocate head office overheads to your projects?)

Please write your answer here:

8 [2c]

What are your objectives of allocating head office overheads to the work sections? *

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '5 [2 Head Office Overhe]' (Do you allocate head office overheads to your projects?)

Please choose **all** that apply:

- ☐ To obtain accurate project costs
- ☐ To measure project performance
- ☐ To value completed work
- ☐ To measure the performance of project supervisors
- ☐ Other:

9 [2d]

Overall how would you rate your system of allocating head office overheads to projects? *

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '5 [2 Head Office Overhe]' (Do you allocate head office overheads to your projects?)

Please choose **only one** of the following:

- ○ Poor
- ○ Satisfactory
- ○ Good
- ○ Very Good

10 [2d1]comments if any

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '5 [2 Head Office Overhe]' (Do you allocate head office overheads to your projects?)

Please write your answer here:

11 [3a]

Do you allocate project overheads such as supervisors' salaries to each section of the work? *

Please choose **only one** of the following:

- ○ Yes
- ○ No

12 [3b]Do you allocate project overheads such as warehouse costs to each section of the work? *

Please choose **only one** of the following:

- ○ Yes
- ○ No

13 [3c]On what basis are project overhead costs allocated to the sections of the project? *

Only answer this question if the following conditions are met:
Answer was 'Yes' *or* 'Yes' at question '11 [3a]' (Do you allocate project overheads such as supervisors' salaries to each section of the work?)

Please choose **only one** of the following:

- ○ Direct labor consumed by the section.
- ○ Value of each section of the project.
- ○ Activity drivers such as warehouse orders made.
- ○ Machine hours consumed
- ○ Other [ ]

14 [3d]
How would you rate your system of allocating project overheads overall? *

Only answer this question if the following conditions are met:
Answer was 'Yes' *or* 'Yes' at question '11 [3a]' (Do you allocate project overheads such as supervisors' salaries to each section of the work?)

Please choose **only one** of the following:

- ○ Poor
- ○ Satisfactory
- ○ Good
- ○ Very Good

15 [3d1]Please comment on the overall effectiveness of the system of allocating overheads in your organisation *

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '11 [3a]' (Do you allocate project overheads such as supervisors' salaries to each section of the work?)

Please write your answer here:

16 [3e]

What are your objectives of allocating project overheads to the work sections? *

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '11 [3a]' (Do you allocate project overheads such as supervisors' salaries to each section of the work?)

Please choose **all** that apply:

- ☐ To obtain accurate project costs
- ☐ To measure project performance
- ☐ To value completed works
- ☐ To measure the performance of project supervisors
- ☐ Other:

17 [3f]How effective is your system of allocating project overheads to project sections? *

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '11 [3a]' (Do you allocate project overheads such as supervisors' salaries to each section of the work?)

Please choose **only one** of the following:

- ○ Poor
- ○ Satisfactory
- ○ Good
- ○ Very Good

18 [3f1]Please comment on how the system could be improved *

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '11 [3a]' (Do you allocate project overheads such as supervisors' salaries to each section of the work?)

Please write your answer here:

19 [4a]

Is your organisation using Activity Based Costing to allocate overheads to construction projects? *

Please choose **only one** of the following:

- ○ Yes
- ○ No

20 [4b]
If not, have you ever considered implementing Activity Based Costing?
*

Only answer this question if the following conditions are met:
Answer was 'No' at question '19 [4a]' (Is your organisation using Activity Based Costing to allocate overheads to construction projects?)

Please choose **only one** of the following:

- ○ Yes
- ○ No

21 [4b1]Comments if any

Only answer this question if the following conditions are met:
Answer was 'No' at question '19 [4a]' (Is your organisation using Activity Based Costing to allocate overheads to construction projects?)

Please write your answer here:

22 [4c]
Please state why you would consider to discontinue your current system.
*

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '20 [4b]' (If not, have you ever considered implementing Activity Based Costing?)

Please write your answer here:

23 [4d]
Which costing system do you think produces accurate project costing results?
*

Please choose **only one** of the following:

- ○ Activity based
- ○ Conventional Costing System
- ○ Other [ ]

24 [4e]
Please explain your answer above.
*

Please write your answer here:

[ ]

25 [4f]

Indicate the benefits your organisation enjoys from the chosen system *

Please write your answer here:

[ ]

26 [5 Other comment]
Please add any other comments you would like to make

Please write your answer here:

27 [6]Please complete the following tabled questions by ticking the appropriate box *

Please choose the appropriate response for each item:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Traditional costing systems produce misleading project costs.	○	○	○	○	○
ABC produces more accurate project cost information than conventional costing systems.	○	○	○	○	○
The use of a single overhead absorption rate results in project cost distortions.	○	○	○	○	○
Traditional costing systems overcost high volume projects.	○	○	○	○	○
Traditional costing systems overcost low complex projects.	○	○	○	○	○
Traditional costing systems undercost low volume projects.	○	○	○	○	○
Traditional costing systems undercost high complex projects.	○	○	○	○	○
ABC is an alternative or substitute to traditional costing systems.	○	○	○	○	○

ABC provides greater insight into costs.	○	○	○	○	○
ABC provides greater insight into what drives costs.	○	○	○	○	○
ABC gives more insight into the costs of performing activities in a company.	○	○	○	○	○
ABC should be used supplementary to traditional costing systems.	○	○	○	○	○
The use of an ABC system improves a company's profitability.	○	○	○	○	○
ABC reduces non-value adding activities.	○	○	○	○	○
An ABC system reduces wastage	○	○	○	○	○
An ABC system reduces costs.	○	○	○	○	○
ABC can be used for competitive project pricing and bidding.	○	○	○	○	○
Implementing ABC is time consuming	○	○	○	○	○
ABC helps in perfomance measurement.	○	○	○	○	○
ABC improves customer profitability analysis.	○	○	○	○	○

Submit your survey.
Thank you for completing this survey.

APPENDIX C: QUESTIONNAIRE – CONSULTANTS

There are 18 questions in this survey

SECTION A

1 [1]
Do you have any clients in the building industry?
*

Please choose **only one** of the following:

- ○ Yes
- ○ No

2 [1.1]Comments (if any)

Please write your answer here:

3 [2]
Which sector of the building industry does your largest client specialise in?
*

Please choose **only one** of the following:

- ○ General Building Works
- ○ Construction Engineering Works
- ○ Mechanical Engineering Works
- ○ Other

4 [3]
What is the size of your largest construction client's company?
*

Please choose **only one** of the following:

- ○ Small Contractor (Grade 1 to Grade 3)
- ○ Medium Contractor (Grade 4 to Grade 6)
- ○ Large Contractor (Grade 7 to Grade 9)

5 [4]
Does your client allocate head office overheads to each project?
*

Please choose **only one** of the following:

- ○ Yes
- ○ No

6 [5]
Please describe briefly how head office overheads are allocated to the projects.
*

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '5 [4]' (Does your client allocate head office overheads to each project?)

Please write your answer here:

7 [6]
Have any of your construction clients adopted Activity Based Costing (ABC)?
*

Please choose **only one** of the following:

- ○ Yes
- ○ No

8 [7]
What were your clients' reasons for adopting ABC?
*

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '7 [6]' (Have any of your construction clients adopted Activity Based Costing (ABC)?)

Please write your answer here:

9 [8]
What have been the benefits to your client from implementing ABC?

Only answer this question if the following conditions are met:
Answer was 'Yes' at question '7 [6]' (Have any of your construction clients adopted Activity Based Costing (ABC)?)

Please write your answer here:

10 [9]
Has any of your construction clients adopted or considered adopting ABC but abandoned the system?
*

Please choose **only one** of the following:

- ○ Yes
- ○ No

11 [10]
What were the reasons for your client abandoning ABC?
*

Only answer this question if the following conditions are met:
Answer was 'Yes' *or* 'Yes' at question '10 [9]' (Has any of your construction clients adopted or considered adopting ABC but abandoned the system?)

Please write your answer here:

12 [11]
How many of your clients in the construction sector are still using conventional costing methods to allocate overheads?

Please write your answer here:

13 [12]
What are your clients' reasons for choosing conventional costing systems?

Please write your answer here:

14 [13]
Do you consider ABC a better costing system for the construction industry?
*

Please choose **only one** of the following:

- ○ Yes
- ○ No

15 [14]
Is ABC a better costing method than conventional costing systems?
*

Please choose **only one** of the following:

- ○ Yes
- ○ No

16 [15]
Give reasons to your answer above.
*

Please write your answer here:

17 [16]
Please add any other comments you would like to make

Please write your answer here:

18 [17]Please complete the following tabled questions by ticking the appropriate box *

Please choose the appropriate response for each item:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Traditional costing systems produce misleading project cost results	○	○	○	○	○
ABC produces more accurate project cost information than conventional costing systems.	○	○	○	○	○
The use of a single overhead absorption rate results in project	○	○	○	○	○

cost distortions.					
Traditional costing systems overcost high volume projects.	○	○	○	○	○
Traditional costing systems overcost low complex projects.	○	○	○	○	○
Traditional costing systems undercost low volume projects.	○	○	○	○	○
Traditional costing systems undercost high complex projects.	○	○	○	○	○
ABC is an alternative or substitute to traditional costing systems.	○	○	○	○	○
ABC provides greater insight into costs.	○	○	○	○	○
ABC gives greater insight into what drives costs	○	○	○	○	○
ABC gives more insight into the costs of performing activities in the company.	○	○	○	○	○
ABC should be used supplementary to traditional costing systems.	○	○	○	○	○
The use of an ABC system improves a company's profitability.	○	○	○	○	○
ABC reduces non-value adding activities.	○	○	○	○	○
An ABC system reduces wastage	○	○	○	○	○
An ABC system reduces costs.	○	○	○	○	○
ABC can be used for competitive project pricing and bidding.	○	○	○	○	○
Implementing ABC is time consuming.	○	○	○	○	○
ABC helps in perfomance measurement.	○	○	○	○	○
ABC improves customer profitability analysis.	○	○	○	○	○

Submit your survey.
Thank you for completing this survey.