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Barriers to Adopting Activity-Based Costing Systems (ABC)
An Empirical Investigation using Cluster Analysis

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for the degree of Doctor of Philosophy

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ABSTRACT

This research seeks to establish why ABC adoption rates are low given the claimed benefits of the system. The view is taken that there are likely to be two sets of interacting variables influencing ABC adoption, contingent variables and the company's ability or willingness to address implementation barriers.

The contingency approach is a recent and important development in ABC research. From the perspective that there is no one universally appropriate MAS system, but that the appropriateness of any system is dependent on the factors facing the firm, it can be argued that ABC system adoption and success will depend upon specific contingent factors such as product diversity, cost structure, firm size, competition, and business unit culture. A contingency model of ABC adoption has been developed in order to examine and investigate the reasons why the take up or adoption of ABC systems remains low. This model seeks to incorporate contingency theory relating to a set of variables which will be identified from the literature as likely to be influential in ABC adoption.

The view is taken that such contingency variables will not of themselves explain ABC adoption rates, rather such contingency factors may be viewed as rendering ABC suitable or otherwise for adoption by companies but that there are also implementation issues which influence adoption. The implementation factors can be classified based upon a review of the literature into three main types Behavioural, Systems and Technical.

This study seeks to establish which of these three sets of factors constitutes the dominant barriers to ABC implementation. Based upon the contingency model, companies are classified into groups, each group having a different "profile" with regard to the individually established contingent variables. Thus, one such group will have a "good match" with the contingent variables and another will have a "poor match", e.g. if "size" is found to be a contingent variable, one group will comprise the larger firms, and another group will comprise the smaller firms, with a number of intermediate groups. The grouping is based on all established contingent variables. Each such group is subdividing into ABC adoption or non-adoption, and the reasons for non-adoption establish for each such group.

A mail questionnaire survey was considered an appropriate method for this study. The survey undertaken comprised all firms listed in *Business and Finance (2004) Irelands Top 1000 Companies* (the total number of companies included in the list were only 925 companies). 218 questionnaires were returned, generates a 23.6% response rate. The quantitative data were processed using a SPSS program, leading to appropriate descriptive and inferential statistical analysis, including frequencies, means, standard deviations, chi-square, t-test, Mann-Whitney and ANOVA tests. Cluster analysis was used to profile the companies according to the individually significant contingent factors.

Seven contingent variables were identified from the literature, six of which were found to be statistically significantly associated with ABC adoption. Companies were "clustered" using these variables into three groups, and reasons for non-adoption were identified. Based upon an analysis of the given reasons for non-adoption, Technical Issues were dominant amongst these companies in the cluster which profile most closely matches the contingent factors.

The findings suggest that in the adoption of ABC, two distinct sets of variables are at work. The 'Contingent Variables' which likely render it appropriate or useful for the company to adopt ABC, and the company's ability, or willingness to address the 'Barriers' and difficulties associated with ABC adoption. The results show a strong significant association between contingent variables and the adoption of ABC.
The results suggest that the contingent variables alone may not of themselves adequately explain the actual take up of ABC systems. Moreover, it suggests that two companies which have similar profiles with regard to contingent variables (with higher overheads, more product diversity etc.) may yet reach different decision with regards to ABC adoption, due to their differing abilities or willingness to address and overcome the issues relating to ABC implementation, the results completely support this suggestion. The results also show that 'Technical Issues' are the most common factor militating against ABC adoption within companies who are rejecting and actively considering its adoption within the cluster whose profile most closely matches the prime factors.

DECLARATION

I certify that this thesis which I now submit for examination for the award of Doctor of Philosophy, is entirely my own work and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

The thesis was prepared according to the regulations for postgraduate study by research of the Dublin Institute of Technology and has not been submitted in whole or in part for an award in any other institute or university.

The work reported on in this thesis conforms to the principles and requirements of the institute's guidelines for ethics in research.

The institute has permission to keep, to lend or to copy this thesis in whole or in part, on condition that any such use of the material of the thesis be duly acknowledged.

Signature ___________________________________ Date _______________

To my great parents,

my lovely wife 'Rasha'

and my beloved kids

Mohamed, Mumin and Maria

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CHAPTER 1: INTRODUCTION

1.1 Background

In the costing of products or services, the appropriate treatment of 'overhead' or indirect costs has posed particular challenges. The traditional absorption costing system deals with these costs by a two stage process of allocation or apportionment to cost centres, from where they are charged to (or absorbed by) the product or service. This second stage utilizes an 'absorption base' which is common to all products or services being costed and which is usually a measure of the volume of activity utilized by the product or service, for example, direct labour hours or machine hours, but other such bases may also be used, for example, direct labour cost or direct material cost. This approach results in the product or service being charged with the overhead costs in proportion with their utilization of the chosen absorption base.

Activity-Based Costing (ABC) is an alternative to the traditional treatment of overhead costs. ABC recognizes that many overhead costs vary in proportion to changes in activities, rather than the measure of production volume utilized as the absorption base in the traditional system. By identifying the "activities" that cause costs to change and thus assigning costs to products on the basis of the "cost driver" usage, it is claimed that ABC can more accurately measure the resources consumed by products. This cause and effect relationship provides a superior way of determining relevant costs. Furthermore, it is claimed (Drury, 2001) that ABC can be used for a range of cost management applications such as value chain analysis, customer profitability analysis, and business process management.

In general, the management accounting literature has provided four genres of ABC research: consulting, basic, critical and contingency research (Otley, 1980; Young and Selto, 1991; Lukka and Granlund, 2002). It can be argued that the genre of contingency research is the most recent and important development in the ABC literature. However, contingency-based research has been given little attention particularly in Ireland. Therefore, this research develops a new and complex contingency model of ABC in order to examine and investigate the relationship between the adoption of ABC systems, Technical Issues and contingency factors within Irish companies.

1.2 Justification for the Research

Despite its high profile, the published evidence on ABC implementation indicates that there is a fairly low rate of implementation (Innes and Mitchell 1991, 1995; Clarke 1992, 1997; Bjornenak 1997; Chenhall and Langfield-Smith 1998; Pohlen and Londe 1998; Groot 1999; Innes et al. 2000; Drury and Lamminmaki 2001; Pierce and Brown 2004; Cohen et al. 2005; Sartorius et al. 2007).

Various possible reasons have been suggested for this relatively low adoption rate, which include the following: Technical Variables such as identifying and aggregating activities, assigning resources to activities, selecting cost drivers (Innes and Mitchell 1990, 1992, 1993, 1995, 1998; Clarke et al. 1999; Groot, 1999; Innes et al. 2000; Chongruksut 2002; Pierce and Brown 2004; and Cohen et al. 2005, Sartorius et al. 2007), Behavioural and Organisational variables such as internal resistance, lack of top management support, human resource availability, lack of knowledge, and an expressed satisfaction with current systems (O'Dea and Clarke 1994; Anderson 1995; Shields 1995; Clarke et al. 1999; Innes et al. 2000; Chongruksut 2002; Pierce and Brown 2004; and Cohen et al.

2005), and Systems Issues, such as data collection difficulties, inadequate computer software, amount of work and time needed (Clarke et al. 1999; Innes et al. 2000; and Pierce and Brown 2004).

ABC implementation has already been investigated in some countries. The literature shows examples of successful ABC implementation in countries such as Ireland (Clark et al. 1999; Pierce and Brown 2004), UK (Innes and Mitchell 1991, 1995; and Innes et al. 2000), USA (Anderson 1995; Pohlen and Londe, 1998; Groot 1999), Australia (Booth and Giacobbe, 1997, Nguyen and Brooks 1997; Chenhall and Smith 1998), New Zealand (Cotton et al, 2003) and Canada (Eden et al. 2004). While there is evidence which suggests that behavioural factors are critical to the successful implementation of a new cost management system (Anderson 1995; Shields 1995), there has been no empirical investigation indicating the impact of technical issues on the successful implementation of ABC. Such technical issues include (i) identifying the major activities (ii) creating a cost pool for each major activity (iii) determining the cost driver for each activity, and (iv) assigning the cost of activities to cost objects.

This study will explore how these issues influence Irish companies together with the impact of contingency factors on the implementation of ABC systems. The focus of this research is to investigate the extent of the impact of these technical issues on companies when implementing ABC.

1.3 Aims of the research

The aim of this research is to develop a model of ABC adoption. This model will seek to incorporate contingency theory relating to a set of variables which will be identified from the literature as likely to be influential in ABC adoption. However, such contingency variables will not of themselves fully explain the issues. Rather, such factors are viewed as rendering ABC "suitable" or otherwise for adoption by companies. The view is taken that in addition to such factors there are also implementation issues which influence adaptation. These implementation factors can be classified, based on a review of the literature, into three main types - Behavioural, Systems and Technical.

While significant consideration of the behavioural issues relating to ABC implementation has been given in the literature, it has been suggested that technical issues should be further investigated, As Anderson et al (2002, p.195) explicitly state: "an aspect of ABC implementation that researchers have neglected is the process of designing the ABC model – i.e. the resources, activities and cost drivers that are the 'economic map' of the organisation".

This research seeks to establish whether or not such technical issues are significant to the adoption of ABC. The model developed will seek to investigate the relationship between the implementation of ABC, the contingent factors influencing such adoption, and the significant technical issues which may act as barrier to such implementation.

It is expected that to achieve this aim an investigation of the following matters will be necessary:

(i) The current state of ABC adoption rates among Irish companies.

(ii) The perceived level of usage and success across a range of specified applications.

(iii) The main reasons and difficulties for the implementation, rejection, consideration and non-consideration of ABC in organisations.

(iv) The nature/role of contingency theory in management accounting and its impact on the decisions on the implementation of ABC systems in Ireland.

(v) The technical issues that have been addressed by those companies which have successfully implemented ABC systems.

1.4 Research questions

This research attempts to answer two main interrelated questions:

1. Is the adoption of ABC by Irish companies associated with firm-specific characteristics, namely industry sector, firm size, nationality, product diversity, type of competition, cost structure and business unit culture?

The above question seeks to test those factors which the literature suggests likely influence the adoption of ABC systems i.e. companies which have a particular 'profile' relating to contingency factors are more likely to find ABC useful and therefore, more likely to adopt it than companies which have an alternative 'profile'.

2. What is the extent of the technical difficulties encountered during the implementation of ABC system?

The technical difficulties focused upon are those identified by the literature review:

(i) Identifying the major activities that take place in an organisation

(ii) Assigning resources to those activities

(iii) Aggregating activities to create cost pools/ activity centres

(iv) Determining the cost drivers for each activity

(v) Assigning the cost of activities to cost objects

A group of null hypotheses are proposed to answer each of the above two questions. For each contingent variable, at least one or more hypotheses are tested.

1.5 Research Methods

This study will proceed in the following three stages:

1.5.1 Literature review

The literature relating to ABC systems with respect to its benefits, problems, implementation, success and satisfaction, as well as adoption rates and status will be reviewed. A comprehensive review of contingency theory in management accounting will follow. The literature review will continue to inform issues throughout the project.

1.5.2 Data Collection

The survey undertaken comprised all firms listed in *Business and Finance (2004) Irelands Top 1000 Companies* (the total number of companies listed were only 925). The main reasons for choosing companies listed in *Business and Finance Ireland* are that they are the top firms, and contact details are readily available. Moreover the top 1000 were used in previous Irish surveys, and this will allow valid comparisons between the results.

The questionnaire used in this study, comprising 12 pages, was pretested to ensure the suitability of the questions and to eliminate ambiguities. The questionnaire was sent with a cover letter and a reply envelope. The cover letter was addressed to the accounting/finance manger of each company as the person considered most likely to understand the cost accounting systems and assumed to be the key person responsible for decisions regarding ABC in the firm. A follow-up questionnaire was posted, approximately five weeks after the first mail-out.

1.5.3 Data analysis

Quantitative data will be processed using a SPSS program, leading to appropriate descriptive and inferential statistical analysis, including frequencies, means, standard deviations, chi-square, t-test, Mann-Whitney and ANOVA tests. Cluster analysis will be used to profile the companies according to the individually significant contingent factors.

1.6 Organisation of the study

An overview of the remaining 10 chapters is provided below:

1.6.1 Chapter 2: ABC Introduction

In order to provide essential background to the following chapters, this chapter aims to provide basic background material on the traditional and ABC systems. It will review the nature of both systems, and will discuss the different approaches adapted by ABC and TCS to the treatment of overhead costs, comparing both systems using Cooper's (1988a) examples.

1.6.2 Chapter 3: Empirical Findings Relating to ABC Implementation

This chapter reviews and analyses the findings of a number of studies regarding the adoption of ABC systems in different countries. This chapter will review these studies chronologically and will report ABC adoption rates, the benefits of adoption and the difficulties of implementing the system. Information in this chapter will be used in developing the research hypotheses in chapter 7.

1.6.3 Chapter 4: Technical issues in the Implementation of ABC System

The purpose of this chapter is to review the structured approach to ABC implementation, which can be broken down into two major segments. The first segment covers design choices that should be made before beginning implementation. Those choices define the characteristics of the system that will emerge. The second major segment covers the steps taken to implement an ABC system successfully. These steps help determine the actual design of the system and how readily it will be accepted by staff. Given the purpose of this chapter, it is intended to be predominantly descriptive rather than analytical.

1.6.4 Chapter 5: Contingency Theory and Management Accounting Design

This chapter aims to review the contingency theory of management accounting, providing illustrations of the relationships between the contingent factors and the features of management accounting systems. This chapter provides an essential background for chapter 6 in developing the research model.

1.6.5 Chapter 6: A Model of ABC Adoption

This chapter reviews a series of contingent factors that may affect the decision to implement ABC systems within Irish firms. It considers the evidence supporting such variables, and based upon this consideration a "basic" contingency model of ABC adoption is developed. This basic model is then extended to include the barriers and difficulties to ABC adoption, which have been previously identified in Chapters 3. In this chapter, seven contingency variables concerning the implementation of ABC systems are developed.

1.6.6 Chapter 7: Research Methodology

The aim of this chapter is twofold: firstly to provide an overview of the research philosophy and paradigms, research questions and research hypotheses that will be tested in this study. This will be achieved by supporting each hypothesis with arguments that are based upon the literature on the implementation of ABC and the literature on contingency theory in management accounting.

The second aim is to give a detailed overview of several methodological issues related to the analysis utilized in this research. This will include an introduction to the data resources used, the study sample, the process of data collection, and an introduction to the different statistical methods implemented. This chapter provides an essential introduction for the following three chapters, 8, 9 and 10.

1.6.7 Chapter 8: Results, Findings and Discussion: Descriptive analysis

This chapter provides an initial analysis of the questionnaire data and presents the univariable analysis of the data collected from each question of the survey. These results are presented, question by question, in the sequence in which the questions appeared in the questionnaire. The results are laid out under the headings of (i) responses to questions asked of all companies, (ii) responses to questions by adopting companies, (iii) responses to questions by companies currently considering ABC adoption, (iv) responses to questions by companies who have rejected ABC and (v) responses to questions by companies which have not considered ABC adoption.

1.6.8 Chapter 9: Bivariate Statistical Analysis

This chapter presents and discusses the results of the bivariable analysis of the underlying relationships between independent variables (industrial sector, size, nationality, type of competition, product diversity, cost structure, overhead expectation and business unit culture) and levels of ABC adoption (implemented, under consideration, rejected and no consideration).

Cross tabulations or contingency tables, Chi-square and Mann-Whitney will be used to explore the relationships among these variables, and to identify whether there are any statistically significant relationships between the contingent variables and the adoption of ABC systems.

1.6.9 Chapter 10: Cluster Analysis

This chapter presents the findings of cluster analysis technique, which sorts cases (companies) into groups, or clusters. A cluster is a group of relatively homogeneous cases or observations, so that the degree of association is strong between companies of the same cluster and weak between companies of different clusters. The statistical procedure for identifying clusters will be achieved use SPSS software, and the Euclidean technique will be used. Three clusters will be utilized in this study, each cluster describes, in terms of the data collected, the characteristics of companies (size, number of products, cost structure, marketing strategy and business unit culture) using descriptive statistics. Moreover, an association between these clusters and ABC adoption status is provided.

1.6.10 Chapter 11: Evaluation of the Research Model

This chapter presents the results of the analysis conducted in previous chapters 8, 9 and 10, and shows how these results support the theoretical model developed in chapter 6 and how they support each of the thirteen hypotheses posed in chapter 7. The chapter also has sought to answer the two interrelated questions posed in chapter 7.

1.6.11 Chapter 12: Summary, Conclusion and Suggestions for Further Research

This chapter is designed to present conclusions and highlights the contributions of the study, starting with a summary of the research questions. The chapter then discusses the theoretical and methodological contributions of the research. Moreover, it suggests potential avenues for further research. Finally, the closing remarks of the research are summarised.

CHAPTER 2: ACTIVITY-BASED COSTING (ABC): REVIEW AND APPLICATION

2.1 Introduction

Activity-Based Costing (ABC) is a method of cost analysis which, it is claimed, constitutes a reliable system of providing accurate cost information (Cooper and Kaplan 1987, 1988a, 1988b; Cooper 1988a, 1988b, 1989; Turney 1996; Drury 2000, 2004). Cooper and Kaplan (1991) argue that ABC offers a solution to the shortcomings associated with traditional costing systems (TCS).

This chapter discusses the different approaches adopted by ABC and TCS to the treatment of overhead costs, the limitations of the traditional system, and the claimed advantages and benefits of ABC. Moreover, a comparison of both systems will be illustrated by using Cooper's (1988a) examples.

The rest of the chapter is organised as follows: Section 2.2 examines traditional costing systems and the two stages allocation processes, moreover it considers the limitation of the traditional systems. Section 2.3 introduces ABC as the key alternative to traditional systems, illustrates the two-stage allocation process, examines the effect of varying product volume and size on reported product cost and outlines the claimed benefits of ABC system. The last section 2.4 summarises and concludes the chapter.

2.2 Traditional Costing Systems (TCS): Treatment of overheads

Volume-based systems (VBC), also known as conventional or traditional costing systems (TCS), use measures of output volume (such as the number of output units, machine hours, material costs, direct labour hours and direct labour cost) as the bases to allocate (i.e. to assign a whole item of cost or of revenue, to a single cost unit, centre account or time period, CIMA) indirect costs to cost objects (Johnson and Kaplan 1987; Cooper and Kaplan 1988a). This section will outline the philosophy of the two-stage allocation process used by traditional costing systems.

2.2.1 Purposes of cost allocation

It has been argued (Andersen 1995; Cooper and Kaplan 1998; Drury 2004) that cost allocations are needed to value inventory for external reporting purposes, for planning and monitoring the cost of activities and processes, and for various short term and long term strategic decisions. Some examples include decisions to "make or buy" sub-components and services, how to price products and services, when to add or discontinue various products and services and when to expand or contract the size of a segment of the company. Horngren et al. (2003) argue that cost allocations are also needed to support a price when "cost-plus" pricing is used, as in government contracting, and in situations where costs must be justified before reimbursement can be obtained.

2.2.2 Predetermined overhead rates

Hansen and Mowen (2000) state that since there are many types of manufacturing costs that fall into the indirect category, (i.e., common or shared costs that cannot easily be allocated to any particular product or job) some methods are needed to allocate or apportion (i.e. to spread revenues or costs over two or more cost units, centers, accounts or time periods, this may also be referred to as 'indirect allocation' CIMA-1996) these costs to the products manufactured. A predetermined overhead rate (a means of attributing overhead to a product or service, based for example on direct labour hours, direct labour cost or machine hours, CIMA-1996) provides a way to accomplish this system requirement.

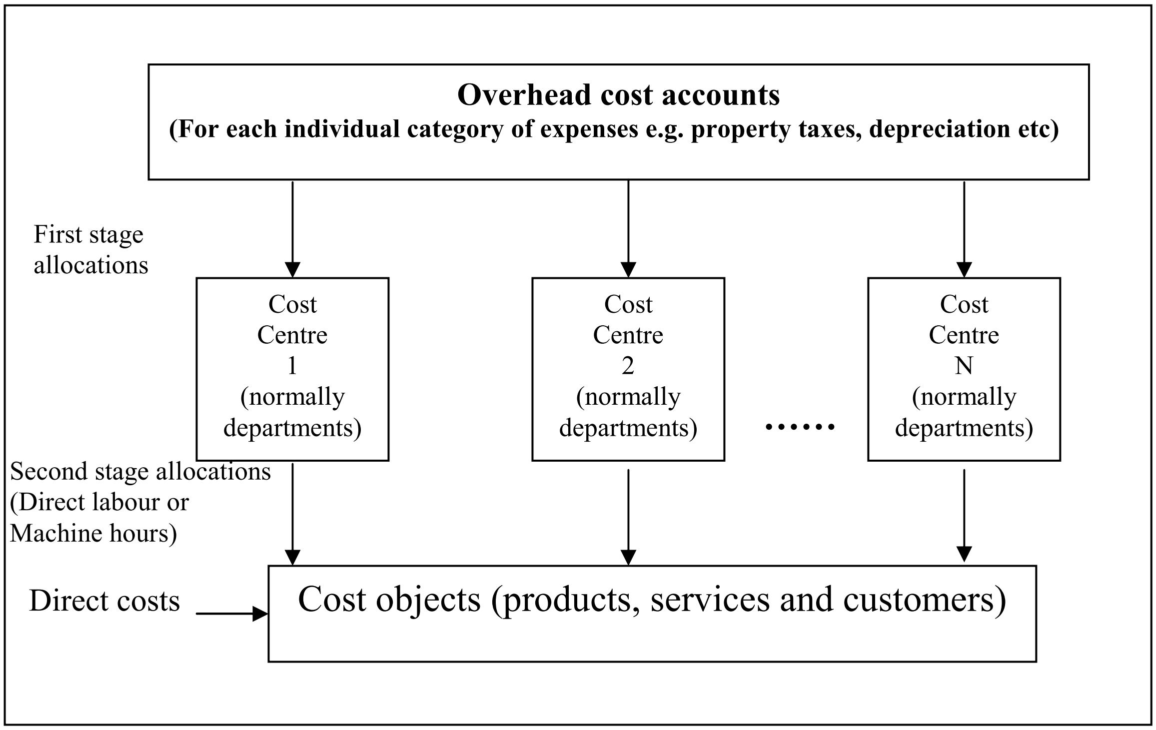
2.2.3 The Two-Stage Allocation Process in Traditional Costing Systems

Drury (2004) states that in order to establish departmental or cost centre overhead rates a two-stage allocation procedure is required. Stage one is to assign overheads initially to cost centres (departments), and in stage two allocate cost centre overheads to cost objects (e.g. products) using second stage allocation bases.

Horngren et al. (2003) argue that applying the two-stage allocation process requires the following four steps; assigning all manufacturing overheads to production and service cost centres, reallocating the costs assigned to service cost centres to production cost centres, computing separate overhead rates for each production cost centre and finally assigning cost centre overheads to products or other chosen cost objects. Thus, steps one and two comprise stage one and steps three and four relate to the second stage of the two-stage allocation process.

Drury (2000) provides an illustration of the two-stage process for traditional costing systems shown below:

Figure 2.1: Two-stage process for TCS



Source: Drury (2000:p.339).

The above figure shows the two stages allocation process under the traditional systems. In the first stage, overheads are allocated or apportioned to cost centers (production and service departments) based on the first stage allocation bases such as; floor area, number of employees, book value of items of plant and machinery, labour hours, machine hours. In addition, those overheads which are allocated or apportioned to service departments must be reapportioned to production departments. In general, there are three methods for reallocating service department costs to production departments, these include: the direct method, the step-down or sequential method and the reciprocal method (Drury 2004). Each method includes developing a set of equations to represent the relationships involved and then solving the equations to generate the desired cost allocations. The equations may be developed for each approach using the proportions of service that each department uses, or using charging rates for each service department (Drury 2004).

In the second stage, the overhead costs which have been allocated and reallocated to the cost centres (production departments) will be absorbed to cost objects (productions, services, and customers) using a selected allocation bases. Most allocation bases relate to the amount of time products spend in each production centre i.e. direct labour hours or machine hours (Drury 2000). A conceptual view of the idea is presented in Exhibit 2.1 above. Usually, only one overhead rate is developed for each production department, although the basis for these rates may differ between departments. The various producing departments might use direct labour hours, or machine hours, as an allocation basis in the second stage allocation process. In this approach, the allocation bases are almost always related to production volume. Hansen and Mowen (2000) argue that the traditional approach will provide accurate product costs if each production department produces (or partially produces) a single product, or a few similar products, that consume all indirect resources within a department in the same proportion and in proportion to the allocation basis used. Hansen and Mowen (2000) state that for the system to be accurate, if Product X consumes 20% of one indirect resource within a department, it must consume 20% of all of the indirect resources within the department and the allocation basis must reflect this percentage. Otherwise a single departmental rate will not provide accurate product costs.

2.2.4 Limitations of Traditional Cost Systems

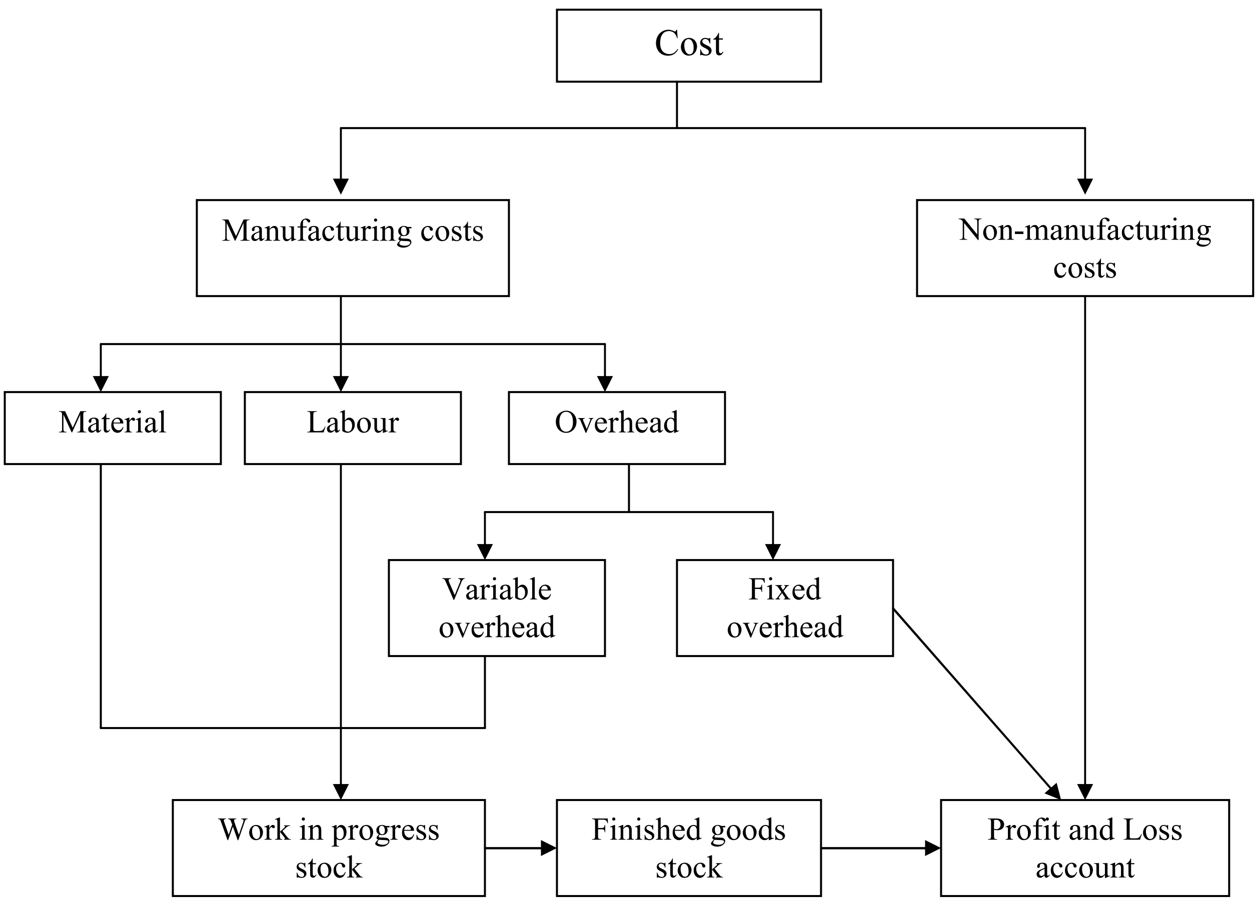
During the 1980s, critical attention focused on the limitations of TCS (Cooper and Kaplan, 1991). Cooper and Kaplan (1987) argue that the major limitations of TCS arise from the use of volume related bases in the second allocation stage, to assign costs from cost centres to products. They state that this procedure may have been adequate decades ago when direct labour was the principal value-adding activity in the material conversion process.

That the criticism of TCS distorting product costs arose only during the mid-1980s was not by chance, but because significant changes in production technology then made costing distortion unavoidable in TCS. TCS was developed in the 1920s (Johnson and Kaplan, 1987) when manufacturing companies were almost 99% labour intensive (Kidd, 1994) and production processes were very simple. As a result, most, if not all, manufacturing overheads were structured with overtime premium, night premium, worker's compensation insurance such as disability insurance, payroll taxes and holiday and vacation wages, all of these costs are associated with, or rather "incurred by", direct labour (Johnson and Kaplan, 1987). Therefore, a product consuming more direct labour would incur proportionately more overheads. Because of a high correlation between direct labour and manufacturing overheads, the all-in-one rate technique based on direct labour of TCS achieved costing accuracy for these companies at that time. In a mass production environment where production was at full capacity, production processes were relatively simple and TCS made up the most sizable portion of manufacturing overheads. Thus the correlation between resource consumption and production volume was very high, as a result of that TCS provides inaccurate product costs because labour hours were no longer the key variables (Johnson and Kaplan, 1987).

An alternative approach used in the traditional system, is provided by Variable or Marginal costing, which overcame the arbitrary nature of allocation in the case of fixed costs. Such a system concentrates on variable manufacturing costs, which are assigned to products and included in the inventory valuation. Marginal costing is a costing method that includes only variable manufacturing costs – direct material, direct labour, and variable manufacturing overhead – in the cost of a unit of product, where on the other hand fixed overhead costs are assigned to the period in which they are incurred .

Drury (2000) provides an illustration of the way marginal costing systems treat these costs.

Figure 2.2: Variable costing system



Source: Drury (2000:p.356).

The above figure shows that variable costs – material, labour and variable manufacturing overheads only –are included in the cost of a unit of product, and in the valuation of finished goods stock. In contrast, fixed manufacturing overheads are treated as expenses in the current period.

Cooper and Kaplan (1987) argue that the traditional academic recommendation in favour of marginal costing may have made sense when variable costs (labour, material and some overhead) were a relatively high proportion of total manufactured cost, and when product diversity was sufficiently small. However, these conditions are no longer typical of many of today's organisations. Increasingly, overhead (most of it considered "fixed") is becoming a larger share of total manufacturing costs. Cooper and Kaplan (1987: 214) conclude that "even if direct or marginal costing were once a useful recommendation to management, it is likely that direct costing, even if correctly implemented, is not a solution – and is perhaps a major problem – for product costing in the contemporary manufacturing environment".

Cooper (1987) argues that cost accounting has undergone few innovations. Practitioners have developed an "if it ain't broke, don't fix it" mentality, and academics have paid little attention to cost accounting. The major changes that had occurred – the increased use of machine hour and material dollar costing – unfortunately did little to overcome the limitations of the existing cost system designs. Cooper (1988a) states that traditional cost systems do a poor job of attributing the expenses of the support resources to the production. The product costs produced by such allocations as direct labour, materials purchases, or unit produced are distorted because products do not consume most support resources in proportion to their production volumes. Cooper (1987) adds that the distortions in traditional costing systems are most severe in companies producing a diverse product mix in the form of size or volume. Moreover, he argues that as overhead has grown and new technologies have come, it goes without saying that assigning overheads based on only 5 - 15% (the proportion of labour hours) of total costs is highly risky.

Drury (2004) argues that today product lines and marketing channels have proliferated due to the fact that companies produce a wide range of products. As a result, Cooper and Kaplan (1988) state that direct labour represents a small fraction of corporate costs, while expenses covering factory support operations, marketing, distribution, engineering, and other overhead functions have exploded. Therefore, overhead allocations using a declining direct labour base cannot be justified, particularly when information processing costs are no longer a barrier to introducing more sophisticated cost systems (Drury 1996).

Cooper (1988b) identifies a number of factors that cause the distortions, resulting from the use of traditional costing systems. These include production volume diversity, size diversity, complexity diversity, material diversity and set-up diversity.

Mishra and Vaysman (2001) reason that while traditional costing systems are much less expensive to implement, such systems can introduce considerable distortions in product costing. They state that the product-mix, pricing, cost control, and other decisions made by managers using these distorted cost numbers can then lead to severe long-run losses. As a result, managers are encouraged to use the new approach to avoid such sub-optimal decisions. When the correlation between manufacturing overheads consumption and direct labour consumption declines, products with high direct labour content will not necessarily incur proportionately more machine-related overheads or more material-related overheads.

In fact, it is not possible for systems which use a single absorption/allocation base to yield accurate cost information because no single factor can explain the variation and consumption of the total overheads. In the hope of achieving “reliable” allocation of manufacturing overheads, ABC emerged. ABC would seem to present an opportunity to provide a better decision-making base for managers.

2.3 Development and Evolution of Activity-Based Costing (ABC)

Activity-Based Costing (ABC), Variance Analysis (VA) and Return on Investment (ROI) are described by Johnson (1990) as the three most important management accounting theories and innovations in the 20th century. ABC has enjoyed a decade of high profile and asserted increasing popularity (Mitchell, 1994) to a large extent through the work of Cooper and Kaplan. In the early 1980s, challenges to the ways in which cost information was calculated and used were beginning to occur (Hicks, 1999). In 1988 Cooper and Kaplan developed an alternative approach for assigning overheads to products and computing product costs. Ning (2005) argues that the development and promotion of this new approach to cost information have been stimulated and largely influenced by the work of Cooper (1988a, 1988b), Johnson and Kaplan (1987), and Cooper and Kaplan (1988a), as well as organisations like ‘Computer-Aided Manufacturing-International (CAM-I)’ [1], Institute of Management Accountants (IMA) and The Society of Management Accountants of Canada (SMAC). These efforts have resulted in the development of a body of knowledge that has come to be known as Activity-Based Costing, or simply ABC (Hicks, 1999). Interest in ABC has developed as a solution to the obsolescence and limitations of TCS. During the 1980s many companies began to realize the adverse consequences of allowing their TCS to generate inaccurate costing information (Cokins, 1999). Especially during the late 1980s, TCS practices were widely

[1] CMA-I later was known as ‘Consortium for Advanced Manufacturing, International’.

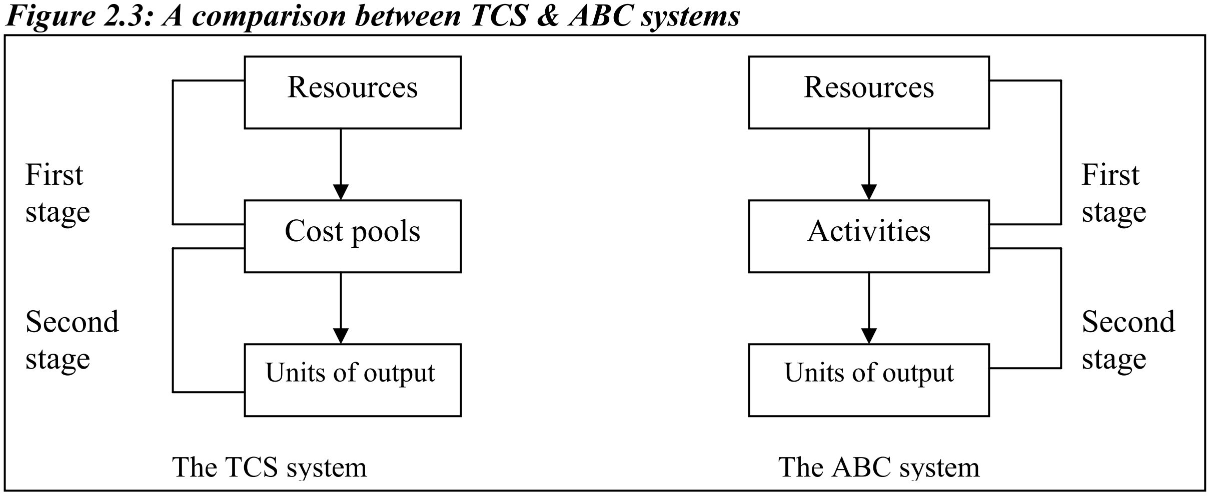
recognized by academics to be unlikely to provide useful information for management (Kaplan, 1984; Kennedy and Graves, 2001). While many lamented that costing practices were lagging behind the contemporary manufacturing environment (Kaplan, 1984; Johnson & Kaplan, 1987; Dunk, 1989), some claimed that TCS should be eliminated (e.g. Kaplan, 1990). ABC is a management accounting process that allocates resource costs to products or customers based on those activities which are the factors causing work and incurring cost, used by the products or customers (O'Guin 1991; Turney 1996; Kaplan and Atkinson 1998). ABC is generally a method of allocating indirect costs to cost objects. Its counterpart is TCS. ABC differs from TCS by using "activities" as the intermediary of allocation, i.e. the medium through which indirect costs are allocated to cost objects. ABC is now used not only for production overheads cost allocation but also for the allocation of non-production costs for purposes such as profitability analysis (Turney 1996).

In fact, the use of ABC for management purposes has become so important and effective that two other systems derived from ABC philosophy have been established, they are Activity-Based Management (ABM) and Activity-Based Budgeting (ABB), (Cooper and Kaplan 1998). Ning (2005) argues that the reason TCS became less useful in the 1980s was that significant changes incurred in manufacturers' product markets, production technologies, and demand for control since the 1960s. During the 1980s, the situation of the three systems became significantly different from what they had been the 1960s. Changes in production technologies and demand for control were mainly caused by the change in product market, which occurred since the 1960s and peaked in the 1980s. The shift from TCS to ABC was a response to the changes in product market, production technology, and demand for control (Ning, 2005).

2.3.1 The Two-Stage Allocation Process in ABC

Before providing an illustration of the two-stage allocation process for ABC, a general comparison between ABC and TCS will be provided. Figure 2.3 below compares TCS with ABC system. Both methods have differences not only in the nature of allocation bases, but also in the number of allocation bases utilised to allocate costs in the second stage. The TCS employs one of three commonly allocation bases, direct labour hours, machine hours and material dollars, whereas ABC typically utilises multiple allocation bases, such as set-up hours, number of times ordered, number of times handled and other transaction-related bases (Cooper 1988a). Consequently, product costs based on ABC system are claimed to have more accuracy than those of the TCS (Kaplan 1988; Cooper 1988b; Dugdale 1990; Innes and Mitchell 1991; Morrow 1992; Turney 1996; Krumwiede and Roth 1997).

Figure 2.3: A comparison between TCS & ABC systems

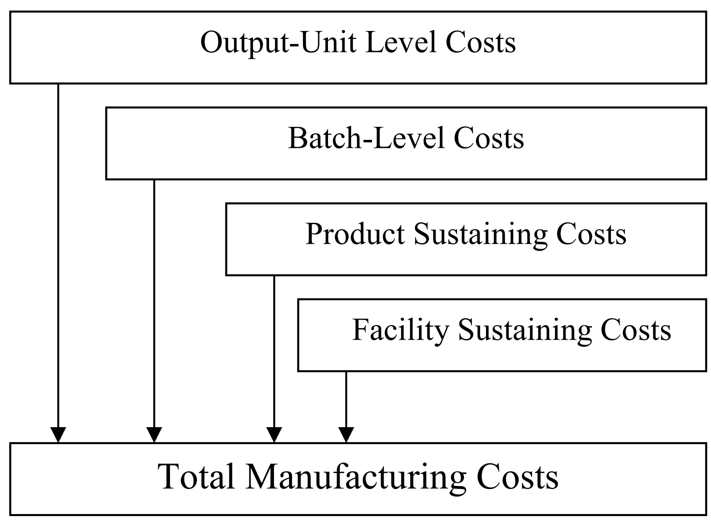


Source: Cooper et al. (1992: p.9-10)

Cooper et al. (1992) argue that ABC system comprises four basic steps: identifying activities, assigning indirect costs to activities, identifying outputs and linking activity costs to outputs. These basic steps can be combined into two stage process:

The first stage assigns all indirect costs to the activities in activity centres based on the resources driver. At this stage (stage one) a cost hierarchy technique is utilized to segregate the indirect costs into four categories (Cooper and Kaplan 1991; Cooper et al. 1992; Kock 1995, Horngren et al. 1997) as following:

Figure 2.4: Manufacturing cost hierarchy



Source: Horngren et al. (1997: p.150)

The above diagram shows four manufacturing cost categories:

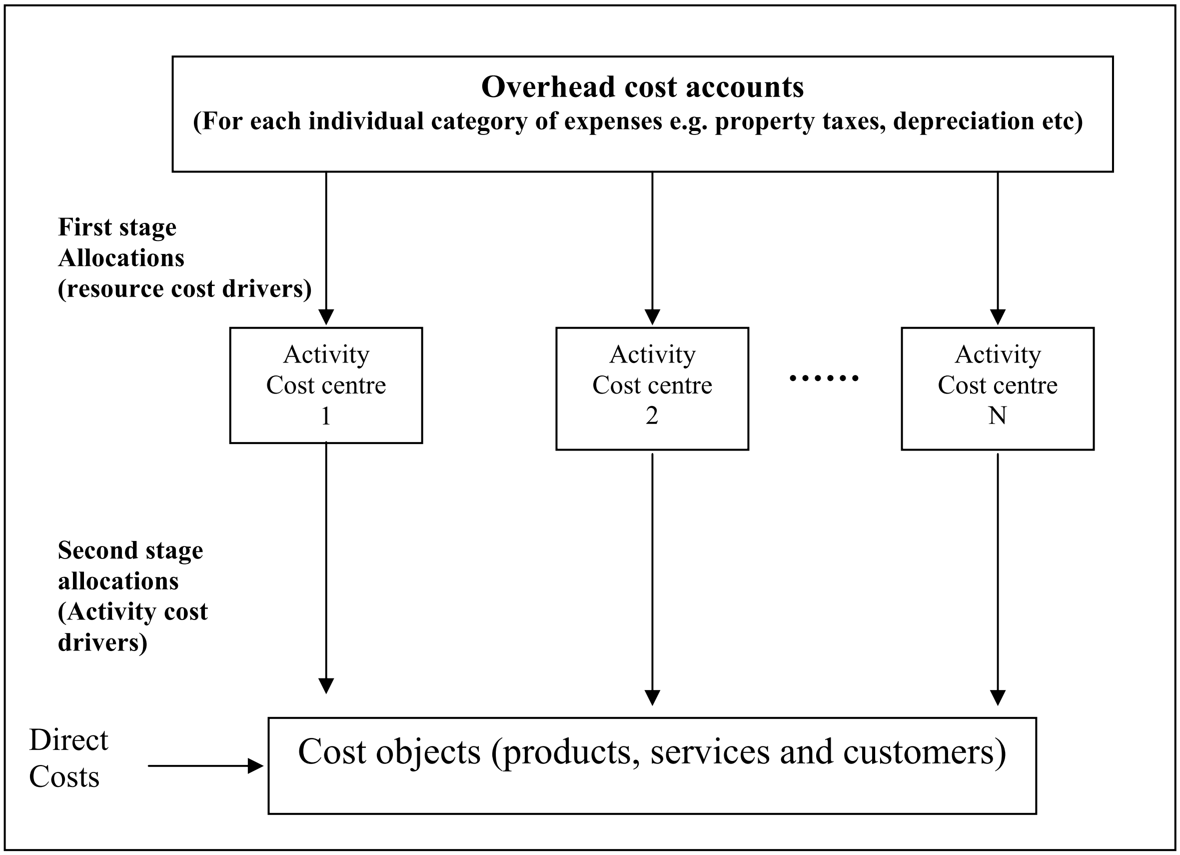
1. Unit-level activities: Costs are assigned to activities that act on each individual unit of product or service, such as direct labour or materials.
2. Batch-level activities: Costs are assigned to activities associated with a group of units of products, such as set-up costs, material movements or purchase orders.

3. Product –sustaining activities: Costs are allocated to activities which are performed to support a specific product or service, such as process engineering, product specifications or engineering change notices.
4. Facility-sustaining activities: Costs viewed as period costs, are assigned to activities underpinning the organisation as a whole. Most of these activities are administrative, and include things as diverse as plant management, security, taxes, building and grounds maintenance, heating and lighting. Given that the facility-sustaining activities are not based on product-related characteristics (product quality, product complexity, product flexibility or production volume), Cooper and Kaplan (1991), O'Guin (1991) and Adler (1999) argue that such activities should not be viewed as part of a product basis.

In the second stage of the ABC process, indirect costs are assigned from activities to products based on the products' demand for these activities during the production process. Cooper (1988b) states that ABC uses many second-stage bases to allocate costs to the products; some of these bases are used to trace inputs whose consumption varies directly with the number of items produced, while others are used to trace inputs whose consumption does not vary with quantity. Therefore, ABC systems utilise a greater number and variety of second stage cost drivers than used in traditional costing system.

Drury (2000) illustrates the two-stage allocation process for ABC as following:

Figure 2.5: Two stage-allocation process for ABC



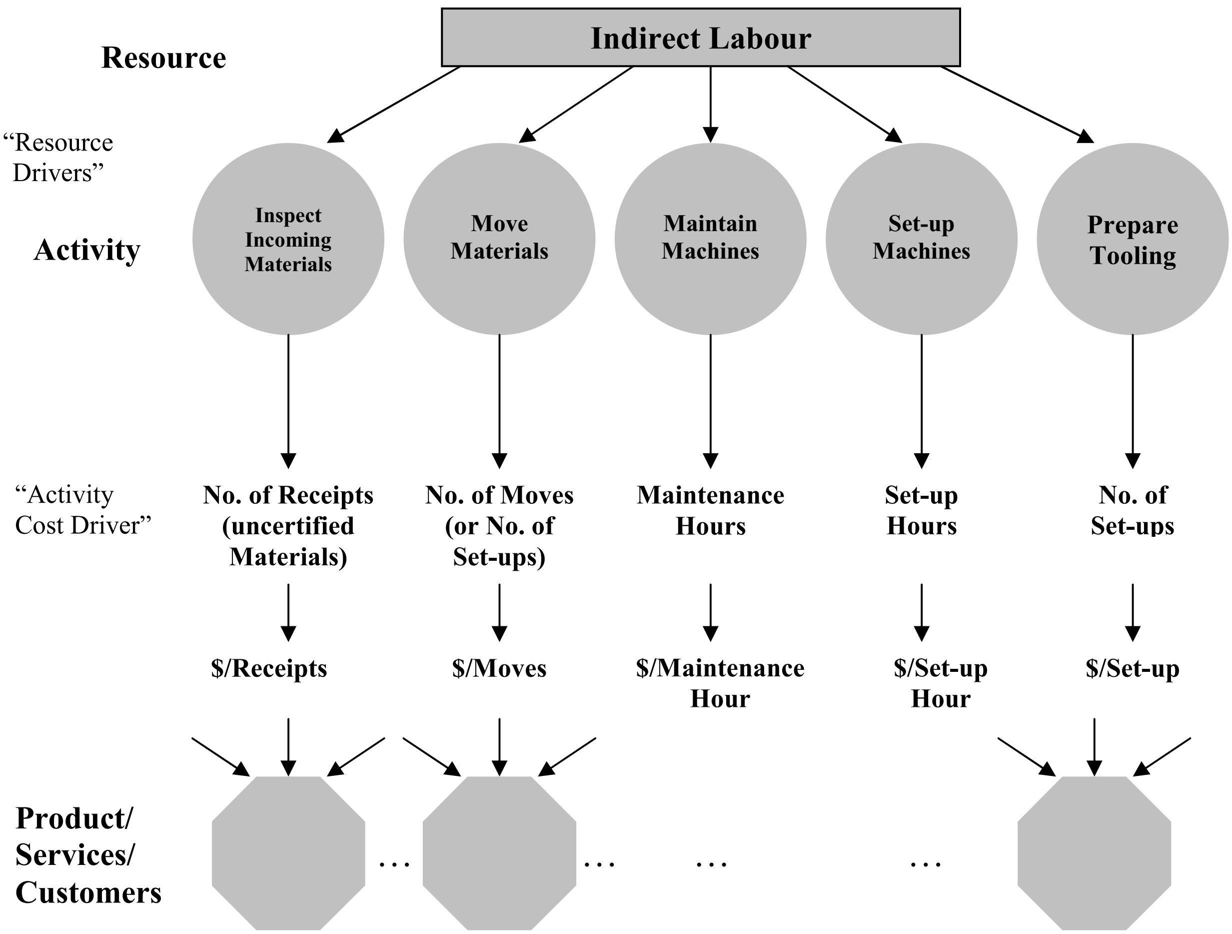
Source: Drury (2000: p.339).

The above exhibit shows the two-stage allocation process for ABC system, the first stage focuses on determining the costs of activities within an organization. This stage of the assignment process splits apart dissimilar resources, activities, and products within an organization. Resource drivers trace the consumption of resources by activities, the work performed in the company.

The second stage allocates activity costs to the products consuming the work performed, by combining the costs of performing specific activities into cost centers at the activity level. Activity drivers trace the activity costs to the products, or cost objects, consuming the work performed in the organization.

Kaplan and Atkinson (1998) describe the procedures of using the two-stage allocation for ABC as being quite simple to illustrate and even to implement in practice. Further, they provide an example to demonstrate how a single resource category – indirect labour – may be decomposed into six different performed activities and then, linked, via appropriate activity cost drivers, to cost objects such as products, services and customers. This is illustrated in the following exhibit 2.6:

Figure 2.6: Decomposition of indirect cost into activities



Source: Kaplan and Atkinson (1998: p.210).

The above exhibit shows the structure of an ABC system for factory operations. At first stage, the ABC system appears quite similar to the traditional cost system described in the first section of this chapter. But the underlying structure and concept are very different. At the heart of all ABC systems lie two critical assumptions. First, resources are consumed only by the performance of activities, and second, activities are performed to produce outputs. Cooper and Kaplan (1998) state that these are robust assumptions, the first one is violated only by resources that decay over time so that no activity can be traced to the consumption of the depleting resource. However, by including time-based depreciation in the ABC system, this limitation can be overcome. The second assumption is violated when resources are supplied but not used; that is by supplying committed resources in excess of actual demands (Cooper and Kaplan, 1998).

Innes and Mitchell (1993) view ABC as a system that overcomes some of the systematic inaccuracies of the existing cost systems and promoted it as a considerable improvement on what had gone before. They also argue that ABC has provided a basic methodology which permits cost information to be attached not simply to the product as the cost object but also to the customer. Activity-based costing systems have become the accepted remedy for the significant limitations of traditional cost accounting systems (Mishra and Vaysman 2001).

Mishra and Vaysman (2001) argue that the information derived from ABC can empower managers to make better operating decisions.

Cooper and Kaplan (1988a) describe ABC as a system that can paint a picture of product costs radically different from data generated by traditional systems. These differences arise because of the systems more sophisticated approach to attributing factory overhead, corporate overhead, and other organisational resources, first to activities and then to the products that create demand for these indirect resources.

Euske and Alan (2007) provide an enhanced model of the ABC Cross that presents a more robust representation of the interaction of process and costing that is the core of ABC and most other cost-measurement systems. Euske and Alan argue that the ABC Cross based on the CAM-I, has come to exemplify the decision by management accountants in the latter part of the last century to address the mismatch of cost and management accounting systems with production systems. Euske and Alan (2007) developed the more complex model by addressing issues of simplification that helped make the original ABC cross useful, these models includes; upside-down model, end-to-end process, bidirectional data and decision flows and capacity measurement model, all of the above models would help both process and functional managers across the organisation. They conclude that if the models are a subset of an integrated ABC models, the related decisions will have a higher probability of working in concert.

2.3.2 The Effect of product Volume and Size on reported product cost

In 1988, Cooper explored the effect of diverse volume and size of products on reported product costs by comparing the TCS with the ABC system. He found that the former, which is based on volume of product-unit, distorts product costs, where product diversity in the form of size or volume exists. Cooper also explored the ability of volume-based and activity-based cost systems to assign product costs precisely when the numbers of products manufactured are different. He found that the traditional cost system could not generate such accurate unit costs when products differ by volume since it overlooks the difference in input consumption of overhead resources. In his examination of the ability of both systems to assign product costs when products have diversity of size, Cooper argues that “a simple volume-related allocation base cannot capture the complexity of the relationship between volume and lot or order size” (p.46). The product costs reported by the ABC system are more accurate than those by the TCS in many situations, including diversity of product size or volume. Cooper (1988a) illustrates a simple ABC system by a series of examples to explain and clarify the effect of varying product volume and size on reported product costs by traditional systems and ABC.

For example, Company A manufactures four products: P1, P2, P3 and P4. All are manufactured on the same equipment and using similar processes. The characteristics of each product are summarised in figure 2.7 below.

Figure 2.7: Characteristics of products

Product	quantity per year	Material $ per unit	Direct labour hours per unit	Machine hours per unit
P1	10	6	0.5	0.5
P2	100	6	0.5	0.5
P3	10	18	1.5	1.5
P4	100	18	1.5	1.5

Size of product

Volume		Small	Large
	Low	P1	P3
	High	P2	P4

Source: Cooper (1988a): p.46)

Company A allocates costs to the products by means of direct labour hours. The quantity and dollar value of each input by product, as well as the allocation of overhead costs by both the traditional cost system and ABC, are presented in Figure 2.8 below.

Figure 2.8: Product costing data for company A

Annual input consumption patterns and Dollar value by product

Product	Material ($)	Direct labour hours	Machine hours	No. of times set up	No. of orders	No. of times handled	No. of part numbers	Total overhead costs
P1	60	5	5	1	1	1	1	
P2	600	50	50	3	3	3	1	
P3	180	15	15	1	1	1	1	
P4	1800	150	150	3	3	3	1	
Units Consumed	2,640	220	220	8	8	8	4	
Dollar Value ($)	264	2,200	3,300	960	1,000	200	2,000	$ 9,924

Overhead Costs Reported by Volume-Based Cost System

Overhead consumption Intensity	Direct Labour	Reported overhead costs	Overhead traced	Reported unit cost
Dollar value	$9.924.00	Consumption intensity	$ 45.11	-
Units consumed	220	Direct labour hours that P1 consumes	5	
Consumption intensity per direct labour hour	$ 45.11	Costs traced (P1)	$ 225.55	$ 22.55
		Direct labour hours that P2 consumes	50	
		Costs traced (P2)	$ 2,255.50	$ 22.55
		Direct labour hours that P3 consumes	15	
		Costs traced (P3)	$ 676.65	$ 67.66
		Direct labour hours that P4 consumes	150	
		Costs traced (P4)	$ 6,766.50	$ 67.66

Overhead Costs Reported by an ABC System

	Direct labour Hours	No. of times set up	No. of part numbers
Total	$ 5,764.00	$ 2,160	$ 2,000
Units consumed	220	8	4
Consumption intensity	$ 26.20	$ 270	$ 500

Reported Overhead Costs

	Direct labour	**No. of time set up**	**No. of part numbers**	**Overhead traced**	**Reported unit cost**	**Difference from existing (%)**
Cons Intensities	$ 26.20	$ 270	$ 500	-	-	-
Product P1 consumes	5	1	1			
Costs traced	$ 131.00	$ 270	$ 500	$ 901	$ 90.10	299.55
Product P2 consumes	50	3	1			
Costs traced	$ 1,310.00	$ 810	$ 500	$ 2,620	$ 26.20	16.18
Product P3 consumes	15	1	1			
Cost traced	$ 393.00	$ 270	$ 500	$ 1,163	$ 116.30	71.88
Product P4 consumes	150	3	1			
Costs traced	$ 3,930.00	$ 810	$ 500	$ 5,240	$ 52.40	- 22.55

Source: Cooper (1988a: p.46-47)

Figure 2.8 above shows that the unit costs of large products (P3 and P4) in the Volume-based cost system are three times higher than those of small products (P1 and P2). This is due to the fact that the large products consume three times the number of direct labour hours as the small products. The unit costs of same size products (the small products P1 and P2 and the large products: P3 and P4) are the same. This is because they consume the same number of direct labour hours. In fact, the numbers of P2 and P4 (the high-volume products) produced are ten times those of P1 and P3 (the low-volume products). In this scenario, a low-volume product manufactured once a year is ordered and handled once and a high-volume product produced three times a year is ordered and handled three times. Therefore, the same unit cost of products in the similar sizes and varying volumes by volume-related allocation base are misrepresented (Cooper 1988a). Moreover, exhibit 2.8 reports the overhead costs handled by the ABC system. When cost drivers, including the number of set-ups, orders, and time handled, are perfectly correlated, the cost of these activities can be collected in a single cost pool (Cooper 1988a). Volume-related costs, consisting of material costs, direct labour costs and machine-related costs, are still assigned to products by using direct labour hours. Thus, the unit costs of products reported by the ABC system differ from those by the volume-based cost system.

Cooper (1988a) explores the ability of volume-based and ABC systems to assign product costs precisely when the numbers of products manufactured are different. He finds that the volume-based cost system could not generate accurate unit costs when products differ by volume since this system overlooks the differences in input consumption of overhead resources. He supports his argument by providing an example of Company B which produces two small products (P1 and P2). P1 is a low-volume product and P2 is a high-volume product. Both are manufactured on the same equipment and by similar processes. The quantity and dollar value of the input by product, as well as the allocation of overhead costs reported by both the traditional cost system and the ABC, are presented in figure 2.9 below.

Figure 2.9: Product costing data for company B

Annual input consumption patterns and Dollar value by product

Product	Material ($)	Direct labour hours	Machine hours	No. of times set up	No. of orders	No. of times handled	No. of part numbers	Total overhead costs
P1	60	5	5	1	1	1	1	
P2	600	50	50	3	3	3	1	
Units Consumed	660	55	55	4	4	4	2	
Dollar Value ($)	66	550	825	480	500	100	1000	$ 3,521

Overhead Costs Reported by Volume-Based Cost System

Overhead consumption Intensity	Direct Labour	Reported overhead costs	Overhead traced	Reported unit cost
Dollar value	$3,521.00	Consumption intensity	$ 64.02	-
Units consumed	55	Direct labour hours that P1 consumes	5	
Consumption intensity per direct labour hour	$ 64.02	Costs traced (P1)	$ 320.10	$ 32.01
		Direct labour hours that P2 consumes	50	
		Costs traced (P2)	$ 3,201.00	$ 32.01

Overhead Costs Reported by an ABC System

Overhead consumption intensities

	Direct labour Hours	No. of times set up	No. of part numbers
Total	$ 1,441.00	$ 1,080	$ 1,000
Units consumed	55	4	2
Consumption intensity	$ 26.20	$ 270	$ 500

Reported Overhead Costs

	Direct labour	**No. of time set up**	**No. of part numbers**	**Overhead traced**	**Reported unit cost**	**Difference from existing (%)**
Cons Intensities	$ 26.20	$ 270	$ 500	-	-	-
Product P1 consumes	5	1	1			
Costs traced	$ 131.00	$ 270	$ 500	$ 901	$ **90.10**	181.48
Product P2 consumes	50	3	1			
Costs traced	$ 1,310.00	$ 810	$ 500	$ 2,620	$ **26.20**	-18.15

Source: Cooper (1988a: p.49)

Company C produces two large products, P3 and P4, P3 is produced in low volume while P4 is produced in high volume. Figure 2.10 below shows the details on product costing data for company C. The three companies (A, B and C) produce the same products using the same manufacturing process. The unit costs of companies B and C reported by volume-based system differ from those of company A, whereas the unit costs of all companies (A, B and C) by the ABC systems are the same. A comparison of product costing data of all three companies shows that the ABC system is able to accurately trace overhead costs when products are manufactured in varying volumes.

Cooper (1988a) examines the ability of both systems to assign overheads when products contain diversity in size. Figure 2.11 below presents the details on product costing data for company D, which produces two products (P1 and P3) in low volume. P1 is a small product while P3 is a large product. Both are manufactured on the same equipment using similar processes. Exhibit 2.12 shows the details on product costing data for Company E, which manufactures two products (P2 and P4) in high volume. P2 is a small product whereas P4 is a large product. All three companies (A, D and E) manufacture the same products using the same manufacturing processes in the same volume.

Similar to companies B and C, the unit costs of companies(D and E) reported by the volume-based system differ from those of Company (A) while the ABC system reports the same product costs of all three companies (A, D and E).

Cooper (1988a) concludes that a simple volume-related allocation base cannot capture the complexity of the relationship between volume and lot or order size. The product costs reported by the ABC system are more accurate than those by the traditional volume-based system in many situations, including diversity of product volume or size.

Figure 2.10: Product costing data for company C

Annual input consumption patterns and Dollar value by product

Product	Material ($)	Direct labour hours	Machine hours	No. of times set up	No. of orders	No. of times handled	No. of part numbers	Total overhead costs
P3	180	15	15	1	1	1	1	
P4	1,800	150	150	3	3	3	1	
Units Consumed	1,980	165	165	4	4	4	2	
Dollar Value ($)	198	1,650	2,475	480	500	100	1000	$ 6,403

Overhead Costs Reported by Volume-Based Cost System

Overhead consumption Intensity	Direct Labour	Reported overhead costs	Overhead traced	Reported unit cost
Dollar value	$6,403.00	Consumption intensity	$ 38.81	-
Units consumed	165	Direct labour hours that P3 consumes	15	
Consumption intensity per direct labour hour	$ 38.81	Costs traced (P3)	$ 582.15	$ 58.21
		Direct labour hours that P4 consumes	150	
		Costs traced (P4)	$ 5,821.15	$ 58.21

Overhead Costs Reported by an ABC System

Overhead consumption intensities

	Direct labour Hours	No. of times set up	No. of part numbers
Total	$ 4,323.00	$ 1,080	$ 1,000
Units consumed	165	4	2
Consumption intensity	$ 26.20	$ 270	$ 500

Reported Overhead Costs

	Direct labour	**No. of time set up**	**No. of part numbers**	**Overhead traced**	**Reported unit cost**	**Difference from existing (%)**
Cons Intensities	$ 26.20	$ 270	$ 500	-	-	-
Product P3 consumes	15	1	1			
Costs traced	$ 393.00	$ 270	$ 500	$ 1,163	$ **116.30**	99.80
Product P4 consumes	150	3	1			
Costs traced	$ 3,930.00	$ 810	$ 500	$ 5,240	$ **52.40**	-9.98

Source: Cooper (1988a: p.50)

Figure 2.11: Product costing data for company D

Annual input consumption patterns and Dollar value by product

Product	Material ($)	Direct labour hours	Machine hours	No. of times set up	No. of orders	No. of times handled	No. of part numbers	Total overhead costs
P1	60	5	5	1	1	1	1	
P3	180	15	15	1	1	1	1	
Units Consumed	240	20	20	2	2	2	2	
Dollar Value ($)	24	200	300	240	250	50	1,000	$ 2,064

Overhead Costs Reported by Volume-Based Cost System

Overhead consumption Intensity	Direct Labour	Reported overhead costs	Overhead traced	Reported unit cost
Dollar value	$2,064.00	Consumption intensity	$ 103.20	-
Units consumed	20	Direct labour hours that P1 consumes	5	
Consumption intensity per direct labour hour	$ 103.20	Costs traced (P1)	$ 516.00	$ 51.60
		Direct labour hours that P3 consumes	15	
		Costs traced (P3)	$ 1,548.00	$ 154.80

Overhead Costs Reported by an ABC System

Overhead consumption intensities

	Direct labour Hours	No. of times set up	No. of part numbers
Total	$ 524.00	$ 540	$ 1,000
Units consumed	20	2	2
Consumption intensity	$ 26.20	$ 270	$ 500

Reported Overhead Costs

	Direct labour	**No. of time set up**	**No. of part numbers**	**Overhead traced**	**Reported unit cost**	**Difference from existing (%)**
Cons Intensities	$ 26.20	$ 270	$ 500	-	-	-
Product P1 consumes	5	1	1			
Costs traced	$ 131.00	$ 270	$ 500	$ 901	$ **90.10**	74.61
Product P3 consumes	15	1	1			
Costs traced	$ 393.00	$ 270	$ 500	$ 1,163	$ **116.30**	-24.87

Source: Cooper (1988a: p.52)

Figure 2.12: Product costing data for company E

Annual input consumption patterns and Dollar value by product

Product	Material ($)	Direct labour hours	Machine hours	No. of times set up	No. of orders	No. of times handled	No. of part numbers	Total overhead costs
P3	600	50	50	3	3	3	1	
P4	1,800	150	150	3	3	3	1	
Units Consumed	2,400	200	200	6	6	6	2	
Dollar Value ($)	240	2,000	3,000	720	750	150	1000	$ 7,860

Overhead Costs Reported by Volume-Based Cost System

Overhead consumption Intensity	Direct Labour		Overhead traced	Reported unit cost
			Reported overhead costs	
Dollar value	$7,860.00	Consumption intensity	$ 39.30	-
Units consumed	200	Direct labour hours that P2 consumes	50	
Consumption intensity per direct labour hour	$ 39.30	Costs traced (P2)	$ 1,965.00	$ 19.65
		Direct labour hours that P4 consumes	150	
		Costs traced (P4)	$ 5,895.00	$ 58.95

Overhead Costs Reported by an ABC System

Overhead consumption intensities

	Direct labour Hours	No. of times set up	No. of part numbers
Total	$ 5,240.00	$ 1,620	$ 1,000
Units consumed	200	6	2
Consumption intensity	$ 26.20	$ 270	$ 500

Reported Overhead Costs

	Direct labour	**No. of time set up**	**No. of part numbers**	**Overhead traced**	**Reported unit cost**	**Difference from existing (%)**
Cons Intensities	$ 26.20	$ 270	$ 500	-	-	-
Product P2 consumes	50	3	1			
Costs traced	$ 1,310.00	$ 810	$ 500	$ 2,620	$ **26.20**	33.33
Product P4 consumes	150	3	1			
Costs traced	$ 3,930.00	$ 810	$ 500	$ 5,240	$ **52.40**	-11.11

Source: Cooper (1988a: p.53)

2.3.3 The Benefits of ABC

It is claimed that ABC provides many significant benefits over traditional costing systems, such as enhanced product cost accuracy, more comprehensive cost information for performance measurement, more pertinent data for management decision-making, increased potential for sensitivity analysis, and a model for value-adding organisational transactions and activities (Bhimani and Pigott 1992; Chung et al. 1997).

Clarke et al. (1999), whose study concentrated on ABC in Irish manufacturing companies, found that respondents were more satisfied on every dimension of ABC than they anticipated. 54% of respondents perceived more accurate product costing would result from ABC, while 46% of respondents perceived that ABC would lead to improved cost control and management. The study also outlines many other benefits of using ABC including improved insight into cost causation and behaviour, better performance measures, more accurate customer profitability analysis and positive behavioural impact on employees.

Innes and Mitchell (1991), Shim and Stagliano (1997), Booth and Giacobbe (1997) and Chung et al. (1997), argue that ABC is a significant source of information for decision-making about product costs and product-line profitability. Kaplan (1990) and Johnson and Kaplan (1987) also claim that accurate product costs are critical to pricing decisions, new product introductions, decisions to drop out-of-date products as well as decisions on how to respond to the products of competitors correctly and on time. This is because product costs identify causes of resource consumption and ways of saving resources, especially at the product and process design stage (Morrow 1992).

Innes and Mitchell (1991) argue that ABC provides more relevant product costs leading to more accurate costs reflecting total overhead costs associated with the product. They also indicate that ABC is providing better product and pricing strategies through the availability of more realistic information on product profitability.

It is also claimed that ABC information is useful for managers in the processes of budgeting and performance measurement, (Kaplan, 1990; O'Guin, 1991, and Innes and Mitchell, 1995, 1998). Activity-Based Budgeting (ABB) has been developed from the basic framework of ABC (Brimson and Foster, 1991). Morrow (1992) adds that ABB provides links between the activities, the organisational actions and the resources consumed.

Mitchell (1994) states that at the stage of actually setting budgets, an ABC framework has several benefits such as, the availability of measures of activity outputs (cost driver volumes) provides an indication of service level volumes, thus providing a starting point for negotiations on the resource requirements of each activity. Furthermore, variance information will be produced for each activity which locates over and under spends firmly in the region where responsibility and cause should be identifiable.

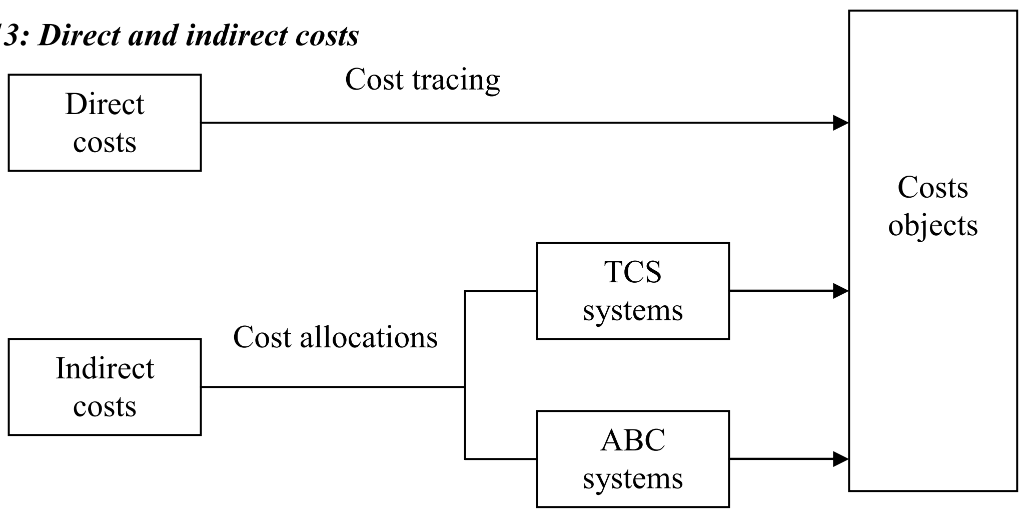
Several studies (Innes and Mitchell 1995; Bailey 1991; Nicholls 1992; Adler et al. 2000; Sartorius et al. 2007) report that the key areas of ABC benefits are cost control and cost reduction, as well as improved profitability. Turney (1996) argues that in cost-reduction analysis, ABC does not decrease cost, but that cost can only be diminished by changing the activities performed and by redeploying the redundant resources, such as reducing the time to set up a machine or removing unnecessary activities. Cost analysis of ABC leads to operational improvement opportunities and increased profitability (Kaplan 1992).

ABC helps management to view the organisation by understanding the activities, their cost and how they link together to form a simple chain of value-creating activities for a business (Morrow and Ashworth, 1994). Principally, Porter's work (1985) identifies the value chain, which is the linked set of value-creating activities from raw material sourcing to the final product or service being delivered to the customer. Horngren (1995) argues that ABC has emphasized that product costs are affected by all activities in the value chain, not just by manufacturing activities alone. Therefore, costs are incomplete measures of produce costs for decision-making.

2.4 Summary and Conclusion

This chapter illustrates the traditional costing systems (TCS) and Activity-Based Costing systems (ABC) by explaining the two stage allocation processes for allocating overheads to cost objects. The chapter shows that two sets of production costs are at work, direct costs which can be specifically and exclusively identified with a given cost object, hence they can be accurately traced to cost objects. Indirect and support costs which cannot be directly traced to a cost object, therefore assigned to cost objects using cost allocations. The following chart illustrates the different between direct and indirect costs and their linkage to the cost objects.

Figure 2.13: Direct and indirect costs



The chapter also shows that both TCS and ABC systems have similar frameworks but they have differences in the allocation of indirect costs. Under TCS the indirect and support costs are allocated to production and service departments and then reallocated the cost of service departments to production departments. The second stage is to calculate the overhead absorption rate by using a few bases that are proportional to the volume of product-units produced such as labour and machine hours.

In ABC, activities are the focus of the costing process. Indirect costs are allocated from activities to products based on the products demands for these activities during the production process. The allocation bases used in ABC are thus measures of the activities performed. These might include such activities as set-up time or number of times handled. Not only is the nature of allocation base used by ABC different but the number of allocation bases used to assign costs in the second stage is also different. Where a traditional system may use up to three second stage allocation bases (direct labour hours, machine hours and value materials used are the most common) an ABC makes use of many bases including such bases as set-ups, items ordered, number of times moved, amongst others.

Three major differences between ABC and TCS have been identified by a number of authors e.g. (Cooper 1988a, 1988b, Kaplan 1990, Drury 1996, 2000 and Hicks 1999), these are (1) In traditional costing systems, it is assumed that cost objects consume resources, whereas in ABC it is assumed that cost objects consume activities, (2) traditional costing systems employ volume – related allocation bases, while ABC uses ‘drivers’ at various levels, and (3) a traditional costing system is structure-oriented, whereas ABC is process-oriented.

The chapter also covers the examples of Cooper (1988a) and reports the effect of diverse volume and size of products on reported product costs by comparing the TCS with the ABC system. The results indicate that TCS distorts product costs, where product diversity in the form of size or volume exists, and that TCS could not generate accurate unit costs when products differ by volume since it overlooks the difference in input consumption of overhead resources.

Even though ABC systems seem to be superior to traditional costing systems in terms of accuracy of cost measurement they might be costly to implement and operate. However, ABC has attracted a considerable amount of interest because it provides not only a basis for calculating more accurate product costs, but also a mechanism for managing costs.

In the following chapter, the empirical studies related to ABC implementation are briefly reviewed first to show the ABC adoption status, the benefits of ABC and the barriers to adopting ABC.

CHAPTER 3: EMPIRICAL FINDINGS TO ABC IMPLEMENTATION

3.1 Introduction

Chapter 2 has considered the different approaches adopted by ABC and TCS to the treatment of overhead costs, the limitations of the traditional system, and the claimed advantages and benefits of ABC.

The essence of the ABC paradox is that if ABC has demonstrated benefits, why then, is it not actually employed by a gradually increasing number of companies? (Innes et al. 2000). A plethora of parameters have been tested in the literature in order to explain this paradox (Cobb et al., 1992; Shields 1995; Bjornenak 1997; Foster and Swenson 1997, McGowan and Klammer 1997; Friedman and Lyne 1999; Anderson and Young 1999; Brown et al., 2004, Sartorius et al. 2007).

This chapter presents an analysis of the results of a number of studies regarding the implementation of ABC systems in different countries. The chapter will review these studies chronologically and report the ABC adoption rates, the benefits and the difficulties of implementing the system.

The organisation of the rest of the chapter is as follows: section 3.2 reviews a number of questionnaire surveys on the implementation of ABC systems. Section 3.3 presents a number of case studies on the implementation of ABC, and the last section contains the conclusion of the chapter.

3.2 Surveys conducted on the implementation of ABC systems

This section reviews chronologically the surveys conducted in a number of countries on the implementation of ABC systems. The findings of these surveys will be presented under three main headings - where possible - the adoption rates of ABC, the benefits derived from the implementation of ABC and finally the reasons and difficulties of not implementing the system.

Innes and Mitchell (1995) used the results of a 1994 survey of ABC in the U.K's' largest 1000 companies. The survey was based on a postal questionnaire to those companies listed in the Times 1000 (1994), and sent to the top 1000 non-financial companies plus the top 60 financial companies and mutuals (investment management firms were excluded). A 33.2% usable response rate was achieved. In relation to the ABC adoption rates, the findings reported that 21% of respondents were using ABC, 29.6% were considering ABC adoption, 13.3% had rejected ABC after assessment and 36.1% were not considering the adoption of ABC. Regarding the benefits and the applications of ABC, the results indicate that ABC had a positive impact which covers all of the core management accounting areas of stock valuation, decision making, control and performance measurement and assessment. In addition, cost reduction and cost control applications of ABC had proved to be particularly popular among U.K's ABC adopters. With respect to the reasons and difficulties for not adopting and implementing the system, the study did not examine or investigate these factors.

Bjornenak (1997) conducted a questionnaire survey on the diffusion of ABC in Norway. The questionnaires were sent to 132 large Norwegian manufacturing companies. A response rate of 57% (75 companies) acceptable questionnaires was achieved. In total, 30 companies (40%) had adopted the system, 23 companies (31%) were classified as non-adopters, and 22 companies (29%) were classified as being without ABC knowledge. The study examines the variables that influence the adoption of the ABC systems, and the results indicate that a range of variables relating to cost structure, competition, and product diversity were associated with ABC adoption, whereas firm size did not significantly discriminate between adopters and non-adopters.

Nguyen and Brooks (1997) conducted a survey in the State of Victoria in Australia. The questionnaires were sent to 350 Australian manufacturing companies and resulted in 120 useable responses which represent a response rate of 34%. The results report that only 12.5% (15 companies) had adopted ABC, 2.5% (3 companies) rejected the implementation of the ABC, 8.3% (10 companies) indicated that they intended to adopt ABC in the future, and the remaining 76.7% (92 companies) did not plan to implement ABC. The findings of the study show significant differences between companies adopting ABC and those not adopting ABC in relation to production complexity, firm size and level of competitive intensity, while no significant differences in relation to the proportion of overhead costs in total manufacturing costs and product diversity were found.

Clarke et al. (1999) report the results of a 1995 survey which was based on a mailed questionnaire. The mail questionnaire was sent to the 511 manufacturing firms in the Business & Finance (1995) listing of Irelands' Top 1000 companies. The questionnaire was addressed to the chief management accountant in each company. A total of 204 (40%) usable responses were included in the analysis. In relation to the ABC implementation rate, the findings were that 12% (24 companies) were using ABC, 20% (42 companies) were currently assessing ABC, 13% (26 companies) had rejected ABC, and 55% (112 companies) had not considered ABC. The study also reports the perceived benefits of ABC. In general, more accurate cost information for product costing and pricing, improved cost control and management, and improved insight into cost causation and behaviour were the main perceived benefits of ABC. Furthermore, the findings indicate other benefits such as, better performance measures, more accurate customer profitability analysis, and positive, behavioural impact on employees. Regarding the difficulties and problems with implementing ABC, the study reports that difficulties in assigning costs to activities, difficulties in identifying and selecting cost drivers, inadequate computer software, and difficulties in defining distinct activities were the most common perceived problems when adopting and implementing ABC among Irish manufacturing companies, followed by lack of adequate resources, difficulties in selling the concept of ABC to managers, and lack of internal expertise.

Groot (1999) reports the results of two similar surveys, the first survey was conducted in 1994 among 564 food manufacturers, retailers, distributors and brokers in the United States. The survey was designed to identify the number of companies using ABC and to investigate the experiences they had in using ABC systems. In this survey, 96 usable responses (17%) were obtained. The second survey was conducted in 1995 among 480 food manufacturers and retailers in the Netherlands. In this survey, 117 (24.4%) usable responses were obtained from companies representing all food sectors in the Netherlands. Since the U.S survey had already been designed and conducted, the Dutch survey was developed to address most of the questions in the U.S questionnaire. In relation to the percentage of ABC users, the results of both surveys indicate that the implementation rate in the Dutch and in the U.S sample was less than 20% in each case. Table 3.1 below shows more details as following:

Table 3.1: Use of ABC by US & Dutch firms

CATEGORIES	U.S. FIRMS		DUTCH FIRMS	
	N	%	N	%
Currently using ABC	17	17.7%	14	12.0%
Conducting a pilot study	14	14.6%	4	3.4%
Planning a pilot study	42	43.8%	25	21.4%
Decided not to use ABC	23	23.9%	74	63.2%
Total	96	100.0%	117	100.0%

Source: Tom Groot (1999:54).

The above table shows that the percentages of ABC users in the two countries (U.S and Dutch) do not differ significantly (18% to 12% respectively). However, a significant difference does exist in the number of companies which decided not to use ABC, the findings show that 63% of Dutch firms decided not to use ABC, as compared to 24% in the U.S. sample. Regarding the benefits derived from the use of ABC information by U.S and Dutch food companies, the findings indicate that the most important purposes for which ABC information is used lies in calculating the product profit margin, in improving production processes, and in evaluating the performance of production units. Less important purposes concern decisions on sales price, product mix and client mix. U.S. companies made similar use of ABC information as did Dutch firms. In relation to the reasons given by Dutch and American food producers for not using ABC, the results indicate that selecting cost drivers and identifying activities were the main issues encountered during the implementation of the ABC, followed by unfamiliarity with ABC, lack of time and other high priorities.

Cinquini et al. (1999) conducted an empirical survey of cost accounting practices in a sample of large and medium size firms in Italy. The questionnaire was sent to 1194 Italian companies, which were selected from a CD-ROM company information database of the Italian National Association of Chambers of Commerce. The questionnaire was addressed to the controller in each company. A total of 132 (11.6%) usable responses were included in the analysis of the study. Regarding the adoption rate of ABC, the findings indicate that 10% of the companies in the sample had already implemented ABC, 47% of respondents claimed that they had never considered the adoption of ABC. The findings also reveal that 27% of respondents had a favourable position toward ABC or assert to having the intention to implement the system. The remaining respondents (16%) had made the decision not to introduce ABC. The study neither reviews the benefits of implementing ABC, nor examines the difficulties of adopting the system.

Innes and Mitchell (2000) report the results of a 1999 survey which mirrored the design of the 1994 study reported in Innes and Mitchell (1995). The survey sought to determine and assess the nature and significance of changes during the 5 years period in ABC adoption rates and patterns of use in the U.K. The questionnaire was sent to the top 1000 U.K's' companies. A usable response rate of 22.9% was achieved. In relation to the adoption rate, the findings reveal that the proportion of ABC users and those currently considering its use had fallen to 17.5% and 20.3% respectively from 21.0% and 29.5% in 1994. Moreover, the results report a slightly higher proportion claiming to have rejected ABC after assessment (15.3% as against 13.3% in the 1994 survey). In addition, an increase in the rate of those companies which had not considered the adoption of ABC accrued in 1999 (46.9% compared with 36.1% in 1994). With respect to the ABC benefits, the findings indicate that the major perceived benefits included improvement in product cost/profitability information, better cost control information, knowledge of customer profitability, superior decision-making information and improvements in performance measurements. Regarding the reasons and difficulties of those respondents not currently using ABC, the results were divided into three groups. The first group includes those who rejected ABC after assessment (n=27), the respondents justified their explicit rejection of ABC on the basis of its administrative and technical complexity and its need for new systems continuously generating activity data. Other reasons included small product line variety, and low overhead costs. The second group consists of those who where still considering ABC (n=36). Their views on factors constraining ABC adoption were primarily based on the costly demands that ABC development would place on staff and other resources. In addition, the results indicate that the need to address difficult technical issues, such as the identification of cost drivers, and the need to provide accurate cost apportionment, and behavioural problems, such as changing well-established practice and employee suspicion about the motives for using ABC were the main problems of the system. The last group includes those who had not considered ABC (n=83). The most common reasons given for not considering ABC were its lack of relevance/suitability to the respondents' business, the existence of a cost management system that operated satisfactorily, and the lack of top management support.

Chongruksut (2002) conducted a mail questionnaire survey among firms listed on the Stock Exchange of Thailand (SET) that operate in the Bangkok region. One of the aims of this study is to examine the adoption of ABC by firms based in Thailand, and to investigate the benefits, reasons and difficulties for not adopting ABC systems. A total of

292 questionnaires were sent to the accounting/finance managers. 101 questionnaires were usable and represent a response rate of around 35%. In relation to the ABC adoption rate, the findings indicate that 11.9% (12 firms) had already adopted the ABC, 2% had rejected adoption, and around 23% of respondents were intending to adopt ABC. The highest percentages of the responses 63% (64 firms) had no plans to adopt ABC and some of them had no knowledge of ABC. Regarding the benefits of ABC implementation, the results of the study indicate that ABC provides more accurate product/service costs, improves cost control, provides better performance measurement and encouragement of commitment to quality and continual improvement. In addition, ABC increases the effectiveness of budgeting by identifying the cost performance relationship of different service levels, provides assistance in cost reduction efforts, and better overhead cost allocation. With respect to the reasons for not adopting ABC, the results of the study were divided into three categories. The first relates to inherent difficulties with ABC which includes, time consumption, difficulties in selecting cost drivers and appropriate software, lack of expertise to implement ABC and that it was costly to switch to ABC. The second category related to the firm's characteristics and business environment, such as higher priorities of other changes or projects, lack of internal resources and top management support, less complexity in products, and no intensity of competition. The last category of the reasons related to the confidence in the existing cost system, such as satisfied with the current system, no significant problems with the current system and ambiguity of ABC benefits in literature.

Cotton et al. (2003) conducted an exact replica survey of that used by Innes et al. (2000) on the usage of ABC in New Zealand (NZ). The target population consisted of Chartered

Accountants (CAs) who were Corporate Sector members of the Institute of Chartered Accountants in NZ (ICANZ), and who were in active employment in commercial firms, local government organisations and state owned enterprises. The questionnaire was sent by mail to a target population of 748 firms and resulted in a response rate of approximately 40%. Regarding ABC implementation rates, the findings reveal that 20.3% of respondent firms were implementing ABC, but fewer companies in NZ compare with the UK were considering using ABC (11.1%), and fewer companies in NZ had rejected the system after assessment (10.8%). The remaining companies (57.8%) were not considering the adoption of ABC. In relation to the purposes and benefits to which ABC had been applied, the findings indicate that these purposes include inventory valuation, product or servicing pricing, production or service output decisions, cost reduction and cost management, budgeting, new product or service design, customer profitability analysis, activity performance measurement and improvement. The study did not investigate the reasons and difficulties of the implementation of the ABC.

Pierce and Brown (2004) conducted a survey of large manufacturing, service and financial sector organisations to investigate the implementation state of ABC systems in Ireland. The questionnaire was designed using a series of questions taken directly from Innes et al. (2000), and was sent by post to a named individual in each company, identified from professional accounting institutes' listings as holding a position as head of management accounting, head of finance or chief executive. The total response rate of the study was 23.2%, out of 550 questionnaires sent. The results show higher implementation rates than previously reported in Ireland. Around 28% of respondent companies were implementing ABC systems, 52.4% of respondent companies were not considering the implementation of the system, 9% of respondent companies were still considering it and 10.7% had rejected the implementation of the ABC. In relation to the benefits and satisfactions of ABC systems, the findings report that ABC provides more in-depth analysis, value adding decisions, and efficiency value-based reporting. Furthermore, ABC provides more accurate product cost, improved product profitability, and evaluation of capital investment. The findings also indicate that ABC would be used to understand cost drivers, to impact and influence product cost through design, and to facilitate pricing strategy and product line performance on profitability and efficiency. Regarding the difficulties and reasons for not implementing the ABC systems, the results of Pierce and Brown (2004) have been divided into three categories, the first category relates to factors which inhibit the implementation of the system, these include lack of support, experience, training and resources; also cost, complexity, and timelines of ABC information. Lack of software support, human resource availability, and perceived complexity were also factors which inhibit ABC implementation. The second category related to reasons for rejecting the system these include, no significant difference in the product costs compared with the traditional systems thus current system was seen as a better management tool, and lack of relevance to the business. The findings also indicate that there is difficulty in establishing the key cost drivers, and difficulty in justifying implementation because of indeterminate benefits. The last category related to reasons for never considering the system. These include satisfaction with current system, lack of knowledge and experience, manufacturing process is simple, small size of organization, and ABC is not relevant to the nature of the business.

Manalo (2004) conducted a telephone survey among the Top 500 Corporations (The Fookien Times Philippine Yearbook, 2001) in the Philippines. The findings indicate that around 17% (i.e., 83 firms) are implementing ABC, 55% (275 firms) are still using traditional costing systems, and the rest of the total sample 28% (142 firms) are still considering ABC implementation. The findings also reveal some reasons for ABC's low implementation, these were: lack of knowledge of ABC, employee resistance and the organisational changes seemed essential to the use of ABC.

Cohen et al., (2005) conducted a questionnaire survey during 2003 on a sample of 177 leading Greek companies. The study aimed to examine the adoption rate of ABC by Greek companies that belong to all three sectors of the Greek economy, i.e. manufacturing, retail and services, as well as investigating the reasons that influence a company's decision to change its current management accounting system.

A total of 88 completed questionnaires were received and analysed, which represent a response rate of 49.7%. In relation to the ABC adoption rates, 40.9% (36 firms) of respondents have already implemented ABC, while 59.1% (52 firms) were non-ABC adopters. Of the non-adopter, 31.9% (28 firms) had rejected ABC, 13.6% (12 firms) were considering the implementation of ABC, and 13.6% (12 firms) were not considering ABC implementation.

With respect to ABC implementation benefits, the findings grouped the benefits into six categories: Cost Accounting, cost Management, Performance Measurement, Decision-Making, General Management and Relationships Management. These benefits categories as well as the parameters they consist of are shown in table 3.2 below listed in order of perceived importance.

Table 3.2: Benefits perceived by ABC adopters

Cost accounting:
Calculation of actual total product cost
Identification of activity cost
Cost accounting system update in order to be more accurate
More accurate indirect cost allocation to products
Cost management:
Identification of the factors that are responsible for cost creation
Overhead decrease
More realistic budget preparation
Cost reduction
Performance measurement:
Analysis and control of product profitability
Improvement of departments' performance measurement
Improvement of activities' management efficiency
Decision making:
Improvement of the decision making process in relation to product cost
Adjust pricing policy as to apply to increase product mix complexity
Abolition of 'loss making' products
Changes of product mix in order to better suit customer needs
General management:
Improvements of products' quality
Improvement of outsourcing decision procedures
Attainment of synergies with total quality systems
Relations management:
Improvements of customers' management efficiency
Motivation of personnel that deals with cost accounting
Identification of 'loss making' customers
Identification of 'loss making' suppliers

Source: Cohen et al., (2005:12).

Regarding the problems faced in implementing of ABC, the findings revealed that activities identification, identification of the proper cost drivers, lack of top management support, software selection, and personnel's resistance to ABC were the main problems with ABC implementation. Furthermore, the study reported that the reasons for not considering ABC implementation in the future included satisfied with the existing cost system, ABC implementation cost is high, top management is not interested in ABC, and lack of resources for ABC implementation.

Sartorius et al. (2007) conducted a telephonic and an e-mail survey of listed South African companies on the Johannesburg Securities Exchange (JSE). A quantitative methodology was adopted in their study to evaluate the extent of ABC implementation and to identify reasons for implementation/non-implementation, problems and critical success factors relating to ABC implementation. The results of the study show that the extent of ABC implementation in South Africa is low, only 11.6% of respondent companies have implemented ABC systems. in relation to the reasons for the implementation of ABC in South Africa, the results report that the need for accurate costs, better cost management, understanding product/customer profitability and budgetary purposes were the most reasons for adopting the system. Regarding the problems and reasons for not implementing ABC, the findings report that difficulty with identifying and defining activity and cost drivers was the most reason for not implementing ABC. Furthermore, the results show that satisfaction with current systems, inadequate marketing of ABC and negative publicity about ABC were other reasons for the non adoption of ABC systems.

3.3 Case Studies on the implementation of ABC

A number of researchers (Innes and Mitchell 1990; Shields 1995; Anderson 1995; McGowan and Klammer 1997; Krumwiede and Roth 1997,; Krumwiede 1998) have utilized case studies to examine the implementation of ABC and to identify the factors influencing the success of the systems. This section reviews chronologically a range of case studies and interviews on the implementation of ABC systems, and presents the main difficulties and barriers to the implementation of the system.

In a case study conducted to provide an overview of how ABC systems have been implemented, Innes and Mitchell (1990) highlighted a number of problems with the implementation of ABC. The cases were selected to give some diversity in terms of size, sector, stage of implementation, and focus of application. The study found that a great deal of work was involved with the implementation of ABC. This included interviewing the managers in order to identify the activities, collecting the costs for activity cost pools, determining the cost drivers and, where appropriate, linking the cost drivers to the individual product lines.

As a result of introducing the ABC system, the companies were able to consider the effect of product volume on product costing. For instance, the cost of a small volume product was increased by 30% more than the cost allocated on traditional systems. The finding also showed that those products with a lower number of components experienced a decrease in cost at the expense of those with larger numbers of components, due to the inherent weakness of the traditional systems. Furthermore, cost driver rates provided a basis for a detailed cost comparison between manufacturing plants, enabling management to make better location decisions for certain processing work. The authors also argued that designers could also improve the design of new products or modifications to existing products, as they have a better understanding of the characteristics of the product which cause overhead cost.

Innes and Mitchell (1990) identified a number of similarities in the approach adopted by the three companies examined in the implementation ABC. These included the setting up of a small team to design and implement the system. In each case this team was headed by a very senior accountant. There were on-going consultations with all the relevant managers in the organisations. This ensured that managers had the opportunity to make an input to the design of the system and to ensure the proposals were acceptable and sensible. The system was kept as simple as possible by limiting the number of cost pools and cost drivers.

A study by Cobb et al (1992) found that the major difficulties perceived by UK companies considering the adoption of ABC were the amount of work involved in installing the system combined with a lack of suitable accounting staff resources, lack of computer resources, and difficulties in selecting suitable cost drivers. Regarding the companies which had rejected ABC, Cobb et al (1992) identify the following issues: difficulty of collecting quantitative data on cost drivers; difficulty of linking cost drivers to individual product lines; amount of work required from the accountant; and other higher priorities (such as survival of the firm during a recession). Furthermore, they indicate that those companies which had adopted ABC faced some difficulties during the initial ABC implementation stage, including: the choice of activities, the selection of cost drivers, the uncertainty over using ABC for stock valuation for external financial reporting, as well as linking cost drivers with individual product lines.

In Ireland, O'Dea and Clarke (1994) conducted semi-structured interviews with multi-national firms operating in Ireland in order to establish the factors associated with the implementation of ABC, and the difficulties that may be encountered. The results indicate that the reasons for not considering the implementation of ABC included the following: the small percentage of overhead costs in the cost structure, low product diversity, the uncertainty as to whether ABC would have any impact on decision-making, and the belief that existing cost systems are satisfactory for product costs and measuring performance. In addition, the results show that among the perceived difficulties of the implementation process were the cost of ABC implementation (time, software, and training), selecting activities and cost drivers.

Anderson (1995) conducted a case study of General Motors and found that technological factors impact on the success of ABC. This study developed a framework for evaluating ABC implementation and hypotheses about factors that influence the implementation of the system. The search for factors that influence ABC implementation success was guided by the information technology (IT) and organisational change literatures, as well as anecdotal evidence of factors that influence the success of ABC implementation.

Shields (1995) shows that variables influencing the success of implementing ABC involve behavioural and organisational variables, as opposed to technical variables. These variables comprise top management support, linkage of the ABC system to competitive strategies, linkage of the ABC system to performance evaluation and compensation, sufficient internal resources, training in designing and implementing ABC and non-accounting ownership, which is the commitment of non-accountants to use ABC information.

Norris' (1997) results correlate with Shields' (1995) findings in that the successful implementation of ABC is associated more with behavioural and organisational factors than with technical factors. Shields and McEwen (1996) found that a significant cause of unsuccessful implementation on the part of several companies was due to an emphasis on the architectural and software design aspects of the ABC system, which served to overlook behavioural and organisational issues. Krumwiede and Roth (1997) also found that behavioural and organisational variables, as claimed by Shields (1995), can overcome the barriers of each stage in the implementation of ABC and when addressed can lead to the successful implementation of ABC.

Turney (1996) states that if ABC is to be successfully implemented the initial requisite steps include the generation of an interest in ABC at all levels of the firm, the removal of any barriers to ABC adoption, and the development of management's commitment to support the implementation of ABC. The result of Norris' (1997) study confirms that internal commitment by individual managers to the change will influence its successful implementation. Implementation of ABC is likely to be unsuccessful without the commitment and sponsorship of users and senior management (Morrow 1992).

Briers and Chua (2001) claim that the implementation of ABC is contingent not only on top management support, but also on external consultants, while several studies (Shields 1995; Shields and McEwen 1996; Roberts and Silvester 1996; McGowan and Klammer 1997, and Krumwiede 1998) contend that the most essential factors influencing successful ABC implementation is top management support, which means the encouragement, by senior management, of developing teams of ABC implementers.

Krumwiede (1998) studied U.S. manufacturing companies to examine how contextual factors, such as cost distortion, size of firms, and organisational factors such as top management support, training or non-accounting ownership, affect each stage of the ABC implementation process. He found that different factors affected the various stages of implementation of ABC and the degree of importance of each factor varies according to the stage of implementation. For example, a company's potential for cost distortions (a contextual factor) is a highly important factor in its decision to adopt and implement an ABC system, and top management support, non-accounting ownership and implementation training (organisational factors) can lead to reaching the highest stage of implementation of ABC. Krumwiede (1998) concludes that firms considering or implementing ABC system should take organisational and contextual factors into account.

Soin et al. (2002) used institutional theory to interpret the role of ABC in organisational change. The study reports on a longitudinal empirical case study of the implementation of ABC in the clearing department of a UK-based multinational bank. They identified tensions between the need to establish ABC as an organisational routine, thereby ensuring its reproduction, with the less routine but more revolutionary aspiration of ABM. Their case suggested that the ABC team succeeded in institutionalising a version of ABC that revealed new links between costs and products but did not transform the strategic thinking of the bank's senior management. Soin et al. (2002) argue that there is a need for future longitudinal case study research on ABC, with particular emphasis on a processual interpretation of the ABC/ABM relationship that further explores the trade-off between strategic capability and the establishment of management accounting routines.

Kip and Augustin (2007) conducted an in-depth study of German and U.S companies to compare the cost accounting methods. The results show that German companies emphasize management accounting more, and U.S companies place their accounting emphasis on financial reporting. In addition, the findings report that more German companies than U.S companies are satisfied with their costing systems. Regarding the adoption of ABC systems, the results show a small difference in the percentages of firms that implementing ABC between the two countries.19% for German and 21% for the American firms, the highest percentages came from non-manufacturing firms; 38% inn the U.S and 27% inn Germany.

Abde-Alnasser and Wei Li (2008) investigate factors that led to the failure of an ABC implementation at a major Chinese financial institution-the Bank of china. They conducted interviews with 18 employees at one branch revealed six factors that blocked the implementation of ABC systems. These factors are: lack of a clear business purpose about the implementation of the system, lack of knowledge regarding ABC, difficulties in designing the systems which includes the identifying of activities and cost drivers, lack of participation and internal resistance to change. Abde-Alnasser and Wei Li (2008) argue that the Bank of China decided to implement ABC systems in 2005, in order to achieve more efficient cost control, and the bank seeks to become a listed company. The implementation of ABC started very slow and then has ceased in most branches because of the previous reasons.

3.4 Summary and Conclusion

The purpose of this chapter was to describe the relative ABC adoption rates, perceived benefits and the reasons and difficulties for not adopting ABC system. The first section of the chapter presents the results of a number of studies into the implementation of ABC systems in different countries. Despite strong advocacy in favour of ABC systems (Cooper 1988a, b; Cooper and Kaplan 1991, 1998) adoption rates are not overwhelming

(Innes et al. 2000). Survey evidence suggests that, over the past decade, there has been a growing awareness of ABC, but overall rates of implementation have been low.

Table 3.3 below shows the overall rates of ABC adopters, rejecters, under consideration and non-considered companies of a number of studies as following:

Table3.3 the overall rates of ABC adoption

Surveys	ABC adopters	Rejecters	Under consideration	Never considered
Innes and Mitchell 1995 U.K	74 21.0%	47 13.3%	104 29.6%	127 36.1%
Bjornenak 1997 Norway	30 40.0%[2]	-	-	45 60.0%
Nguyen and Brooks 1997 Australia	15 12.5%	3 2.50%	10 8.30%	92 76.7%
Clark et al. 1999 Ireland	24 11.8%	26 12.7%	42 20.6%	112 54.9%
Groot 1999 U.S	17 17.7%	-	56 58.4%	23 23.9%
Groot 1999 Dutch	14 12.0%	-	29 24.8%	74 63.2%
Cinquini et al. 1999 Italy	13 10.0%	21 16.0%	36 27.0%	62 47.0%
Innes and Mitchell 2000 U.K	31 17.5%	27 15.3%	36 20.3%	83 46.9%
Changruksut 2002 Thailand	12 12.0%	2 2.0%	23 23.0%	64 63.0%
Cotton et al. 2003 New Zealand	60 20.3%	32 10.8%	33 11.1%	171 57.8%
Pierce and Brown 2004 Ireland	34 27.9%	13 10.7%	11 9.0%	64 52.4%
Manalo 2004 Philippine	83 17.0%	-	142 28.0%	275 55.0%
Cohen et al 2005 Greek	36 40.9%	28 31.9%	12 13.6%	12 13.6%
Sartorius et al 2007 South Africa	21 11.6%	-	-	160 88.4%

[2] This percentage represents of companies which had adopted ABC and planned to adopt it).

The above table reports lower adoption rates than might be expected, despite the potential advantages and benefits of using ABC information which have received widespread prominence in the literature.

This chapter also analysis the advantages and benefits of using the ABC systems, derived from the same studies mentioned above, summarised in table 3.4 below:

Table 3.4: Benefits and advantages of ABC systems

More accurate cost information for product costing and pricing
Improved cost control and performance measurement and assessment
Improved insight into cost causation and behaviour
More accurate customer profitability analysis
Assistance in cost reduction and cost control applications
Improved the calculation of the product profit margin
Improved decisions on sales price, product mix and client mix
Superior decision-making information
Better encouragement of commitment to quality and continual improvement
Increases the effectiveness of budgeting
Increase in profitability and better overhead cost allocation
Improved the inventory valuation
Improved production/service decisions
Improved new product or service design
Provides more in-depth analysis, and value adding decisions
Improved efficiency value-based reporting
Provides more accurate evaluation of capital investment
Facilitate pricing strategy and product line performance on profitability and efficiency
Improvement of the decision making process in relation to product cost
Changes of product mix in order to better suit customer needs
Improvement of outsourcing decision procedures
Motivation of personnel that deals with cost accounting
Identification of ‘loss making’ suppliers

While the implementation of ABC appears to result in obtaining and achieving the above benefits, at the same time the adoption rates are low. This chapter explains the reasons for this confliction by identifying the main difficulties which are encountered in implementing the ABC systems.

The following table summarises the common issues that emerge from the various studies (surveys and case studies) which have been reviewed:

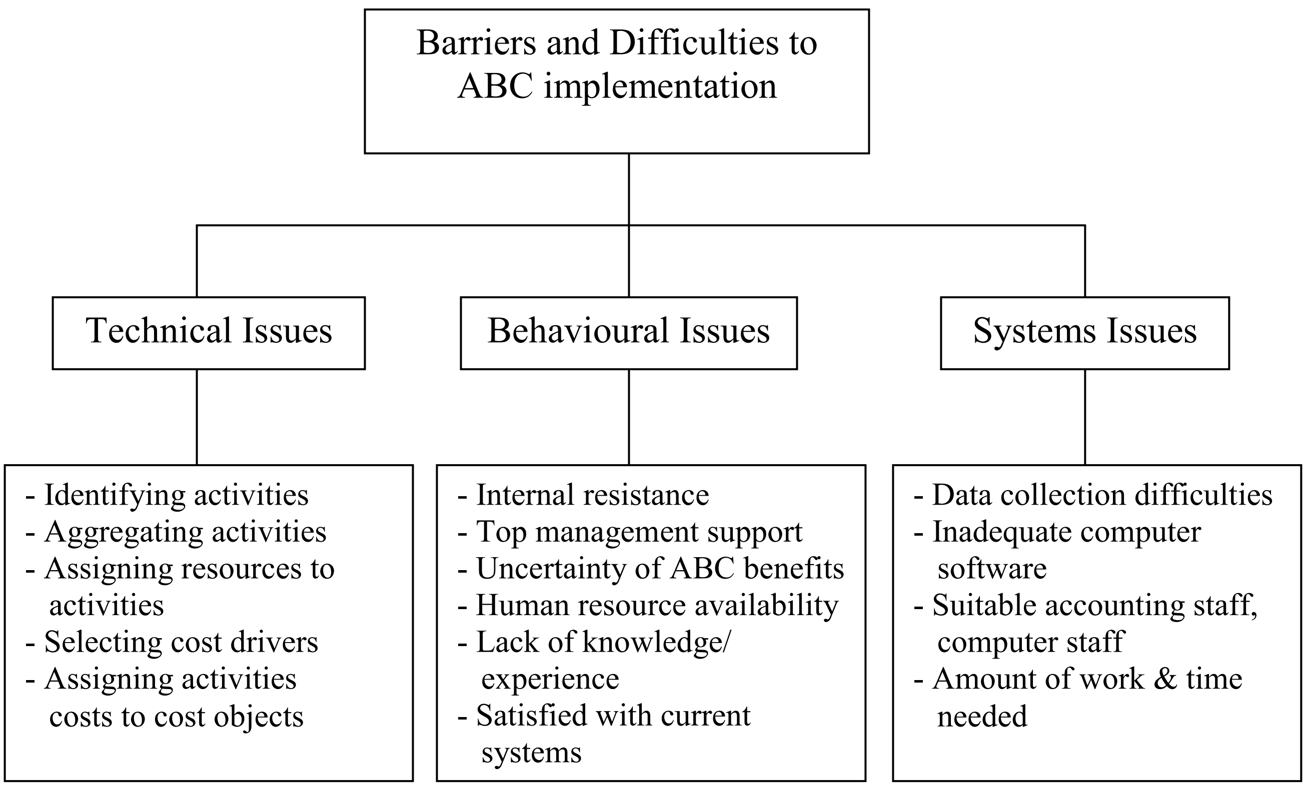
Table 3.5: Main difficulties encountered during ABC implementation

Barriers and difficulties	Innes&Mitchell 90,95,2000 Friedman & Lyne 1995	O'Dea Clarke., 94.Clarke 1999	Groot, 1999. Sartorius et al. 2007	Cobb, Innes & Mitchell 1992	Pierce& Brown 2004	Chongruksut 2002. Cohen et al 2005
Identifying and aggregating activities	✔	✔	✔	✔	✔	✔
Assigning resources to activities	✔	✔	✔	✔	✔	✔
Selecting cost drivers	✔	✔	✔	✔	✔	✔
Assigning activity costs to cost objects	✔	✔	✔	✔	✔	✔
Internal resistance	✔	--	✔	✔	--	--
Top management support	✔	✔	--	✔	✔	✔
Uncertainty of ABC benefits	✔	✔	--	✔	✔	✔
Data collection difficulties	--	--	✔	✔	✔	--
Suitable accounting staff, computer staff	--	✔	--	✔	--	--
Inadequate computer software	✔	✔	--	✔	✔	✔
Amount of work and time needed	✔	✔	--	--	✔	✔
Human resource availability	--	--	--	✔	✔	--
Lack of knowledge/ experience	✔	✔	✔	✔	✔	✔
Satisfied with current	✔	✔	✔	--	✔	✔

The above table indicates that technical issues such as: defining activities, selecting cost drivers and assigning resources and costs to activities are common difficulties encountered during the implementation stage of ABC among the studies.

Based upon an analysis of the above table, the barriers to and difficulties of implementation of ABC systems may be classified into three distinct strands, as illustrated in the following chart:

Figure 3.1: Barriers and difficulties classification



Given the frequency with which technical issues have been identified as constituting "difficulties", it is perhaps surprising that so little empirical research has been devoted in this area. As Anderson et al (2002, p.195) state: "an aspect of ABC implementation that researchers have neglected is the process of designing the ABC model – i.e. the resources, activities and cost drivers that are the 'economic map' of the organisation".

By contrast, a number of studies have considered behavioural issues (Anderson 1995; Shields 1995; McGowan and Klammer 1997; Anderson et al., 2002).

In order to more fully clarify and understand the nature of the technical difficulties, the next chapter will review the literature relating to implementation of ABC systems, with particular emphasis upon the technical decisions relating to identifying activities, aggregating activities, assigning resources to activities, selecting cost drivers and assigning activities costs to cost objects.

CHAPTER 4: TECHNICAL ISSUES IN THE IMPLEMENTATION OF ABC SYSTEMS

4.1 Introduction

Chapter 3 established that internationally, the take up or adoption rates of ABC are relatively low, particularly when one considers the benefits that have been claimed for the system. In addition, chapter 3 reviewed the empirical studies relating to ABC implementation, in order to establish the extent to which technical and other difficulties actually play a part.

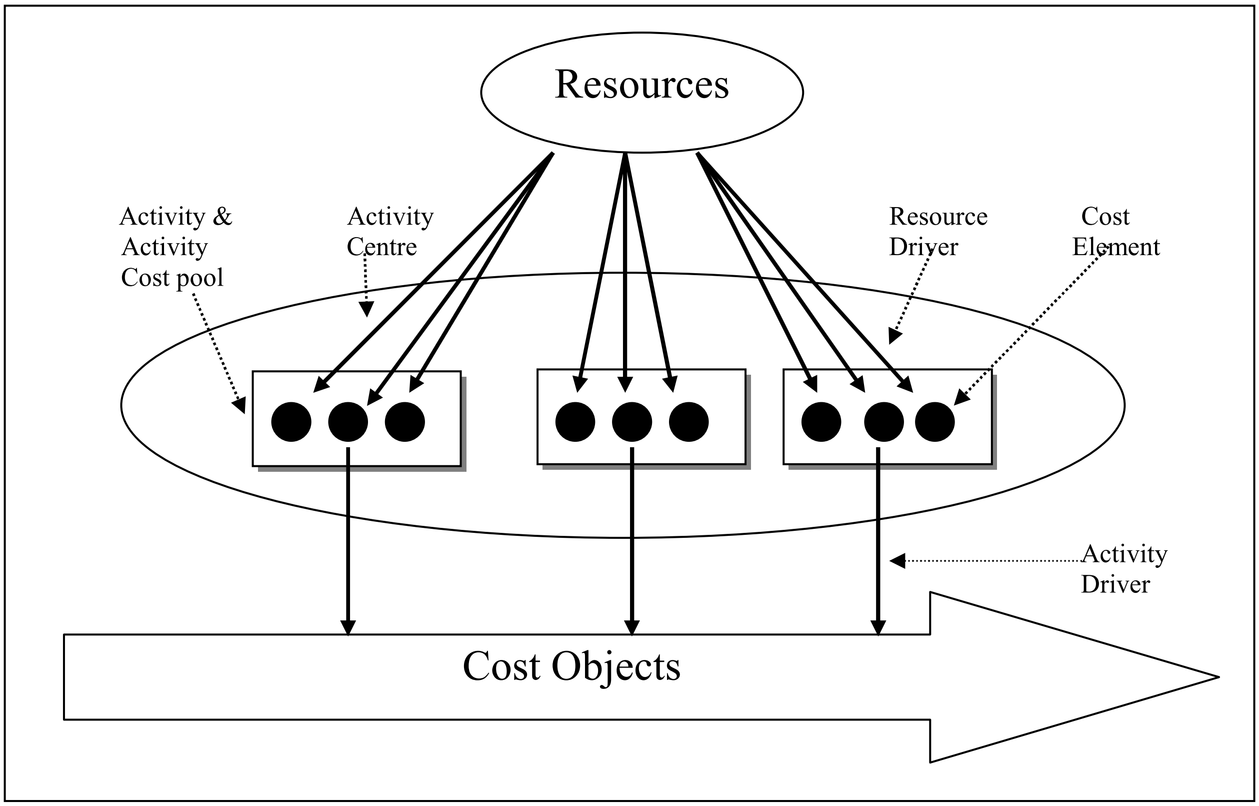
This chapter elaborates on the nature of these technical difficulties. This elaboration will be conducted by considering the various stages, which need to be addressed during the implementation process, and the various technical options available.

The organisation of the chapter is as follows: Section 4.2 investigates and explains the necessary steps taken in designing and implementing an ABC system, (together with a description of the nature of the technical issues encountered during the implementation of an ABC system). Finally, a summary and conclusions are presented in section 4.3.

4.2 Steps in designing and implementing ABC systems

It has been argued (Cooper 1989, 1990; Scapens 1991; Cooper and Kaplan 1991, 1998; Drury 1996, 2000; Kaplan and Atkinson 1998) that the main components of an ABC system are: Resources, Activities and Cost Objects. Turney (1996. p96) states that the main items, which he considers the "basic building blocks of the ABC system", are resources, activity, activity centre, resource driver, activity cost pool, cost element, activity driver and cost object. Figure 4.1 below shows how these building blocks fit together.

Figure 4.1: Basic building blocks of the ABC system



Source: Turney (1996: 97)

From the above exhibit, it can be seen that costs flow from the resources to activities, and then flow through to the cost object that triggers the activities. Therefore, the view which is adopted is that activities consume resources, and cost objects consume activities.

Cooper (1988b) argues that the ABC system focuses on activities rather than products. This helps to avoid the distortion in product costs that can arise from the use of the traditional costing systems, and provides more information that is accurate. Drury (1996) advises businesses to understand the factors that drive each major activity, the cost of activities and how activities can be related to products. The art of designing an ABC system can be viewed as making two separate interrelated decisions about the number of cost drivers needed and which cost drivers to use (Cooper and Kaplan 1998).

This section will present the different steps or stages that are undergone during the design and implementation of an ABC system. The primary focus will be on the nature of the technical issues encountered during these stages, while acknowledging that not all issues critical to successful implementation are of a “technical” nature.

The design process begins with a generally agreed definition of the objectives of an ABC system and ends with the assignment of the cost of activities to objects and includes the following stages (Cooper 1990; Cooper and Kaplan 1991; Sharman 1994; Turney 1996; Drury 1996, 2000).

4.2.1 Selecting the specific objectives of an ABC system

4.2.2 Developing the ABC team

4.2.3 Organisational issues

4.2.4 Identifying and grouping the major activities in an organisation

4.2.5 Assigning costs to each activity

4.2.6 Determine cost drivers

4.2.7 Assigning the cost of activities to cost objects

4.2.1 Selecting specific objectives of the ABC system

Cooper (1990) argues that the complexity of an ABC system’s design appears to depend on many factors, including management’s objectives for the cost system and the diversity of the company’s product mix. He further comments that if a single management objective dominates, only a few cost drivers may be required to achieve that purpose.

Turney (1996), Cooper (1990) and Drury (1996, 2000) suggest a list of objectives which a company can achieve by successfully implementing an ABC system. These objectives are:

(i) To provide information about manufacturing activities with the objective to support and motivate waste elimination programmes

(ii) To provide information about non-manufacturing (non-value adding) activities and cost objects (customer and distribution channels) that support cost reduction in these areas

(iii) To provide product costs and to facilitate studies of relative product profitability

(iv) To provide information to formulate pricing strategies

(v) To provide information to guide market focus

4.2.2 Developing the ABC team

The next stage in designing an ABC system is to develop a team, which should include members from several disciplines other than finance (Cooper 1990). Sharman (1994) states that implementation involving a multifunctional team of experienced employees can be highly efficient because their knowledge of the organisation and its business already exists. The team size depends on the organisation's size, urgency of completion of the project and availability of staff (Turney 1996). Cooper and Kaplan (1991) identify a minimum of four team members as follows:

(i) The team leader should be an engineer who is working in a strategic planning group

(ii) A Company cost accountant who has had significant experience in production as well as working knowledge of a firm's existing accounting system

(iii) A production supervisor

(iv) An industrial engineer with many years of experience

Cooper (1990) argues that if someone thinks that it is an accountant's job to deal with the costing system then it is not possible to design a successful ABC system, because it is a management system not a financial system. In addition, the team should have the full support of top management, which is only possible if management is convinced that the new system is better than the old system (Cooper 1990).

4.2.3 Organisational issues

According to Innes and Mitchell (1998), the specific nature and circumstances of the organisation are highly related to an assessment of how suitable the adoption of an ABC system would be. They suggest some organisational issues that should be considered in the design of the ABC system, and should be analysed by the ABC team before identifying the activities, such issues comprise:

(i) Number of products produced or service output

(ii) Diversity of the product lines

(iii) The significance of overheads in the cost structure

(iv) The rate of growth of overheads

(v) The existing approach to overhead absorption

(vi) The number and diversity of channels of distribution

(vii) Differences in Customer levels of service

The above issues have been investigated from a contingency theory perspective, which suggested that the implementation of ABC (as for any management accounting system) within individual firms is dependent upon, or at least associated with particular variables of the firm (chapter 6 will discuss these issues in more details).

4.2.4 Defining the major activities in an organisation

Identification of the activities is the fundamental step of an ABC system, as it sets the structure and scope of the system (Cooper, 1989, 1990; Cooper and Kaplan, 1991, 1998; Drury, 1996, 2000; Kaplan and Atkinson 1998; Scapens 1991). Turney (1996) believes that defining and describing activities is at the heart of designing an ABC system. This is because the identification of the activities forces the accountant to determine what is actually happening in the relevant areas of the business and ensures that the costing system is built on reality (Innes and Mitchell, 1998).

Drury (1996) defines an activity as an event, task, or unit of work with a specified purpose, while Ittner et al (1997) state that, the ABC literature defines an activity as any discrete task that an organisation undertakes to make or deliver a product or service. Cooper and Kaplan (1998:210) argue that "activities are described by verbs and associated objects: schedule production, move materials, purchase materials, inspect items, respond to customers, improve new products, and so on".

Activities differ in type and location from one company to another, because of the variations in each company's technology, size, and its nature, while the number and type of activities also differ according to its business approach (Turney 1996).

4.2.4.1 The major approaches to identifying activities

4.2.4.1.1 Activity Dictionary

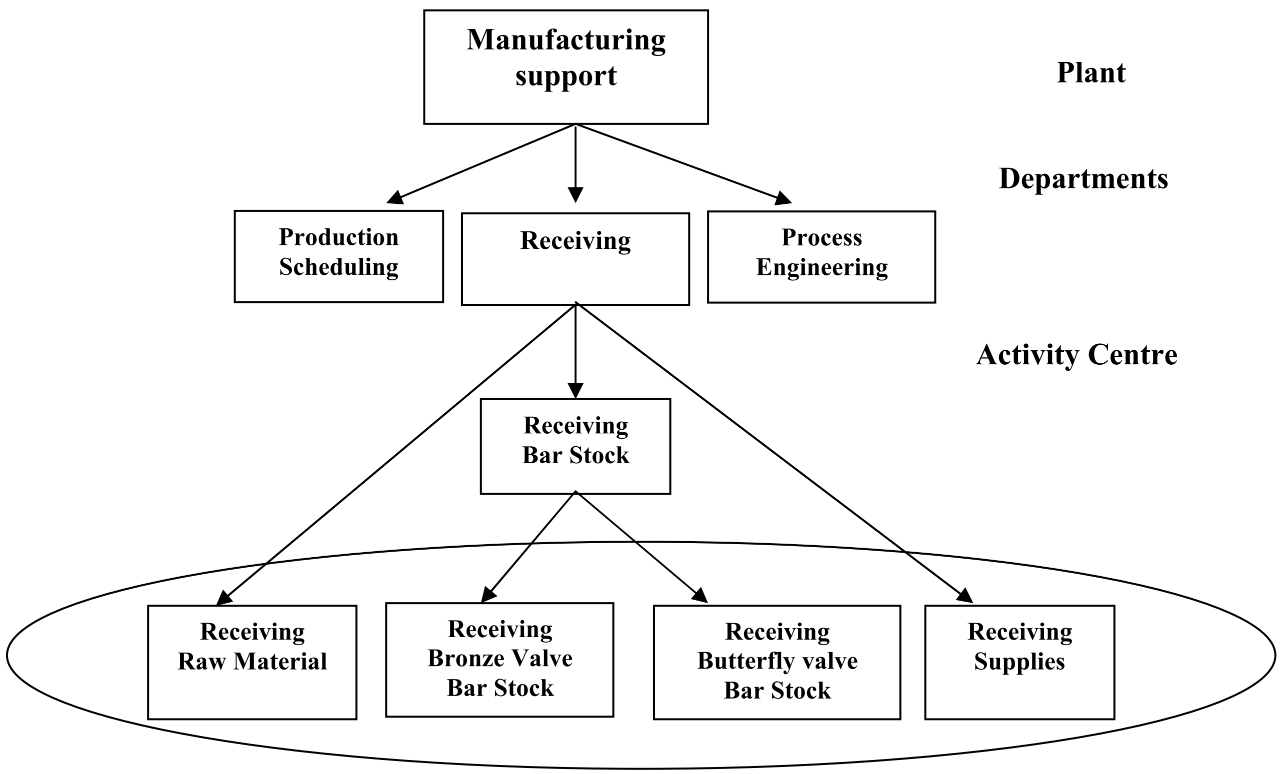
Cooper and Kaplan (1998) suggest that a Standard Activity Dictionary, which lists and defines all the major activities performed by the organisation be prepared. They believe that such an activity dictionary provides a useful approach to identifying the activities suitable for use in the particular application of ABC. In designing the activity dictionary, Sharman (1994) argues that an activity dictionary is prepared by the team in advance of interviews taking place and represents a list of all the major activities performed by the organisation and their definitions. Cooper and Kaplan (1998) demonstrate that the number of activities is a function of the purpose of the model, and the size and complexity of the organisational unit being studied. Cooper and Kaplan (1998) further add that activity dictionaries can be relatively brief, say 10-30 activities, especially where the prime focus of the ABC system is to estimate product and customer costs. Therefore, the activity dictionary simplifies the activity analysis process by listing the typical activities by function or department.

4.2.4.1.2 Functional decomposition

Turney (1996) mentions the term 'functional decomposition' as a process by which to identify activities. He states that "to identify activities with functional decomposition, start with an organisation chart for the company. Then divide each box in the chart into smaller units. This division of larger functions into smaller functions is continued until you meet the purpose of the ABC system" (Turney 1996: 262). To illustrate how functional decomposition works, Turney provides the example shown below in exhibit

4.2, which shows some proposed support-departments, including production scheduling, receiving, and process engineering. The first step is that the activities be defined by visiting all the departments of a company and interviewing staff members to determine the work done in each department. The next step is to break out the activities.

Figure 4.2: Functional decomposition



Source: Turney (1996: 263)

Based on the above, three activities are performed in the receiving department; receiving raw material, receiving bar stock, and receiving supplies. Turney argues that it is important to identify each of these activities separately because the effort required to process a receipt may vary depending on what is received. For instance, he observes that there are two types of bar stock received, bronze valve bar stock and butterfly valve bar stock.

Turney (1996) adds that there may be literally hundreds of activities in the database, and you can easily become lost without some method of organisation. He states that the most common approach is to group activities into activity centres (see exhibit 4.1). This section illustrates the approaches of grouping and aggregating activities.

4.2.4.2 Grouping and aggregating activities

Cooper (1990:78) argues, "The number of actions performed is typically so vast that it is economically unfeasible to use a different cost driver for each action". Therefore, he suggests that actions must be aggregated into activities, and then a single driver is used to allocate the cost of those activities to cost objects.

This section presents the methods of aggregating activities to simplify the implementation of ABC systems as follows:

4.2.4.2.1 The activity centre

In exhibit 4.1 mentioned earlier, Turney (1996) argues that an activity centre is a collection of related activities, such as those in a particular department. He provides an example of activities in an inspection activity centre as follows:

Figure 4.3: The activity centre

Inspection Department

Inspecting incoming material

Inspecting incoming components

Inspecting the first piece of each batch

Inspecting customer complaints

Source: Turney (1996: 103)

Based on the above figure, the activity centre directly parallels the inspection department in scope, but contains information about the activities that would not be found in any conventional departmental report. Turney (1996:103) argues, “This information includes the cost of each activity, the resources used by each activity, and operational information about activity performance”. Turney concludes that the purpose of the activity centre is to facilitate management of function or processes. It also holds strategic and operational information relating to the centre’s activities in one place. This information is used to help answer the following types of questions about the work of the centre. These are: what work is performed in the activity centre; which activities consume most of the resources of this department; which activities contain waste and are candidates for improvement; how does each activity meet the needs of its customer (i.e. the next activity in the process), and what is the overall performance of the department or the process.

4.2.4.2.2 Activity Hierarchy

Horngren et al (2003) state that an activity hierarchy categorises costs into different activities based on the different types of cost drivers, cost-allocation bases, and different degrees of difficulty in determining cause-and-effect relationships. Cooper and Kaplan (1991) argue that when separating activities, a hierarchy occurs and activities are classified into:

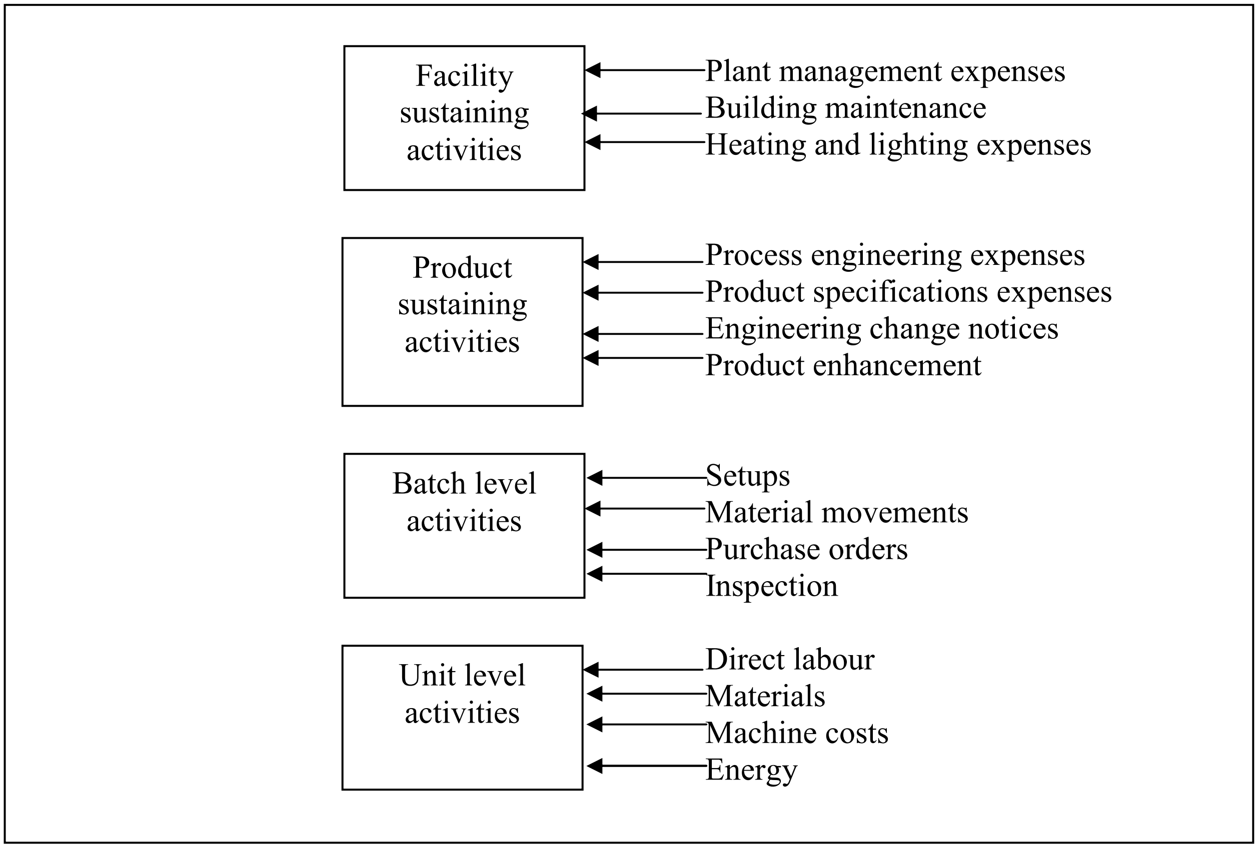
(i) Unit-level activities: are performed for each unit of product

(ii) Batch-level activities: undertaken every time a batch is produced

(iii) Product-sustaining activities

(iv) Facility-sustaining activities

Figure 4.4: Activity hierarchy



Source: Cooper and Kaplan (1991:132)

Based on the above figure, unit level activities consume resources in proportion to the number of units produced and sales volume. Figure 4.4 also shows that batch related activities such as machine set up or material movements are performed each time a batch of goods is produced. Product level activities are performed to allow the production and sale of different products, e.g. product specifications expenses (bill of materials). The last level is facility level; these costs include plant management expenses, building maintenance and heating and lighting expenses etc. These are incurred in the support of the whole organisation. Drury (2000) states that there would need to be a dramatic change in activity for these costs to change, e.g. additional premises. He adds that these cost are seen as necessary and not allocated to individual products as they are seen as irrelevant for the majority of decisions, as such they are deducted from the total operating margins of all products.

Philip and Mandi (2008) argue that ABC is a complex costing system that deals with indirect costs by constructing a hierarchy of four activity levels based on these cost definitions. Philip and Mandi (2008) provide an example of a firm called Hierarchy Manufacturing Co. as following:

Figure 4.5 cost drivers and cost driver rates at Hierarchy Manufacturing Co.

	Cost driver (1)	**Cost driver rate (2)**	**Product X 40,000 units (3)**	**Product Y 10,000 units (4)**	**To product X (2x3)**	**To product Y (2x4)**
Unit-level activities						
Materials	Pounds	$5 per pound	120,000 lbs.	70,000 lbs.	$600,000	$350,0000
Labour	Labour hors	$1 per hour	360,000 hours	40,000 hours	4,320,000	480,000
Batch-level activities						
Set up	# of batches	$4,500 per batch	80 batches	100 batches	360,000	450,000
Inspection	# of shipments	$1,000 per shipment	300 shipments	200 shipments	300,000	200,000
Product-sustaining activities						
Design	Engineering hours	$450 per hour	30,000 hours	20,000 hours	1,500,000	1,000,0000
Change orders	# of change orders	$1,000 per order	60 orders	40 orders	60,000	40,000
Facility-level activities						
Occupancy	Square feet	$20 per sq.ft	60,000 sq. ft	100,000 sq. ft	1,200,000	2,000,000

Source: Philip and Mandi (2008:18)

The above first category consists of the unit level activities of materials and labour, each having its own cost drivers: pounds and labour hours respectively. The second level of activities in ABC system, known as the batch level, includes costs of activities performed on batches of units produced rather than on each unit individually. Product-sustaining activities are the third level of the hierarchy; the costs associated with these activities serve a specific product and are concurrently direct and fixed. Finally, facility-level activities support the entire production process, as opposed to a specific product line or unit of product, and are both common and fixed.

4.2.4.2.3 Business process

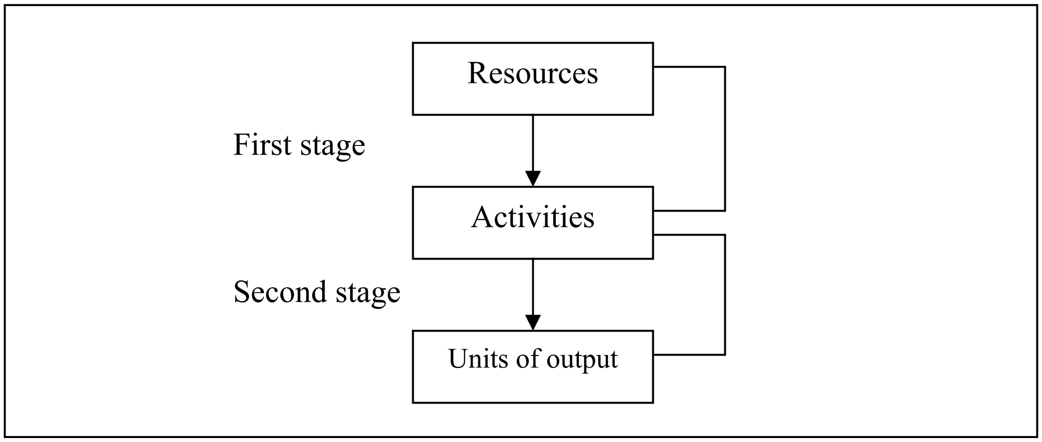
Cooper and Kaplan (1998) argue that activities can be grouped collectively into higher-level business processes. Cooper (1990) suggests the aggregation of many actions into each activity. Cooper and Kaplan (1998) referred to those activities within the procurement function, which might be too diverse for costs to be driven to products by a single cost driver, such could involve ordering materials, scheduling delivery of materials, receiving, inspecting, moving, storing materials and negotiating with and selecting vendors. These activities may require a different cost driver, if they built up into separate activities. Nevertheless, a single cost driver, like the number of purchase orders might be selected if all the activities were aggregated together into a procurement process. Cooper and Kaplan (1998) further added that such an aggregation would fail to identify differences in activities required for ordering different types of materials from different vendors and using different ordering relationships. There is also an opportunity for managers to compare the cost of performing the same business process at different plants or across different organisational units to identify efficient and inefficient practices. Therefore, it is necessary during activity analysis to identify which activities are significant and agreed on which activities can be aggregated.

Based on the above, it is interesting to argue that identifying activities are at the heart of designing an ABC system. Activities are made up of the amalgamation of tasks or units of work and can consist of many different tasks. The activities are usually identified by carrying out an analysis of the work in an organisation through interviews and/or time in motion exercises. Two major approaches have been reviewed to identify activities: these are activity dictionary and functional decomposition. Initially numerous tasks can be identified. These should be aggregated into a reasonable number of activities, otherwise there will be a proliferation of information which is costly to manage. Three approaches have been presented in relation to aggregating activities: these are the activity centre, activity hierarchy and business process. The final list of activities chosen is a matter of judgment but is likely to be based on the total cost of the activity centre and whether or not a single driver can provide a reasonable determinant of the cost of the activity. If it is not reasonable then it will be necessary to break the cost centre/pool down further, (Drury 2000).

4.2.5 Assigning costs to each activity

After the activities have been identified, the next step is to assign the overhead costs to each activity using the first stage cost drivers, which link spending and expenses as captured in the organisation's financial, or general ledger system, to the activities performed (Cooper 1990; Turney 1996; Cooper and Kaplan 1998; Drury 2000). Figure 4.5 below simplifies the general picture of the two-stage allocation within ABC systems.

Figure 4.6: Two-stage allocation for ABC system

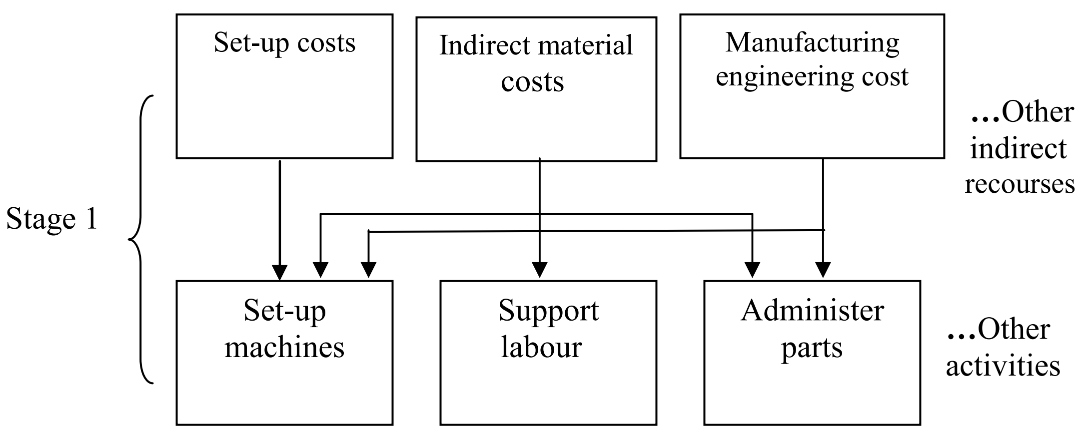


Source: Cooper et al. (1992)

The initial stage is referred to as a first-stage allocation, which assigns the costs of inputs cost pools within each activity centre. At this stage many of the resources may easily be directly attributable to specific activities, but some may be shared by a number of activities (such as lighting, heating, executive salaries, and depreciation).

Figure 4.6 below illustrates the first stage of assigning overhead costs to each activity, for example, set-up costs are directly allocated to set-up machines activity, while indirect material cost are shared by the three activities as following.

Figure 4.7: First stage ABC allocation



Turney (1996) states that the primary cost drivers (resource drivers) are the links between the resources and the activities. They are used to allocate a cost from the general ledger and assign it to the activities. These cost drivers actually show how specific resources are consumed by an activity. Turney (1996: p101) provides an example of two significant resources associated with the inspection department; £100,000 in salaries and benefits and £20,000 for supplies. Salaries and benefits are assigned to each activity based on estimates of the effort devoted to each activity. This estimated effort is the resource driver for salaries and benefits. Consequently, every activity should be analysed in detail to create a list of all the primary cost drivers. For instance, if two out of ten people in the department are found to spend 50% of their time on inspection of customer complaints, then 10% (i.e. 2/10 multiplied by 50%) of salary and benefit cost (i.e. 10% of £100’000 = £10,000) is traced to this activity (Turney 1996: P 101).

4.2.6 Determining Secondary Activity Drivers

Traditionally, cost systems used simple bases, such as direct labour hours, machine hours, unit produced, or materials processed to allocate production cost centre costs to cost objects (Cooper, 1989, 1990; Cooper and Kaplan, 1991, 1998; Drury 1996; Kaplan and Atkinson 1998; Horngren et al, 2003). Babad and Balachandran (1993) point out that an ABC system achieves improved accuracy in estimation of costs by using multiple cost drivers to trace the cost of activities to the products associated with the resources consumed by those activities.

The ABC system aims to make a more realistic allocation of overheads to objects (Cooper and Kaplan 1988b). The key to this is the determination of the correct drivers for the production process. Cooper and Kaplan (1988b) also argue that the cost driver can be defined as the factor that generates and controls the cost of an activity; it is any factor that could change the cost of the activity. Thus, the cost drivers provide the best explanation of why costs in an activity cost pool change over time.

Babad and Balachandran (1993) argue that a cost driver is an event, connected with an activity that results in the consumption of an organisation's resources. Homburg (2001) states that the selection of cost drivers is a major issue in designing and implementing an ABC system. He also concludes that a high accuracy level in allocating overhead costs often requires a high number of cost drivers, but a small number of cost drivers are desirable to obtain acceptable information cost, and to make the ABC easier for management to understand. Sharman (1994) believes that in reality the number of drivers is strongly influenced by the size and complexity of the organisation; the more complex the operation, the more likely the number of drivers will increase.

The accuracy of a product cost depends on the appropriate selection of cost drivers, because cost of activity is an aggregation of cost of primary drivers and product cost is an aggregation of the cost of activities (Gunasekaran et al, 1999). The selection of the cost driver reflects a subjective trade-off between accuracy and the cost of measurement (Cooper and Kaplan 1998). Lin et al. (2001) argue that the most relevant driver(s) can often be determined by questioning those employees who are most familiar with the activity to indicate which factor causes an increase or decrease in the time and effort they spend on the activity. They also add that the cost driver should have a direct relationship to the amount of effort required to perform the task.

4.2.6.1 Types of activity cost drivers

Cooper and Kaplan (1998) advice ABC system designers to choose from three different types of activity cost drivers:

4.2.6.1.1 Transaction drivers

These kinds of drivers can be used when all outputs make essentially the same demands on the activity. Cooper and Kaplan (1998) provide some examples, such as the number of set-ups, number of receipts, and number of products supported, which count how often an activity is performed.

4.2.6.1.2 Duration drivers

According to the authors, duration drivers should be used when significant variation exists in the amount of activity required for different outputs. This type includes set-up hours, inspection hours, and direct labour hours, which represent the amount of time required to perform an activity. In the case of activity homogeneity, Cooper and Kaplan (1998) suggest that duration drivers are more accurate and expensive than transaction drivers because more information is required about resources consumption by activity.

4.2.6.1.3 Intensity drivers

Cooper and Kaplan (1998) argue that although intensity (direct charging) drivers are the most accurate activity cost drivers they are the most expensive to implement. They also indicate that this type of activity cost drivers should be used only when the resources associated with performing an activity are both expensive and vary depending upon the cost object in terms of both the quantity and price of the resources consumed.

Kaplan and Atkinson (1998) argue that there is a choice between the above three types of cost driver can occur for almost any activity. For instance, in the case of sales activity, as in the case of retaining existing customers, it could be possible to use a transaction, duration, or an intensity driver, as following:

(i) Cost per customer (assumes that all customers cost the same)

(ii) Cost per hour (assumes that different customers use different amount of sales resources time, but each hour of support time costs the same)

(iii) Actual cost per customer (actual or estimated time and specific resources committed to specific customers) (Kaplan and Atkinson, 1998).

4.2.6.2 The optimal cost driver selection

The selection of cost drivers is the central innovation of ABC Systems, and is the major issue since accuracy must be traded off against the complexity of the ABC system (Kaplan and Atkinson, 1998, Homburg, 2001).

Drury (1996) identifies several factors influencing the selection of suitable cost drivers:

(i) It should provide a good explanation of costs in each activity cost pool

(ii) A cost driver should be easily measurable

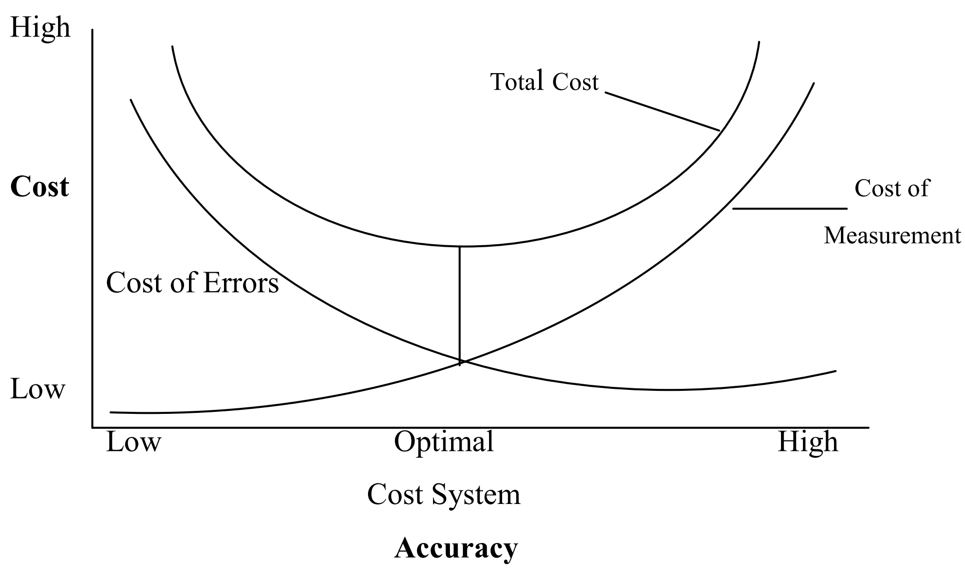
(iii)The data should be relatively easy to obtain and be identifiable with products.

Therefore, the costs of measurement, the care to ensure that cost drivers represent a reasonably homogeneous measure of the output for each activity, and a satisfactory explanation of activity's costs are factors that should be taken in consideration when selecting cost drivers. Cooper (1990) argues that the desired accuracy plays an obvious role in identifying the minimum number of cost drivers that an ABC system uses. That means that the more accurate a company wants its reported costs to be, the more cost drivers the company will need to achieve that accuracy. Cooper (1988b) states that simple cost systems impose low measurement costs, but by reporting heavily distorted product costs, they can cause managers to make poor decisions.

Kaplan and Atkinson (1998) state that the ABC system is not just complex and expensive in performing cost allocations, but it has the ability of tracing back from any cost task to underlying economic events. For instance, "set-up costs are assigned on the basis of set-ups performed for individual products. Product support costs can be traced back to work performed to maintain products in the organisation. And customer administration costs can be traced back to handling customer orders, responding to customer requests, and marketing existing and new products to particular customers" Kaplan and Atkinson (1998: p110).

Kaplan and Atkinson (1998) have illustrated this issue in the following figure:

Figure 4.8: Designing the optimal ABC system



Source: Kaplan and Atkinson, (1998, p.112)

As shown above, the optimal cost system is that which minimises the sum of the cost of measurement, and the cost of errors, which are associated with making poor decisions based on inaccurate product costs.

4.2.7 Assigning the cost of activities to cost objects

Cooper (1990) coined the term "first stage cost driver" as the method of assigning costs from a general ledger line item to an activity cost pool and "second stage cost driver" as the method of assigning the activity cost to the cost object. Lin et al (2001) argue that a cost driver is usually articulated on a cost per unit basis by dividing the total cost of resources used on the activity by the number of cases performed. ABC then multiplies the usage amount of a cost driver in performing an activity by the unit cost of the driver to determine the total cost of that activity for an individual cost object.

Lin et al (2001) argue that some costs will trace directly from the ledger to the activity, whereas others will require extensive interviews with employees and on-site observations to obtain the amount of resources consumed in the activity. For instance, if one employee is spending all of his/her time on a specific activity this makes cost tracing from the ledger easy, whereas, another employee may spend a fraction of his/her time on a particular activity creating a more difficult task of tracing the cost of labour to the activity. Due to the indirect nature of the costs, this can be a difficult step in the implementation process of the ABC system (Lin et al, 2001). In the stage of assigning the cost of activities to objects, Cooper (1990) suggests designers to take into account the identification of secondary cost drivers as following:

4.2.7.1 Identification of secondary or activity cost drivers

Turney (1996) defines activity drivers as a method for assigning the total cost of activities to cost objects. He also argues that activity drivers "measure how often activities are performed on each type of product or customer and the effort involved in carrying them out" (1996: p108). Cooper (1990) states that once the cost of the resources consumed by all the activities that are performed in each activity centre has been traced to the activity cost pool, second-stage cost drivers can be selected. A secondary cost driver therefore, is a measure of the frequency and intensity of the demands placed on activities by the cost object.

A cost driver is a variable used as denominator in the rates used to apply activity costs to product or cost objects (Innes and Mitchell 1998). The cost driver rate however, can be calculated from:

Cost driver rate = activity cost for period / cost driver volume for period

Turney (1996) identifies some criteria, which should be considered in choosing the secondary cost drivers: He argues that the cost driver selected should have a strong correlation with cost level in the activity cost pool. Minimise the number of unique drivers. Cost and complexity should be directly correlated with the number of drivers. Select cost drivers that encourage improved performance, and select cost drivers that are readily available and /or have a low cost of collection

Generally, the number of cost drivers to be used and the selection of the cost drivers, are two interrelated decisions, because the type of cost drivers selected affects the number of drivers needed to achieve a desired level of accuracy (Cooper, 1990).

4.3 Summary and Conclusion

This chapter has described the technical steps encountered during the design and implementation of the ABC system. It is clear from the literature review and the case studies presented that technical issues pose significant challenges in the implementation of ABC. Indeed, the majority of the surveys conducted (Cobb et al. 1992; Clarke 1996; Groot 1999; Innes and Mitchell 2000), found that the most common problems experienced during the design and implementation stages of ABC system were as follows:

(i) Identifying the major activities that take place in an organisation

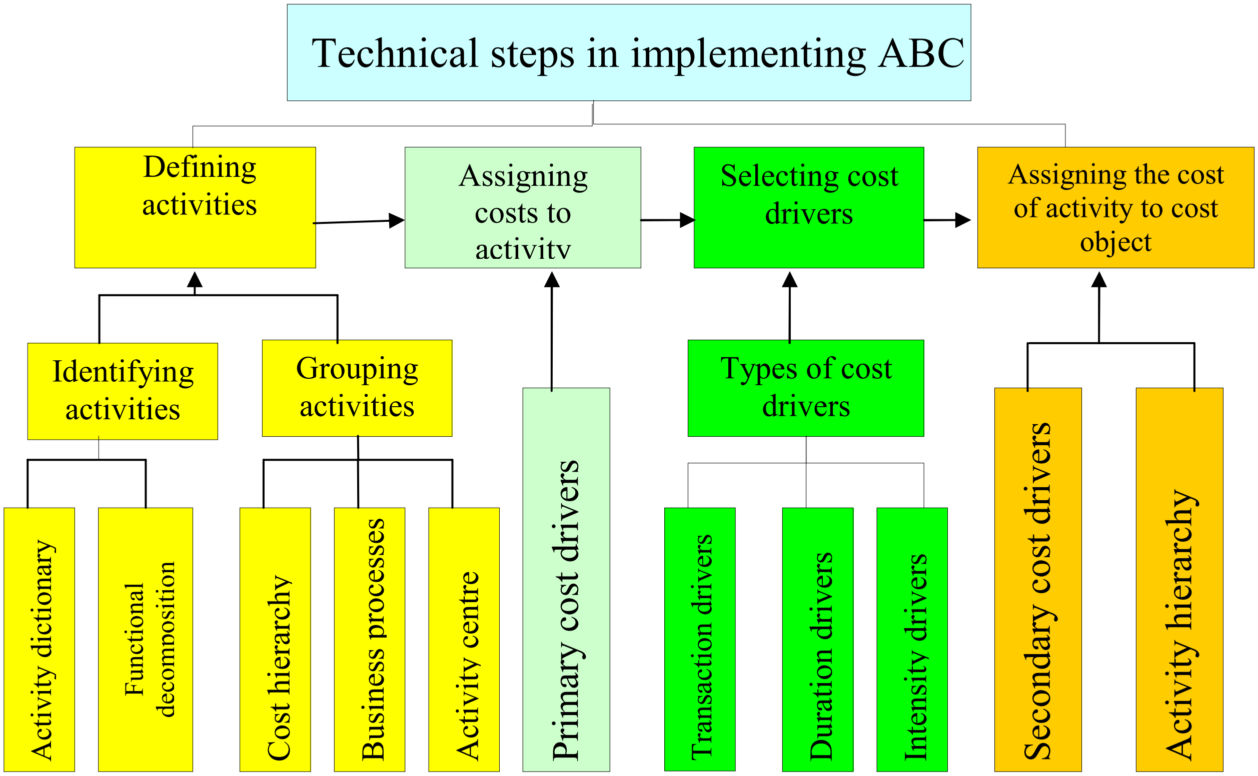
(ii) Creating a cost centre/cost pool for each major activity

(iii) Determining the cost driver for each major activity

(iv) Assigning the cost of activities to products according to a product's demand (using cost drivers as a measure of demand) for activities

Based on the above explanation, a summary of the technical steps are shows in the following chart:

Figure 4.9: Technical steps in ABC implementation



Source: Own

ABC emphasises the need to obtain a better understanding of the behaviour of overhead costs, and therefore ascertains the causes that effect overheads and how they allocate or assign to products. The literature review highlights that the basic principles of ABC are to identify activities to calculate the cost of each activity and then to cost the product based on the consumption of activities. Thus, identifying activities must be the first step in designing an activity-based costing system.

This chapter has organised and discussed the major issues as following:

The major approaches to identifying activities

It was stated in this chapter that defining and describing activities are the heart of designing an ABC system. Two approaches to identifying activities have been illustrated.

The **'Activity Dictionary'** approach lists all the major activities performed in an organisation and provide work activity description for each. It also facilitates the activity analysis process by listing the typical activities by function or department. Furthermore, the activity dictionary helps companies in selecting activity measures 'drivers' and provides a good guide to activity budgeting and performance measurements.

The **'Functional Decomposition'** approach starts with dividing each box in the organisation chart into smaller functions until it meets the purpose of the system (ABC). Visiting and interviewing staff members are very important features of this approach, in order to determine the work done in each department and then to break out the activity separately. Using this approach to identify activities enables the organisation to achieve suitable and economical activities. This approach is based upon four main rules to identify activities; matching the level of detail to the model's objectives, using macro activities to summarise activities, combining insignificant activities, and more clearly describing the activity labels.

Types of Grouping Activities, two approaches to grouping activities have been considered - cost hierarchy and business processes. Cost hierarchy was described as a method to classify overhead costs into different cost pools based on different types of cost allocation bases. At this stage, the activities in various departments are listed and analysed based on their cost variability, such as unit level activities, batch level activities, product level activities, production sustaining level activities and corporate sustaining activities. Cost hierarchy provides a framework for understanding cost behaviour, forms the basis for assessing product profitability, evaluates the cost implications of proposed managerial decisions, and designs advanced cost accounting systems. The second type of grouping activities is business process; it concentrates on aggregating many actions into a limited number of activities, by taking into account the identification of the significant activities. The main advantage of this approach is to compare the cost of performing the same business process at different plants or across different organisational units in order to identify efficient and inefficient practices.

Selection of the correct cost drivers

Selecting cost drivers was identified as a second common issue in the design and implementation of an ABC system. ABC is a unique system using multiple cost drivers to make a more realistic allocation of overheads to products. Cost driver, has been defined as a factor that generates and controls the cost of an activity. The relationship between the selected cost drivers and the level of accuracy plays a major role in obtaining an acceptable information cost through implementing ABC. Three different types of activity cost drivers have been illustrated in section two: transaction drivers, duration drivers and intensity drivers. A balance needs to be achieved between the accuracy of the output from the ABC system and the costs and difficulties associated with operating a more complex ABC system. Innes and Mitchell (1990) suggest that the activities must be reduced to ensure a practical and cost effective ABC system is finally designed. They suggest that to effect this reduction the accountant will need to determine:

(i) The significance of the cost of each activity listed (in order to judge if it is material enough to justify a separate cost pool) and,

(ii) The factor or factors which influence the cost of each activity (namely the cost driver) in order to judge whether there is homogeneity in the cost behaviour of separate activities (which may be combined into one cost pool, at least for product cost purposes).

Designing a hierarchy of drivers to indicate at which level costs are driven (e.g. unit, batch, product and facility) facilitates an understanding of cost behaviour, which assists cost control and modelling for decision-making.

Section 2 presents the last stage in designing the ABC system: assigning the cost of activities to the cost object. This stage involves; calculating the activity costs by selecting appropriate first stage cost drivers and applying them to distribute the natural expenses to various activities undertaken. Following this, the product costs are calculated by selecting appropriate second stage cost drivers and using them to distribute the activity costs to various products manufactured or services produced.

In summary, the benefits of ABC can be realised if the system is implemented in a systematic manner. The steps to be followed are objectives selecting, team building, and designing the system. All these sub-processes take their own time, depending upon the size and complexity of the organisation. It is also apparent that identifying the suitable activities and selecting their correct cost drivers play crucial roles in helping an organisation create an understanding of ABC and leading an organisation to achieve the implementation of ABC.

CHAPTER 5: CONTINGENCY THEORY AND MANAGEMENT ACCOUNTING SYSTEMS

5.1 Introduction:

Chapter 3 established that the take up or adoption rate of ABC is relatively low considering the claimed benefits of the system. Chapter 4 has sought to establish and clarify the technical difficulties involved in implementing ABC, while acknowledging that there may also be behavioural and systems issues to be overcome during the implementation. However, it is a fact that some companies have adopted the system while some have not. A possible explanation for this might be provided by the adoption of a contingency framework to examine these issues.

This chapter provides a general review of contingency theory as it has been applied to management accounting systems design. Chapter 6 will attempt to specifically apply such a framework to the adoption of ABC systems.

Contingency theory first became prominent as a means of explaining organisational structure, suggesting that organisational design is contingent upon contingency factors includes environmental uncertainty, technology and organisational size (Chenhall & Morris, 1986; Fisher, 1995; Chenhall, 2003). Within management accounting research, contingency theorists have been concerned with identifying the specific features of an organisation's context that impact on particular features of accounting system design (Otley 1980).

In the past three decades, contingency theorists have called for more research which examines the influence of contextual settings on the effective design of Management Accounting Systems (MAS) (Khandwalla, 1972; Gordon and Miller, 1976; Otley, 1980; Thomas, 1991; Fisher, 1995; Chenhall, 2003; Baird et al, 2004; Gerdin, 2005). Fisher

(1995) states that contingency theory has become one of the dominant paradigms for research on management control design. The majority of empirical studies have relied on large scale cross-sectional postal questionnaire studies to examine the relationships between the identified contingent variables and characteristics of management accounting information (Krumwiede, 1998).

The objective of this chapter is to review contingency theory of management accounting, providing illustrations of the relationships between the contingent factors and the features of management accounting systems.

This chapter is structured as follows. The next section introduces the area of contingency-based Management Control Systems (MCS) and Management Accounting Systems (MAS) research and provides an overview of findings over the past 30 years. The third section examines the nature of the contingent factors such as environment, organisational structure and culture, technology and organisational size. The last section summarises the chapter.

5.2 An overview of contingency theory of Management Accounting

A widely used definition of contingency theory as applied within management accounting research is provided by Otley (1980: p.413), who states:

> The contingency approach to management accounting is based on the premise that there is no universally appropriate accounting system which applies equally to all organisations in all circumstances. Rather, it is suggested that particular features of an appropriate accounting system will depend upon the specific circumstances in which an organization finds itself. Thus a contingency theory must identify specific aspects of an accounting system which are associated with certain defined circumstances and demonstrate an appropriate matching.

Otley (1980) concludes that much needs to be done in the development of contingency theory of accounting, and outlines some minimal requirements for such. He also argues that contingency theory provides an approach to developing a descriptive theory of management accounting systems (MAS) based on the idea that the effectiveness of a management accounting system is contingent on an organisation's structure.

Otley (1980) summaries the variables included in the main empirical studies of structural features in the following table:

Table 5.1: Contingent variables included in studies of structural features

Study	**Contingent variables**	**Organisational design**	**Type of accounting information system**	**Organisational effectiveness**
Burns and Waterhouse (1975)	Organisational context (origin, size, technology, dependence)	Structuring of activities Concentration of authority	Control system complexity and perceived control leading to budget-related behaviour; interpersonal and administrative control strategies	
Daft and Macintosh (1978)	Technology (task variety; search procedures)		IS style (amount, focus and use of data)	
Dermer (1977)	Organisational objectives Technology Managerial style	Decentralisation Differentiation	Choice of AIS or MCS techniques	
Gordon and Miller (1976)	Environment (dynamism, heterogeneity and hostility)	Decentralisation Bureaucratization Resource availability	Technical characteristics of accounting IS	
Hayes (1977)	Environment factors Inter-dependency factors, Internal factors		Appropriate performance evaluation techniques	Departmental effectiveness
Khandwalla (1972)	Type of competition faced		Sophistication of accounting controls	
Piper (1978)	Task complexity (product range and diversity variability between units)	Decentralization of decision making	Financial control structure (e.g., use of financial planning models; frequency of reports)	
Waterhouse and Tiessen (1978)	Environmental predictability Technological routine ness	Nature of sub-units operational or managerial	Management accounting system design	

Source: Otley (1980: 420)

The 1980 review by Otley (above) indicate the complex nature of the approach. There is high variety in the choice of the contingent variables which are the subject of the studies.

Also the variables studied may either have a direct impact upon the accounting system e.g. Hayes (1977), Khandwalla (1972) or impact the system via organisational design e.g. Piper (1978), Waterhouse and Tiessen (1978). Likewise there are significant variations in the particular characteristics of the accounting system which are impacted by the contingent variables.

Merchant (1981) investigates how differences in budgeting systems related to corporate size, diversity, and degree of decentralisation. The sample included 19 organisations in the electronics industry and questionnaires were returned from 170 managers. Larger firms were found to make relatively higher use of formal administrative control. Administrative control is characterised by greater budget participation by middle and lower management, greater importance placed on achieving budget targets, more formal budget communication and greater budget sophistication. In addition, Merchant (1981) found that managers self-ratings of performance were higher in larger firms which used administrative control.

According to Tiessen and Waterhouse (1983), one popular view of contingency theory is that the structure of an organisation depends on the company's technology and environment; and that the effectiveness of managerial processes (including the management accounting system), is contingent on the organisation's structure. They argue that the location of information in relation to technology and environment has an important influence on organisation structure. In uncertain environments with non-routine technology, information is frequently appropriate for internal use. Conversely, where environments are more certain, or where technology is routine, information is useful for external use. Tiessen and Waterhouse (1983) indicate the dimensions of structure and control include authority structure and activities structure, that is, rules and procedures that determine the discretion of individuals. Authority relates to social power. In the contingency model, decentralised authority is more appropriate where uncertain environments or non-routine technology exist and centralised authority is more appropriate when environments are certain.

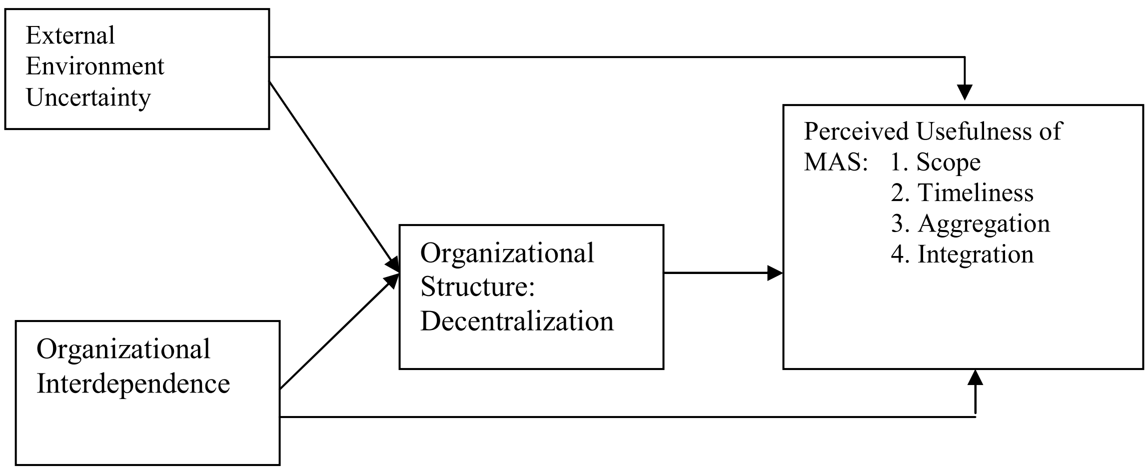
Flamholtz (1983) examines the relationship between budgeting and controls in organisations from a theoretical and empirical perspective. Flamholtz argues that exercising control in organisations is significantly more complex than described in management accounting literature. The author adds that budgeting (and other accounting systems) are not control systems per se; but rather parts of a total organisational control system, and concludes that firm culture is a powerful control mechanism that must be synchronized with formal control system.

Govindarajan (1984) investigates the relationship between environmental uncertainty and the performance appraisal system. Govindarajan argues that business units which face higher environmental uncertainty will use a more subjective performance appraisal system, while those facing lower environmental uncertainty will employ a more formula based performance appraisal approach. Fifty-eight general managers in eight Fortune 500 companies were surveyed, and results strongly supported both hypotheses.

Chenhall and Morris (1986) examine the effect of structural decentralisation, perceived environmental uncertainty, and organisational interdependence on Management Accounting Systems (MAS) design. They use the following framework (exhibit 5.1 below) to investigate the relationship between managers' perceptions of the usefulness of

MAS information characteristics –including scope, timeliness, level of aggregation, and information on how activities are integrated and 1) organisational structure, defined as the level of decentralized decision autonomy; 2) managers' perceptions of the uncertainty in their operating environments; 3) organisational interdependence, defined as the extent of exchanges between different sections within the sub-unit.

Figure 5.1: A contingency model of perceived usefulness of MAS



Source: Chenhall and Morris (1986:17)

Chenhall and Morris (1986) conclude that decentralisation is associated with a preference for aggregated and integrated information; perceived environmental uncertainty with broad scope and timely information, organisational interdependence with broad scope, aggregated, and integrated information. They also conclude that the effects of perceived environmental uncertainty and organisational interdependence were in part, indirectly influenced by their association with decentralisation.

Macintosh and Daft (1987) examine the relationship between departmental interdependence and the design and use of three elements in management control: the operating budget, statistical reports, and standard operating procedures and policies. The sample included 90 department heads from twenty organizations. The authors found that standard operating procedures were important control tools in pooled interdependence departments. Sequential interdependent departments emphasised operating budgets and statistical reports. Reciprocal interdependence departments de-emphasized all three forms of control. Macintosh and Daft argue that reciprocal interdependence may pose the greatest challenge to formal management control systems. They speculated that departments with reciprocal interdependence may rely on subjective control systems.

Govindarajan and Fisher (1990) investigate the relationships among control systems, resource sharing, and competitive strategies and their interactive effects on strategic business unit performance. Data was collected from strategic business unit managers at 24 firms on the Fortune 500 list. Empirical results supported the notion that output control and high resources sharing were associated with higher effectiveness for low-cost managers. Behavior control and high resource sharing were associated with higher effectiveness for differentiation business managers. However, for differentiation strategic business units with low resource sharing, output was associated with increased effectiveness. They conclude that control systems are an important ingredient in strategy implementation and should be tailored to SBU strategy.

Fisher (1995) provides an overview and synthesis of the research literature on contingency theory and management control in complex organisations. Fisher argues that one of the major weaknesses of contingent control research is the piecemeal way in which it is done, adding that many studies examine only one contingent factor and one control attribute at a time. Understanding interactions between multiple contingent and control factors may be essential in determining the effectiveness of control system design. The simplest contingency analysis attempts to correlate one contingent factor with one control system attribute, while more complex analysis simultaneously examines multiple contingents and control system factors. Fisher (1995) indicates that the ultimate goal of contingent control research should be to develop and test a comprehensive model that includes multiple control systems, multiple contingent variables, and multiple outcome variables. Fisher (1995) takes an initial step by describing the relevant control, contingent, and outcome variables examined in previous research and categorizing previous studies by their level of complexity into four categories as following;

The first level of analysis examines the correlation between one contingent factor with one control mechanism. For example, Macintosh and Daft (1987) examined the relationship between departmental interdependence and three elements of control: the operating budget, periodic statistical reports, and standard operating procedures. They concluded that the role of the control system reflects a fit between the need for information created by interdependence and the supply of information provided by the control system. Similarly, Merchant (1985) examined control systems for discretionary expenditures at the profit level, hypothesing that control systems would differ according to profit centre strategy. Budget pressure was greater in rapid growth centers than in profit centers with other strategies. High budget pressure resulted in tight income and headcount targets in rapid growth profit centers (Merchant 1985).

The second level of analysis examines the joint effect of a contingent factor and a control mechanism on an outcome variable. The typical outcome variable examined is unit or firm performance. Only the joint effect of one contingent factor and one control mechanism is examined; the potential interaction between multiple control systems and contingent factors is not addressed. Some studies within this level, for example Ginzberg (1980) suggest that the interaction of organisational factors with a firm's control system determines the organisational control system fit, in turn affecting organisational performance. Ginzberg hypothesized that firms with a stable environment and a routine technology tend to use a procedural control system for higher performance.

Govindarajan (1984) examined the effects of environmental uncertainty on the strategic business unit. Environmental uncertainty was defined as the level of predictability in the actions of the customers, suppliers, competitors, and regulatory groups that compose the external environment of SBU. Govindarajan found that SBUs facing high environmental uncertainty used a subjective performance appraisal system, whereas those facing a more certain external environment used a formula-based evaluation approach. In addition, he found that the matching of a highly uncertain external environment with a subjective control system led to higher business unit performance.

At the third level of analysis, the joint linkage between multiple control mechanisms, a contingent factor, and a firm outcome is examined (Drazin & Vande Ven 1985; Govindarajan, 1988). Such analysis reflects the notion that there might be substitution and complementary aspects to control system design. Control system substitution implies the use of different control mechanisms can achieve the same desired results. On the other hand, control systems may be used in a reinforcing way implying a complementary relationship. Most third level research has found control to be complementary. This level contrasts with the two preceding levels by examining control mechanisms as a system rather than being independent.

The last level of analysis is a multiple-contingency approach which acknowledges that control systems must be tailored to multiple contingent factors (Fisher & Govindarajan, 1993; Gresov, 1989). If contingency demands conflict, simultaneous tailoring of the control system to all contingent factors in a straightforward design is not possible. The findings of Gresov (1989) study reports that business units that faced conflicting contingencies were less efficient than units facing nonconflicting contingencies. Furthermore, Fisher and Govindarajan (1993) states that the incentive compensation demands of a low cost/build strategy conflict with those of a differentiation/harvest strategy, a conflict makes the design of a control system problematic. Fisher (1995) lists the major contingent studies that were identified in the accounting and management literature. The list is not exhaustive, but these studies were selected to highlight the differences between the four levels, as shown in table 5.2 below:

Table 5.2: Major contingent studies (four levels)

Level 1

Study	Level of analysis & Type of Methodology	Contingent variables	Control system variables	Results
Macintosh & Daft (1987)	Department Managers – case studies in 4 companies	Department, inter-dependence	Operating budgets, Statistical reports	Sequentially interdependent departments relied more heavily on operating budgets and statistical reports than other departments.
Merchant (1985)	Profit centre managers- case study approach	Profit centre strategy	Budget pressure	Rapid growth profit centers had highest level of budget pressure.
Simons (1990)	SBU managers- case study approach	Competitive strategy	Budget Tightness	An SBU with a defender/low cost strategy had tight budget goals, little budget revision, and for multi-based incentive when compared with a prospector/differentiation SBU.
Rockness (1994)	R & D Supervisors- case study technique	Task characteristics	Behaviour & output control	Behaviour control was correlated with a high level of knowledge of the transformation process.

Level 2

Study	Level of analysis & Type of Methodology	Contingent variables	Control system variables	Results
Ginzberg (1980)	Organisational units – quantitative data based on survey	Environment, Technology	System formality Procedural systems	Procedural control systems are more likely to succeed in firms with routine technologies and stable environments.
Govindarajan & Gupta (1985)	SBU managers – qualitative data based on case studies approach	Product life cycle	Performance appraisal system	Long-run performance measures and subjective approaches are more effective for determining in build SBUs manager compensation than in harvest SBUs.
Govindarajan (1984)	SBU manager- both quantitative and qualitative data were achieved	External environment	Performance appraisal system	A subject performance appraisal system was positively related to higher Environmental uncertainty. This match was correlated with higher performance.
Simons (1987)	SBU managers – qualitative data achieved based on a case study approach	Competitive strategy	Budget flexibility and importance	Managers of defender SBUs had static budget targets, and incentive compensation was based on achievement of budget targets. Prospector SBUs emphasized forecast data and monitoring of outputs. There was weak support that these matches resulted in higher performance.
Fisher (1994)	Departmental Units- case study approach was used to gather the data	Inter-dependency	Budget-based incentive	Interdependency between business units implies a group labor production function which defines the business units that can have the greatest impact on firm performance. Control systems should be tailored to motivate those key units.

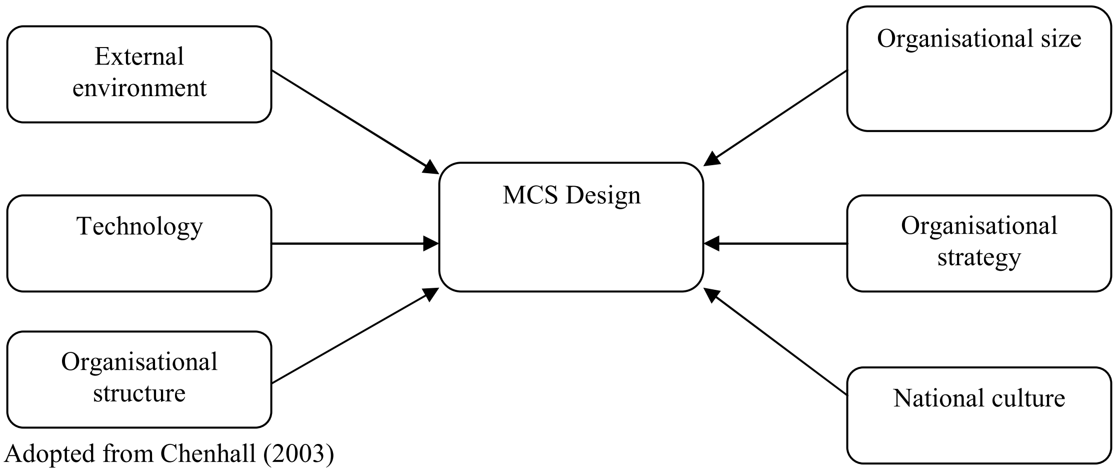
Level 3				
Study	**Level of analysis & Type of Methodology**	**Contingent variables**	**Control system variables**	**Results**
Waterhouse & Tiessen (1978)	Subunit managers – case studies in 25 org.	Technology, Environment	System formality, Centralization	Sub-units that face a certain environment or have a routine technology use a formal centralized control system.
Merchant (1981)	Mid-level managers – case studies in 19 firms in Electron.	Size Diversification	Budget pressure Sophistication, and Formality	Increased complexity results in the budget being used administratively. There was weak support that this match resulted in higher performance.
Govindarajan & Fisher (1990)	SBU managers – the results based on a qualitative data.	Porter typology Resource sharing	Behaviour and Output control	High levels of resource sharing and output control had a positive impact on effectiveness of SBUs with a low- cost strategy.
Govindarajan (1987)	SBU managers- both qualitative and qualitative data was obtained.	Porter typology	Budget evaluation Style, Decentralization, and Locus of control	The alignment of the three control system variables with competitive strategy results in increased SBC performance.

Level 4				
Study	**Level of analysis & Type of Methodology**	**Contingent variables**	**Control system variables**	**Results**
Gresov (1989)	SBU managers – case study approach	Task Uncertainty Dependence	Firm structure	Business unit that faced conflicting contingencies were less efficient than units facing nonconflicting contingencies.
Fisher and Govindarajan (1993)	SBU managers – survey and case study approaches were used.	Porter typology and Product life	Incentive Compensation	The incentive compensation demands of a low/cost build strategy conflict with those of a differentiation/harvest. A conflict makes the design of a control system problematic.

Source: Fisher (1995: 36-38).

Chenhall (2003) discusses contingency theory from a functionalist perspective, where the assumption is that management control systems (MCS) are developed or adopted to assist in achieving desired organisational goals and outcomes. He also states that the appropriate management accounting system is contingent on the external environment, technology, organisational structure, organisational size, organisational strategy and national culture. The figure below illustrates this functionalist perspective:

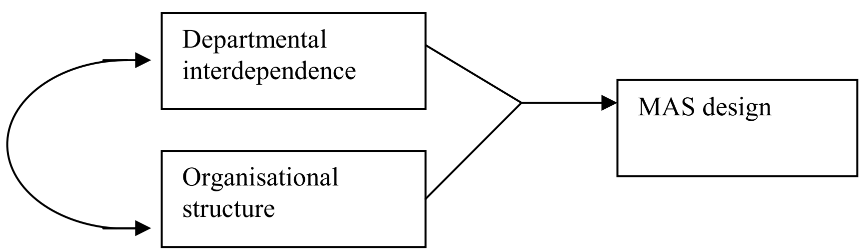
Figure 5.2: A functionalist contingency model



Adopted from Chenhall (2003)

Gerdin (2005) proposes a multiple contingencies model that examines the combined effects of departmental interdependencies and organisation structures on Management Accounting Systems. Exhibit 5.3 below outlines the proposed model.

Figure 5.3: Multiple contingencies model



Source: Gerdin (2005:100)

The findings provide some support for the expected relationships between departmental interdependence, organisational structure and MAS design in manufacturing departments. Under conditions of sequential interdependence, broad scope MASs were significantly over-presented among lateral units. Furthermore, the proportion of Rudimentary MASs was generally higher among simple units compared with that of the overall sample.

Gerdin (2005) argues that a number of findings did not confirm prior research, for example, traditional MASs was not common among functional units experiencing sequential interdependence. Gerdin concludes that the unexpectedly high proportion of traditional MASs among lateral units may be the result of conflicting contingencies. That is, reciprocal interdependence implies coordination by means of ad hoc mutual adjustment, whereas coordination and control in larger and more complex organisations tend to rely on sophisticated and formalized MASs.

This section has reviewed a number of contingency studies conducted during the last three decades. Most theorists (Khandwalla, 1972; Otley, 1980; Merchant, 1981, 1985; Tiessen and Waterhouse, 1983; Flamholtz, 1983; Chenhall and Morris, 1986, Macintosh and Daft, 1987; Govindarajan and Fisher, 1990; Fisher, 1995; Chenhall, 2003; Gerdin, 2005) believe that there is no single optimal way to organize, and it may be a question of fit between the organisation's structure, its size, its technology, and the requirements of its environment. In considering management control systems research since 1980, it is apparent that a number of key variables such as environment, technology, structure and size have been found as descriptors of fundamental, generic elements of context. A number of recent studies (Fisher 1995, Chenhall 2003 and Gerdin 2005) focus on contemporary aspects of the environment, technology and structural arrangements, and draw on the original organizational theorists to develop arguments that help explain how the effectiveness of MCS depends on the nature of contemporary settings.

5.3 The nature of the contingent variables

Chenhall and Morris (1986) argue that the variables of decentralisation, perceived environmental uncertainty, and organizational interdependence were identified as important dimensions of context in the study of MAS design. Thomas (1991) argues that contingency theory first became prominent as a means for explaining organisational structure, suggesting that organisational design is contingent on environmental uncertainty, technology and size. Chenhall (2003) indicates that researchers have attempted to explain the effectiveness of management control systems by examining designs that best suit the nature of the environment, technology, size, structure and national culture.

Based on the above, this section reviews these contingent factors in more detail:

5.3.1 The external environment

One of the earliest studies in relation to the environment was conducted by Lawrence and Lorsch (1967) who made one of the early contributions to the development of a contingency theory of organisations. The fundamental question posed in their study is what kind of organisation it takes to deal with different environmental conditions (p.3). They describe the major contribution of their study as being ‘the increased understanding of a complex set of interrelationships among internal organizational states and processes and external environmental demands’ (p.133-134). By comparing a number of effective organisations Lawrence and Lorsch suggest that it is possible to understand differences in their internal states and processes by reference to differences in their external environments. The conclusion of their study suggests a contingency theory of organization which recognizes their systemic nature. The basic assumption underlying such a theory, which the findings of their study strongly support, is that organizational variables are in a complex interrelationship with one another and with conditions in the environment.

Lawrence and Lorsch (1967) establish that the determinants of effective internal organisational process are dependent (or contingent) upon variations in the environment in which the organisation operates. They argue that 'these outside contingencies can then be treated as both constraints and opportunities that influence the internal structure and processes of the organization' (p.186). Lawrence and Lorsch (1967) also argue that financial reports and disclosure practices can be viewed as the outcome of an internal decision process of an entity. Therefore, a simple extension of Lawrence and Lorsch's conclusion suggests the possibility of viewing the choice of accounting and disclosure practices as the result of an internal process which is influenced by outside contingencies. This suggests that variations in the environment in which companies operate, will lead to differing decisions as to the optimal methods of corporate reporting and levels of disclosure.

In his study examining the effect of the external environment (competition) on management control practices, Khandwalla (1972) outlines some of the competitive conditions under which sophisticated management controls are more extensively utilized and those under which they are less extensively utilized. He states that different types of competition, for example price, marketing or product competition, had very different impacts upon the uses made of accounting information in manufacturing firms. Moreover, he argues that the greater the competition, the greater the need to control costs, and to evaluate whether production, marketing, finance are operating according to expectations. Khandwalla found a positive association between competition and the use of sophisticated management controls. This implies that as competition intensifies, the expected benefits from the application of these controls tend to outweigh their costs. Khandwalla (1972: 282) states that the findings suggest substantial differences among the three competitions regarding their relationship to the usage of management controls. Price competition appears to have little, if any, impact on their usage. Distributive competition appears to have a modest positive impact. Product competition seems to have a much larger positive effect on their usage. Hence, designers of control systems need to supplement their information about the extent of the general competitiveness of their firm's environment with information about the intensity of specific forms of competition. Khandwalla (1972) concludes that intense price competition may not require the firm to have a sophisticated control system, but intense product competition may. Hence the designers of control systems need to be quit selective and know the intensity of each type of competition faced by the firm.

Gordon and Miller (1976) identify three main environmental characteristics - dynamism, heterogeneity and hostility - and their relationship with accounting systems. They argue that a high level of dynamism, or rate of change, will require frequent control reports incorporating more non-financial data to provide managers with information on competitor actions, consumer tests, and shifting demographic factors. Financial data alone will not provide information which is sufficiently precise to inform managers of important trends before they become crises (Gordon and Miller, 1976). Regarding the environment heterogeneity or the number of different product markets served, Gordon and Miller state that as the level of environmental heterogeneity increases, the greater the need there is for more decentralised accounting system with quasi-independent responsibility centres. With respect to market hostility, Gordon and Miller (1976) argue that hostility results from threatening actions of competitors (e.g. cut-throat competition) or threatening shortages of scarce resources due to strikes, governmental regulations or credit squeezes. They hypothesized that, as hostility increase, a more sophisticated accounting information system is required incorporating non-financial information about critical threats.

Otley (1978) studies the effects of different environments faced by unit managers within a single firm. He concludes that senior managers were found to use budget information in quite different ways in 'tough' environments compared to 'liberal' environments. Whereas a rigid style of performance evaluation that emphasized the attainment of budget targets was effective in a liberal environment, a more flexible style was required in a tough environment.

Gordon and Narayanan (1984) drew on Khandwalla (1972) to study the relationship between an organisation's environment, structure and information system, and concluded that both information systems and organisational structures are functions of the environment. They found that organisations develop a more organic information structure requiring more non-financial, external information when the environment was more uncertain. They found however, after controlling for the effects of the environment, that an organisation's information system and structure do not appear significantly related to each other.

Rayburn and Rayburn (1991) examine various aspects of environmental uncertainty as a contingency variable, including unpredictability of input-output relationships. They define uncertainty as a lack of information about future events, so that alternatives and their outcomes are unpredictable. They found a high correlation between environmental uncertainty and performance evaluation style. Their reasoning was that the greater the environmental uncertainty, the more difficult it is to prepare satisfactory targets which could then become the basis for performance evaluation. Their focus was on the uncertainty arising out of the external environment and was defined to include unpredictability in the action of customers, suppliers, competitors and regulatory group that comprise the external setting.

Gernon and Wallace (1995, p: 57) go so far as to suggest that 'Essentially, the development of explanatory IAR (International Accounting Research) theories has involved the interface between accounting and its environment'. They argue that the influence of environmental factors upon the development of national accounting and disclosure practices is usefully conceptualised with the aid of a contingency theory approach. The development of a strong theoretical base for the identification and conceptualisation of those environmental factors likely to affect accounting and disclosure practices is a necessary precursor to the empirical investigation of their relationship. Gernon and Wallace (1995) suggested that contingency theory offers a systematic approach toward the conceptualisation of the national and foreign environmental variables which may have a significant bearing on the similarities and differences in accounting styles and practices across countries.

Chenhall (2003) argues that the external environment is a powerful contextual variable that is at the foundation of contingency-based research. He suggests that the most widely researched aspect of the environment is uncertainty. Distinguishing uncertainty from risk, he argues that the former is concerned with situations in which probabilities can be attached to particular events occurring, whereas uncertainty defines situations in which probabilities cannot be attached and even the elements of the environment may not be predictable. In his study, Chenhall suggests that the distinction between dimensions within the external environment, such as uncertainty, hostility and complexity are important to MCS design. He also argues that more mechanistic, formal MCSs tend to provide incomplete information in uncertain conditions and require rapid reformulation to cope with the unfolding unpredictability. Clear specification of the environmental dimensions of interest is required, as different theories are required to consider the effects of diverse dimensions. Chenhall (2003) states that there are rich research opportunities to investigate appropriate MCS design for settings that are uncertain and also hostile and complex.

Julie and Audrey (2007) argue that companies are faced with pressures from government, stockholders, and the public to improve their environmental records while achieving profitability goals to keep Wall Street happy. They also add that as environmental issues increasingly influence corporate performance, they need to be institutionalized in management accounting systems. Julie and Audrey (2007) state that two methods of evaluating product mix decisions given an environmental constraint include ABC and the Theory of Constraints (TOC). While ABC is important for understanding how environmental spending affects product cost, it does not necessarily help in making decisions to reduce the most environmentally damaging products from the mix.

From the above review regarding the external environment, it can be seen that most of the variables within this category are concerned with the level of environment uncertainty. Most of the studies reviewed suggest that the greater the perceived environmental uncertainty the greater the need for more sophisticated management accounting information system that has a broad scope such as external, nonfinancial and future oriented information.

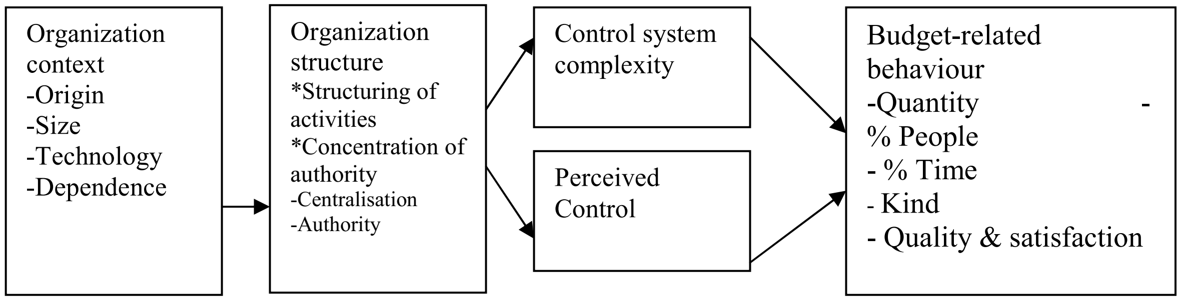
5.3.2 Organisational structure and cultural factors

Definitions of organizational structure are plentiful; Lawrence and Lorsch (1967) refer to structure as the way in which the organisation is differentiated and integrated. Differentiation is concerned with the extent to which the sub-unit managers act as quasi entrepreneurs, while integration is defined as the extent to which the sub-units act in ways that are consistent with organisational goals.

Pugh et al (1969) identify examples of structural mechanisms that have been used commonly in contingency-based research, including centralization, standardization, formalization and configuration. Further to this, Perrow (1970) identifies examples of structure in terms of bureaucratic and non-bureaucratic approaches.

Bruns and Waterhouse (1975) state that the structure of organisations can be viewed as contingent upon environment and organisation characteristics such as size, technology, and dependence (the extent to which an organisation is autonomous in relationship with other organizations) this is conceptualised as following:

Figure 5.4: Structure of organization model



Source: Bruns & Waterhouse (1975:181)

Figure 5.4 above illustrates two variables - control system complexity and perceived control- which are seen as intervening to affect budget-related behaviour. This includes the quantity of such behaviour, the kind of behaviour, and the quality and satisfaction in terms of the extent to which the budget is seen as effective in accomplishing organisational aims. Furthermore, Bruns and Waterhouse (1975) argue that the choice between decentralisation with structuring and centralization is limited to some extent by internal and external conditions faced by the organisation. A decentralized and structured organisation operating in a stable environment seems particularly well suited to the use of budgetary control. In a highly centralized organization, most decision-making of any importance is taken centrally with middle managers being constrained by various rules, procedures and policies that govern what they are able to do. Bruns and Waterhouse (1975) conclude that large firms with sophisticated technologies that are decentralized have been characterised by a strong emphasis on formal MCS.

Chenhall and Morris (1986) define organisational structure as the level of decentralised decision autonomy. They argue that decentralisation provides managers with greater responsibility over planning and control activities and greater access to information not available to the corporate body. They contend that an appropriate structural response for organisations facing uncertainty is to encourage managers to differentiate their segments with respect to the environments that their sub-units face. These managers will have more decentralized authority to develop their own goals and management style. They conclude that organisational interdependence is important when designing an MAS and that a broad scope, as well as aggregated and integrated information were perceived as useful by managers of sub-units who had interdependent operation.

Emmanuel et al (1990) argue that organisational structure is a potent form of control because, by arranging people in a hierarchy with defined patterns of authority and responsibility, a great deal of their behaviour can be influenced and even pre-determined. They also add that a contingency approach to the design of control systems suggests that the inter-relationship between organisational structure and management controls (such as personnel selection and training) must be considered. However, different forms of organisational structure will require different types of accounting information to be provided to enable them to function effectively.

O'Reilly et al (1991) state that the organisational culture profile shows reasonable reliability and convergent-discriminant validity, for instance, individuals with high needs for achievement show a significant preference for aggressive, outcome-oriented cultures. The results of their study also indicate that respondents with high needs for autonomy show a preference for innovative cultures and negativity toward those characterized by an emphasis on supportiveness and teamwork. O'Reilly et al (1991) also argue that individual variations in preferences for different organisational cultures are associated with interpretable differences in personality characteristics. The structure underlying individual preferences also appears to compare to the structure underlying the culture in a selection of firms. O'Reilly et al (1991) conclude that cultures within organisations tend to be similar when the organisations are in relatively homogeneous industries and thus have similar sizes, structures, levels of technological maturity, personnel configurations, regulatory demands, and orientations. Conversely, firms in heterogeneous industries are less similar.

Chenhall (2003) defines organisational structure as the formal specification of different roles for organisational members, or tasks for groups, to ensure that the activities of the organisation are carried out. He also adds that structural arrangements influence the efficiency of work, the motivation of individuals, information flows and control systems and can help shape the future of the organisation. Chenhall (2003) argues that the ways in which MCS combine with elements of organisational structure to provide differentiation and integration within contemporary organisational structures provide many opportunities for worthwhile research. He concludes that large organisations with sophisticated technologies and high diversity that have more decentralized structure are associated with more formal traditional MCS.

Macarthur (2006) studies the influences of national culture on management accounting practices in order to explain the differences between U.S. and German management accounting practices. Macarthur argues that when comparing the two countries, one key cultural difference is uncertainty avoidance. Germany is classified as exhibiting strong uncertainty avoidance (SUA) with a low tolerance for uncertainty, while the United States is considered to be a weak uncertainty avoidance (WUA) nation with a high tolerance for uncertainty. Macarthur concludes that U.S. organisations should consider management accounting models used successfully in other nations, such as Germany, and vice versa. However, any improvements are likely to be different to some degree in respective countries because of varying national cultural and other factors. He also emphasises that national cultural factors are a part of the cost-benefit considerations that should underlie all management accounting choices.

Henri (2006) examines the influence of organisational culture on the design and use of one component of management control systems namely performance measurement systems (PMS). Henri (2006) argues that culture is an omnipresent factor which affects practically all aspects of organisational interactions, and the understanding of this contingent factor is necessary to examine and understand PMS from a holistic perspective. The results of the study show a greater diversity of measurement for flexibility value firms than control value firms. Henri (2006) also concludes that top managers of firms reflecting a flexibility-dominant paradigm tend to use more performance measures.

The above studies suggest that the choice of structure in organizational contingency research has focused on the appropriate fit between the levels of uncertainty in the environment and the organization's technology. Generally, it is believed that more organic structures are suited to uncertain environments. As with other elements of context, in contemporary settings, structure remains an important factor in understanding MCA design. The findings also indicate that the notion of organizational culture has been important in the study of organizational behaviour for the past two decades. In spite of disagreements over some elements of definition and measurement, researchers seem to agree that culture may be an important factor in determining how well an individual fits an organizational context, and impacts upon MCA.

5.3.3 Technology

Otley (1980) contends that production technology is the simplest and longest established contingent factor used in management accounting. He refers to the work of Woodward (1965) who distinguishes between different types of production technique (e.g. unit production, small batch, large batch, mass production and process production) which is a factor that has long been recognised as influencing the design of internal accounting systems. Otley (1980) states that the nature of the production process determines the amount of cost allocation rather than cost apportionment that takes place. In job-order costing, the measure of production is well-defined and only limited allocation and averaging are required because a large proportion of total costs can be directly associated with particular jobs. In contrast, the polar extreme of process costing requires extensive allocation and averaging because the bulk of total costs are incurred jointly by a mix of final products. Otley concludes that production technology has as important effect on the type of accounting information that can be provided.

Daft and Macintosh (1978) argue that organisational technology places a critical constraint on the design of the information system, and found a strong relationship between the technology of a work unit and the amount and type of information participants required to perform effectively. Daft and Macintosh (1978) identify four major categories of technology; programmable, technical-professional, craft, and research.

Daft and Macintosh (1978) find that successful information systems vary systematically according to the technology used, and the lesson is that each information system must match the appropriate work unit technology. Programmable technologies have few problems, and when problems do arise they are fairly well understood (airline reservation systems and on-line banking are examples of concise information systems). They also argue that "technical-professional technologies" are characterised by large bodies of established knowledge. Tasks are quite well understood, and therefore an elaborate information system -one with a broad base and which draws upon established knowledge - is called for (accounting, engineering and law are examples of technical-professional technology). When problems do arise within craft technologies they are handled on the basis of experience and judgement (specialised psychiatric care unit are an example of craft technology). Daft and Macintosh argue that diffused information system is suited to the high uncertainty associated with research-type technologies, and that large amounts of information of various types have to be accessible or gathered. Moreover, Foster and Gupta (1990) found that flexible manufacturing systems were associated with performance measures focused on time, quality, operating efficiency and flexibility. They also state that there is a change in the costing methods such as, allocation, treatment of costs as period and changes in the components of direct costs.

Sim and Killough (1998) investigate whether manufacturing practices and management accounting systems interactively affect performance. The findings of the study provide evidence that performance can result from complementarities between Total Quality management (TQM) or Just in Time (JIT) and specific features of management accounting systems. They find that when a mass production system exists, management accounting systems with fixed pay and fewer customer and quality-performance goals have the highest expected performance. In contrast, if a JIT or TQM system exists, then the highest expected performance occurs when pay is performance contingent and more customers or quality-related goals exist.

Chenhall (2003) defines technology to refer to how the organization's work processes operate, and he includes hardware, materials, people, software and knowledge in this schema. He suggests three generic types of technology of importance to management control system design: complexity, task uncertainty and interdependence. He develops propositions concerning generic concepts of technology and MCA: (p: 140-141) "The more technologies are characterized by standardized and automated processes, the more formal the controls including a reliance on process control, and traditional budgets with less budgetary slack. The more technologies are characterized by high levels of task uncertainty the more informal the controls including: less reliance on standard operating procedures, programmes and plans, accounting performance measures, behavior controls; higher participation in budgeting; more personal controls, clan controls, and usefulness of broad scope MCA. The more technologies are characterized by high levels of interdependence, the more informal the controls including; fewer statistical operating procedures; more statistical planning reports and informal coordination; less emphasis on budgets and more frequent interactions between subordinates and superiors; greater usefulness of aggregated and integrated MCA".

Based on the above views of technology, it appears that production technology has an important impact on the type of accounting information that should be provided for effective performance. Moreover, the more technologies are characterized by high levels of task uncertainty, the more informal the controls, resulting (1) in less reliance on standard operating procedures, behavioural controls and accounting performance measures; (2) higher participation in budgeting, and (3) grater reliance on personal controls, and the use of broad scope management accounting control systems.

5.3.4 Competitive strategy

Khandwalla (1972) outlines some of the competitive conditions under which sophisticated management controls are extensively utilized and those under which they are less extensively utilized. The study shows that different types of competition (price, marketing, and product) may have very different impacts on the use of management controls in manufacturing organizations. The findings report that of the three types of competition, product competition seems to have the most impressive impact on the usage of controls. Price competition appears to have little, if any, impact on their usage of management accounting, while marketing or distributive competition appears to have a modest positive impact on the use of management control systems. Moreover, the results indicate that overall competition is related to the use of flexible budgeting and statistical quality control of production fairly strongly. It is related less strongly (but significantly, in a statistical sense), to the use of standard costing, internal or present value in evaluating investments.

Drury (2000) argues that competitive strategy describes how an organisation elects to compete in its market and tries to achieve a competitive advantage relative to its competitors. In fact, increasing competition has led to two consequences. On the one hand, it has led to the formation of cartels, whereby organisations have informally cooperated to achieve greater stability in the market place. On the other hand, it has encouraged management accounting practices such as ABC and target costing, whereby organisations seek to reference their performance to that of their competitors (Otley, 1994).

Porter (1980) provides a classification of competitive strategy which identifies cost leadership, differentiation, and focused competitive strategies, while Miles and Snow's

(1978) classification distinguishes defenders, prospectors, analysers, and reactors competitive strategies. Consideration of competitive strategy has, rather surprisingly, not been prominent in studies of MCA design, despite arguments that differences in competitive strategy should lead to differences in planning and control systems design. If a control system is concerned with ensuring the attainment of objectives, then attention must be paid to the nature of those objectives, which are codified in competitive strategy (Ashton et al, 1995).

Chenhall and Langfield-Smith (1998) argue that firms were identified as emphasizing product differentiation, low price strategies or a combination of both. They also add that management accounting practices important in assisting managers implement management techniques were traditional management techniques; ABC; balanced performance measures; employee-based measures; benchmarking and strategic planning.

5.3.5 Organisational Size

Contingency theories of organizations developed by Burns and Stalker (1961), Lawrence and Lorsch (1967), and Woodward (1965) suggest that size may affect the way organizations design and use management accounting systems.

Khandwalla (1972) argues that large firms are more diversified in product lines, employed mass production techniques, contain more divisions and make greater use of sophisticated controls and environmental information gathering such as forecasting and market research. Burns and Waterhouse (1975) identify two forms of control associated with size: “administrative” with large firms and “personal” with small firms. They argue that administrative control comprise more sophisticated technologies, formalized operating procedures, high levels of specialists and work related rules. Managers perceived that employees had high levels of control and had high levels of participation in setting standards and spent more time in budgeting. They perceived budgets as limiting innovation and flexibility in structuring organisations. Interpersonal control involved centralized decision making, individuals saw themselves as having more interaction on budget related matters, not having their methods of reaching budgets accepted and being required to explain budget variances. Individuals reported satisfaction with their superior-subordinate relationships. Bruns and Waterhouse (1975) conclude that two contextual variables - size of organisation and technology - are significantly and positively correlated with structuring activities. Bruns and Waterhouse (1975) argue that one possible implication of this is that large, process dominated, technological organisations may be not as inhumane as they have been represented in the previous literature. This is because increased size and advanced process technology lead to or are at least correlated with structuring of activities, and this structuring implies the distribution of authority and an increase in perceived control as well as increased participation in planning and feelings of involvement on the part of managers. They also argue that those who speak against large organisational units may be ignoring the countervailing tendency of size to lead to structuring of activities and greater job involvement.

Merchant (1981) considers size as an aspect of a multiple variable approach. He finds that larger firms tend to make relatively high use of more formal administrative as opposed to interpersonal controls. The results also highlight that in larger firms where there is greater diversity and decentralization of decision making, there is greater participation in budgeting. This is despite less personal interaction between managers, and a general attitude that meeting the budget was important to managers' career progression. Furthermore, the results indicate that performance is highest in the larger firms when an administrative approach to budgeting was used, in contrast to smaller firms where the best performance was associated with a more personal approach.

Damanpour (1996) argues that size is one of the most important factors affecting the structure and processes of an organization and both advantages and disadvantages are associated with large size. Damanpour states that large size has been said to inhibit innovation because large organizations are typically more formalized, managerial behavior is more standardized, inertia is higher, and managerial commitment to innovations is lower. Smaller organizations, on the other hand, are more innovative because they are more flexible, have greater ability to adapt and improve, and demonstrate less difficulty accepting and implementing change. In his conclusion, Damanpour (1996) indicates that the effect of size as a contingency factor is applied to the structural complexity relating to the innovation triad. The structure of most small organizations is simple, but, as organizations expand, their structures become more differentiated and specialized. Growth in size, especially growth from diversification, might also make the structure more hierarchical and formalized, to enable top managers to achieve control over diversified activities. He also adds that because bureaucratic control negatively influences innovations, some large organizations may adopt structures that are flexible and simple. Therefore, a greater variety of structural forms would exist for large than for small organizations; structural complexity exhibits a limited range of values in small organizations.

Hoque and James (2000) examine the relationship between organization size, product life cycle stage, market position, balance scorecard (BSC) usage and organizational performance. The results suggest that larger firms make more use of a BSC. In addition, firms that have a higher proportion of new products have a greater tendency to make use of measures related to new products. The authors infer that large firms make more use of the measures in the questionnaire used than do small firms. They do not suggest whether that is because large firms get more benefit from these measures, or because they can spread the fixed cost of information systems over larger output and therefore find additional measures more affordable.

The above review regarding organizational size suggests that growth in size has enabled firms to improve efficiency, providing opportunities for specialization and the division of labour. However, as an organization becomes larger the need for managers to handle greater quantities of information increases to a point where they have to institute controls such as rules, documentation, specialization of roles and functions, extended hierarchies and greater decentralization. Size has also provided organizations with the resources to expand into global operations, sometimes by ways of mergers, takeover, licensing or other collaborative arrangements. The above review also shows that studies which have examined size have considered its effect together with other elements of context such as technology, product diversity and have examined an array of controls.

5.4 Summary and Conclusion

This chapter reviews the finding relating to contingency theory in management accounting for the last three decades, and the effects of contingency factors upon the design of the system. The general argument of contingency theory is that there is no ideal or universal form for an accounting information system. Rather, particular circumstances, or contingencies, dictate the best choice of system in each particular circumstance. The chapter shows these contingencies, which are usually classified, are the environment, organizational structure, technology, competitive strategy, organizational size and culture. Moreover, the chapter indicates that contingency theories of accounting are the opposites of universal theories of accounting in that they link the effects or the optimality of accounting systems to the environment and context in which these systems operate. In summary of the early management accounting studies that used contingency frameworks, Otley (1980) concludes that much needs to be done in the development of a contingency theory of accounting, and he outlines some minimal requirements for a contingency theory of accounting, stating that:

> '……… a contingency theory must identify specific aspects of an accounting system which are associated with certain defined circumstances and demonstrate an appropriate matching' (1980, 413).

Contingency theory suggests that the implementation of any management accounting system within individual companies is dependent upon, or at least associated with particular factors of the organisation. Therefore, this study will base on the perspective that there is no one universally appropriate MAS system, but that the appropriateness of any system is dependent on the factors facing the organisation. The following chapter will review a series of contingent variables which potentially influence the decision of implementing ABC system.

CHAPTER 6: A MODEL OF ABC ADOPTION

6.1 Introduction

Chapter five has reviewed contingency theory within management accounting. An examination of the issues relating to the adoption rates of ABC, from a Contingency Theory perspective, would suggest that the implementation of ABC (as for any management accounting system) within individual companies is dependent upon, or at least associated with particular factors or variables of the firm. Thus, from the perspective that there is no one universally appropriate MAS system, but that the appropriateness of any system is dependent on the factors facing the firm, it can be argued that ABC is more likely to be adopted by those firms for which it is appropriate or suitable. Critically, what is not as yet established is the identification of the set of variables which would likely impact upon the adoption of ABC.

Furthermore, such contingency variables will not of themselves explain ABC adoption rates, rather such contingency factors may be viewed as rendering ABC suitable or otherwise for adoption by companies but that there are also implementation issues which influence adoption. The implementation factors can be classified based upon a review of the literature into three main types Behavioural, Systems and Technical.

This chapter aims to review a series of contingent variables that might effect the decision of the implementation of ABC systems together with a development of an ABC model of ABC which seeks to incorporate a contingency approach.

The chapter is structured as follows. The next section reviews the potential contingent variables and their association with the implementation of the ABC systems. Those variables consist of; product diversity, cost structure, firm size, types of competition, company sector, nationality, and business unit culture. The third section develops the research model and the last section summarises the chapter.

6.2. Potential Contingent Factors

Based upon the literature reviewed in chapters four and five, it is possible to identify a series of factors which potentially impact upon the adoption of ABC by individual companies.

These factors are considered below, initially on an individual basis.

6.2.1 Company Sector

Drury (2004) argues that management control systems have been shown to differ by industry type. He argues that firms in the manufacturing sector exercise control over their possess via a large number of standard cost centres that rely extensively on detailed variance analysis. In contrast, costs in non-manufacturing industries tend to be mostly of a discretionary nature.

Innes and Mitchell (1995) examine the relationship of company sector to ABC adoption. The results show that ABC tended to develop in a manufacturing context, but that the extent of its adoption in the non-manufacturing sector was not significantly different from that found among manufacturing firms. The findings show that 36 companies (48.6%) of ABC users were manufacturing companies. 20 companies (27%) of adopters were financial and 24.3% comprised service companies.

Clarke et al (1999) use a sample of Irish manufacturing companies to examine their implementation of ABC. The results show that overall relatively few Irish manufacturing companies used ABC (12%). The results also indicate that the largest percentages of those implementing ABC are to be found in the drug, pharmaceutical and healthcare industries (31%). The authors posit that 94% of the respondents from the drug, pharmaceutical, and healthcare industry are multinational subsidiaries, a factor which they claim is positively correlated with the decision to adopt ABC. Other types of manufacturing activities report significantly lower adoption rates of 12% or fewer.

Innes et al (2000) found that the majority of ABC adopters are manufacturing and financial companies, 12 companies (38.7%) of ABC adopters were manufacturing industries, and 11 companies (35.5%) of adopters were financial companies. Service companies represent 25.8% (8 companies) of ABC adopters.

Pierce and Brown (2004) found higher levels of ABC adoption among manufacturing companies than in the other sectors. The results show that 64.7% of ABC adopters were manufacturing companies, 23.5% of ABC adopters were service companies and 11.8% of adopters were financial companies.

The majority of studies have concentrated mainly on the manufacturing and financial sectors, or in some cases just on a single sector e.g. Clarke's (1999) study. To date no Irish study has included all sectors of the economy. The current study will seek to redress this and will not focus on selected sectors.

6.2.2 Firm Size

It has been argued (Innes and Mitchell, 1995, 1998; Bjornenak, 1997; Van Nguyen and Brooks, 1997; Krumwiede, 1998; Clarke et al, 1999) that the size of the company usually explains the rate of adoption of sophisticated cost accounting systems as, in general, larger size increases complexity and usually requires greater accounting resources.

Innes and Mitchell (1995) examine the relationship between company sizes in terms of annual turnover and the implementation of ABC. They found that company size does provide a statistically significant source of differentiation among ABC adopters, where a markedly significant higher rate of adoption is apparent in the larger firms surveyed.

Bjornenak (1997) uses the number of employees as the measure of company size, finding that the difference in size between adopters and non-adopters is strongly significant. He concludes that the only factor described to discriminate between adopters and non-adopters seems to be company size. Bjornenak (1997) also argues that larger firms have larger information fields (i.e. contacts and communication channels) and the necessary infrastructure, and are therefore more likely to adopt innovations.

Van Nguyen and Brooks (1997) test the impact of firm size and hypothesis that larger firms are no more likely to implement ABC than smaller firms. They use two variables as proxies for firm-size, turnover and number of employees of companies. The results indicate that mean-values of both variables between the two groups; adopters and non-adopters, were significantly different (t-values are 2.38 and 1.78), and the mean-values of group 1 (ABC adopters) were all greater than those of group 2 (non-ABC adopters). This would indicate that average firm-size of group 1 was greater than average firm-size of group 2 at .05 level of significance. As a result, the null hypothesis cannot be accepted, suggesting that larger firms are more likely to adopt ABC compared to smaller firms. Van Nguyen and Brooks (1997) justify this by arguing that large firms are more likely to have greater access to individuals with the knowledge to design and implement ABC systems. In addition, as ABC implementation is costly, larger firms are more likely to obtain economies of scale, with the cost spread across several products.

Booth and Giacobbe (1997) found a positive relationship at the initiation of interest in ABC stage, but no relationship for the later evaluation and adoption stages. They reason that large firms have more discretionary resources (such as personnel, computing facilities and time), and are therefore more inclined to adopt ABC systems.

Krumwiede (1998) tests how size in terms of level of sales revenue affects ten stages of the ABC implementation process, based on a survey of U.S. manufacturing firms. The findings indicate that larger companies are more likely to adopt ABC than smaller companies. Krumwiede (1998) argues that one possible explanation is that sales are correlated with the organisational level of the reporting business unit. To test whether ABC adoption is related to 'pure' size, the adoption model was applied to only the 101 business units reporting the 'whole company' level. Although not quite as significant (p=.014), size is still highly related to ABC adoption for whole companies.

Cinquini et al (1999) examine firm size in terms of number of employees. Their results show that the firm's size does not relate to ABC adoption or consideration in a significant way.

Clarke et al (1999) found a correlation between firm size in term of annual sales and adoption of ABC. The results report that 18% of the firms with more than £50 million in sales use ABC while only 4% of the firms with sales fewer than £10 million use ABC.

For the smaller firms (less than £10 million), the results show that 70% have not considered ABC. Clarke et al (1999) argue that one would expect larger firms to have adopted more sophisticated costing systems such as ABC given that larger firms have more complex and more varied product lines.

Groot (1999) argues that the bigger the company, the more resources will be available to develop, implement and operate ABC systems. The results examine size in terms of full-time employed workers, and indicate that the difference between the categories "ABC-users" and "Non-ABC users" is significant (Chi-square, $p<0.05$). More than half of the non-ABC users are small companies of between 50 and 150 employees, while half of the ABC-using companies employ more than 250 workers. Groot states that these results confirm the hypothesis that, on average, larger companies apply ABC more frequently than do smaller companies, when size is expressed in terms of full-time workers employed.

Innes et al (2000) examine the influence of company size in terms of annual turnover. The results indicate a statistically significant size effect, that larger companies are more likely to adopt ABC.

Baird et al (2004) examine the association between business unit size in terms of number of equivalent full-time employees in each unit, and the adoption and implementation of ABC systems. The results indicate that there was no association between business unit size and the ABC systems. They summarise that "while size is important generally in the implementation of Activity Management (AM), its importance at the ABC level may be less than that of other factors, particularly the factor of decision usefulness of cost information" (Baird et al. 2004:p.394).

Pierce and Brown (2004) use two criteria for size, annual turnover and number of employees to measure the relationship between size and ABC adoption. The results show that companies with larger turnover are more likely to adopt ABC (Chi-square 8.104, p-value 0.044) and that companies with larger numbers of employees are more likely to adopt ABC (Chi-squared 7.417, p-value 0.060).

With the exception of the studies by Cinquini et al (1999) and Baird et al (2004), all other studies have found that firm size is significantly and positively associated with ABC adoption. The majority of the studies use a single measure of company size, but the measure used varies between the studies e.g. level of sales revenue, number of employees, annual turnover, and full time workers employed. It is however probable that these various measures may be positively correlated. This is supported by the study by Pierce and Brown (2004) which found that annual turnover and number of employees, when tested separately, were both significantly and positively associated with ABC adoption. This study will adopt a similar approach to that of Pierce and Brown (2004) and measure company size both by annual turnover and number of employees.

6.2.3 Nationality

Few studies examine the impact of nationality on the implementation of ABC systems. Peter (1998) examines the relationship between national culture and ABC systems, and how international culture diversity could affect an ABC implementation. The data was gathered from a field-based study of the Harris Semiconductor (HS) Company, by visiting each U.S. plant and the Malaysia plant. The company has fabrication plants in Findlay, Ohio; Mountaintop, Pennsylvania; and Palm Bay, Florida; as well as an assembly and test facility in Kuala Lumpur. The comparisons between the national cultures of the two countries where HS's plants are located - the U.S. and Malaysia - are discussed. The auther hypothesises that the level of ABC success will be greater in HS's Malaysia plant relative to its U.S. plants. The findings of the study show that, at a national level, the Implementation Attitudes Questionnaire (IAQ) scores, interview results and ABC usage data all indicate higher levels of ABC success in HS's Malaysia relative to its U.S. plants. At the plant level, Malaysia had higher indications of ABC success than all three U.S. plants on at least two out of three of the measures used in the study. The findings also show that apart from Palm Bay's interview results, all the findings at the plant level indicate greater ABC success in Malaysia relative to the U.S.

Clarke et al. (1999) argue that the distinction between subsidiaries of multinational firms as compared to national firms is an important one in ABC adoption. They argue that managers of a subsidiary of a multinational firm based in Ireland may be more aware of and adopt new management accounting practices through communication with other divisions and corporate headquarters, or through international transfers of personnel in comparison to managers of solely national firms. They also state that "it is less likely that managers of national firms are exposed to new techniques since communication and managers are mostly, if not exclusively, in-house" (p:450). The results of their survey indicate that a greater percentage of multinational subsidiaries (14%) use ABC than do national firms (5%). Moreover, 70% of national firms have not considered ABC compared to half of multinational subsidiaries in Ireland. The study also examines the impact of multinational/national status and firm size in isolation, finding that national firms, whether small or large, are far less likely to adopt ABC than multinational subsidiaries.

Pierce and Brown (2004) found that ABC adoption rates are higher among indigenous Irish firms than multinationals, although not significantly higher (Chi-squared 0.591, p-value 0.442). The results show that 50% of ABC adopters were indigenous Irish firms, whereas 44.1% of adopters were multinational firms and 5.9% represents others. These results are in conflict with Clarke et al (1999) mentioned above.

While few studies have addressed the issue, the above studies indicate contradictory results in relation to the nationality and ABC adoption within the Irish context. This study will include nationality as a contingent factor, and examine the association between nationality and ABC adoption within Irish environment.

6.2.4 Type of Competition

Cooper (1988b) argues that it is possible to define the conditions when ABC is most likely to be justified. Specifically, he states that implementing an ABC is advisable if the existing cost system was designed when: measurement costs were high, competition was weak, and product diversity was low, but that now measurement costs are low, competition is fierce, and product diversity is high. This argument, that increasing competition will support ABC adoption is generally supported by the finding of Khandwalla (1972) who found a positive association between intensity of competition and used of sophisticated management control, and Gordon and Miller (1976) who argue that treating actions by competitors require a more sophisticated accounting system.

Kalagnanam and Lindsay (1998) argue that currently the business environment is characterised by intense global competition, with organisations competing not only on the basis of price but also on quality, product flexibility, and response time. These competitive circumstances have increasingly led organisations to focus on the manufacturing function as being of strategic importance, providing an important source of competitive advantage. For many organisations, this has led to the adoption of Automated Manufacturing Environment (AME). Berliner and Brimson, (1988) state that ATM has dramatically changed manufacturing cost-behaviour patterns. The direct labour and inventory components of product cost are decreasing, while depreciation, engineering, and data-processing costs are increasing. These changes have resulted in higher overhead rates and a shrinking base of labour over which to allocate those costs. Organisations have always had to face the problem of choosing an appropriate cost-allocation system. However, changing cost-behaviour patterns demands that organisations re-evaluate their allocation decisions continually (Berliner and Brimson, 1988).

Van Nguyen and Brooks (1997) develop a hypothesis regarding firms facing high level of competition. They hypothesise that such firms are no more likely to adopt ABC than those which operate in less competitive industries. The t-test results show that the mean-value of ABC adopters was significantly different and greater than that of non-adopters. The null hypothesis cannot be accepted, suggesting that companies which are exposed to more competitive environments are more likely to adopt ABC.

Bjornenak (1997) uses two measures to indicate competition; the first one being the percentage of sales being exported. This is based on an assumption that competition is higher in the foreign markets. The other variable is the number of competitors in the markets of the firm's major products. This is a category variable in which the value 1 constitutes monopoly, 2 constitutes 1-3 competitors, 3 is 4-10 competitors and 4 means more than 10 competitors. The results show that the two measures of competition used are positively correlated ($r = 0.413$). Although the results are only weakly significant for export in the non-parametric test, both variables indicate that the non-adopters of ABC have a higher number of competitors and a higher export rate. Bjornenak indicates that this is not consistent with an a priori assumption that higher competition means higher adoption rates. A test was performed to ascertain whether the results can be explained by a high representation of process industries in the group of non-adopters as these companies normally have simpler costing problems and a higher export rate. Bjornenak adds that the results gave the same picture after excluding these industries. The competition variables are not strongly correlated with the other variables used in the study.

Cinquini et al (1999) argue that firms following a differentiation/quality strategy may further enjoy the benefits of ABC through a better comprehension of profitability and differentiation costs. The results of the survey indicate that 23% of the Italian firms are in price/cost competition. Of these only a small percentage were adopting or implementing ABC (30%). They argue that this fact does not prove to be statistically significant. Even including firms that are considering adoption of ABC does not establish a relationship between key competitive factors and ABC that is statistically significant.

Based on the above, there is an apparent conflict between the empirical findings, which are generally non supportive of an association between high levels of competition and ABC adoption rates, and the more theory oriented work which generally is supportive of such an association. However, the empirical findings are not extensive, nor do they differentiate between different types of competition. Given this ambiguity, the current study will seek to investigate the possible linkages between competition and ABC adoption rates.

6.2.5 Product Diversity

Kaplan (1988) argues that the traditional approach to fixed overhead manufacturing costing becomes increasingly dysfunctional when product diversity increases within the firm. Cooper (1988a) states that increasing product diversity introduces the risk of significant inaccuracies in product cost assignment using traditional costing approaches; such diversity includes production volume diversity, size diversity, complexity diversity, material diversity and set-up diversity. It is claimed that ABC avoids the deficiencies of the traditional absorption costing methods, which use bases such as direct labour to assign overhead costs. It is also claimed that it can provide more precise information about the cost of the product than the traditional cost systems can, in particular when manufacturing processes are intricate or products are produced in a diversity volumes and sizes (Cooper and Kaplan 1988a).

Cooper (1988b) illustrates a simple activity-based costing system by a series of examples in order to explain and clarify the effect of varying product volume and size on reported product costs by traditional systems and activity-based costing. He refers to four products which are produced on the same equipment and by similar processes (see chapter two for more details). The products differ either by size (small and large) or by volume (low and high) in a single production run.

The example illustrates that traditional costing systems report distorted product costs whenever companies produce a diverse range of low-volume and high-volume product. Furthermore, the results report how volume-based systems could overcost high-volume products and undercost low-volume products when the costs of some product-related activities are unrelated to volume. Cooper (1988a) concludes that traditional systems report distorted product costs whenever companies produce a diverse range of products, by over costing high-volume products and under costing low-volume products. ABC on the other hand seeks to address these very issues. Cooper (1988a) concludes that product costs reported by the ABC system are more accurate than those by the traditional volume-based system in many situations, including diversity of product size or volume.

Bjornenak (1997) uses the number of product variants and the degree of customised production as measures for testing product diversity as a factor related with ABC adoption. Bjornenak (1997) divides the number of product variant into four groups based on the log N10 value (1-10, 11-100, 101-1000, more than 1000). The results indicate that ABC adopters have a higher number of product variants than non ABC adopters (mean- 2.667:2.348) and (median- 3:2) respectively. Furthermore, the results show that the non-adopters make significantly more customised products than adopters; highly customised production normally means high product diversity, especially complexity diversity, material diversity and set-up diversity. Bjornenak (1997) concludes that ABC is adopted by companies with a high number of semi-standardised products.

Van Nguyen and Brooks (1997) provide empirical evidence relating to the characteristics of firms adopting ABC compared to those not adopting ABC. They test the hypothesis that firms which have more production complexity are no more likely to implement ABC than other firms. They use four variables as proxies for production diversity: the degree of flexibility in production facilities, the frequency of changes in products and product design, the degree of volume variation between products, and the degree of variances in complexity between products. T-tests compared mean-values of each variable between the two groups, and the results showed that, in all cases, means between the two groups were not significantly different. They conclude that companies which have adopted ABC or plan to adopt ABC possess no significant difference in terms of production diversity compared with firms which have not adopted ABC.

Clarke et al. (1999) examine the adoption of ABC systems by Irish manufacturing companies. In relation to product diversity, Clarke et al (1999) use product lines which they divided in four categories or groups (single product, 2-5 products, more than 5 similar products, and more than 5 dissimilar products). The results show that firms which produce more than five similar products tend to be more likely to use ABC than firms in the other categories with fewer products: (17%) by comparison with the other categories (0%, 7% and 6%) respectively .

Groot (1999) develops two hypotheses regarding production-related characteristics of Dutch food companies using ABC and not using ABC: the first is that ABC-using companies produce a larger number of different products than do non-ABC-using companies. The second hypothesis is that ABC-using firms use more product lines and packing lines than do firms not using ABC for the manufacture of their products.

The results of the study do not support the hypotheses; the difference between ABC-users and non-ABC users are not significant when the number of different products is taken into consideration. Groot (1999) argues that perhaps the number of different products is too crude an approximation of the demand for overhead activities, and more information is needed about the ways in which food products are produced. It is conceivable that a highly automated production line is capable of producing a large number of different products without incurring much overhead. In this situation, overhead activities are then more closely linked to maintenance of the production line than to the number of different products. More overhead costs would then be related not to the number of products but to the number of production lines and packing lines operated. This argument is supported by the results of the differences in the number of production and packing lines between ABC-using food companies and non-ABC-using companies. The difference in the number of production lines is as expected and is statistically significant: on average, ABC-using firms operate more production lines than do firms not using ABC.

Abernethy et al (2001) use data collected from multiple sites to examine the implications of product diversity for costing system design choices, and also to explore factors influencing costing system design. The study is based on semi-structured interviews within five different manufacturing firms, and it concludes that multiple products do not in themselves generate a demand for a hierarchical-based costing system. One of the firms (FT2) produced more than 2000 different products, and while they did not have hierarchical cost pools, managers were satisfied with the information produced. Product diversity was achieved in (FT2) through investment in advanced manufacturing technology (AMT) that facilitated rapid product or volume changes. The authors conclude that there is no reason to believe that the information provided by a system that has volume-related cost drivers will be significantly distorted. It is only when product diversity is associated with variations in the material composition, batch sizes, set-up times and complexity of the manufacturing process that individual products will consume disproportionate levels of overhead resources relative to their volume. It is then that the potential for distortion becomes significant.

Brown et al (2004) examine the influence of product diversity as a technological factor on firms' initial interest in ABC and their decision to adopt it or not, by testing if the higher levels of product complexity and diversity will be positively associated with the adoption of ABC. The results indicate that product complexity and product diversity display significant and positive association ($p<0.05$ level) with the implementation of ABC systems.

Based upon the above, the balance of research evidence appears to be supportive of the impact of product diversity upon ABC adoption. With the exception of the Van Nguyen and Brooks (1997) study, all other studies offer support. The Abernathy el al (2001) study suggests that the variations in material composition and manufacturing complexity associated with product diversity provides the link to adoption. Groot (1999) shows that it is the number of production lines which appear relevant, and the other studies likewise offer strong support, either of a direct or indirect nature. It is also important to remember that the methods of measuring product diversity and the categories used for grouping products differ between the studies. Therefore, there is a strong evidential support that product diversity, depending upon how it is measured, is a potential contingent factor which impacts upon the decision of implement ABC.

6.2.6 Cost structure (Level of Overhead)

The early published literature on ABC (Cooper and Kaplan, 1988; Cooper, 1989; Drury, 2000; Mitchell, 1994) argues that as overhead becomes an ever larger component of product cost, it compounds the problematic distortions inherent in traditional volume-based costing systems. This literature also states that product diversity may itself 'cause' growth in overheads and a shift from volume-driven overhead costs (Cooper, 1988a, 1988b). The growth in overheads and their change in nature were seen to create a demand for better information because incorrect overhead allocation had the potential to threaten firm survival. Bjornenak (1997) argues that the importance of the allocation of these costs is a function of the amount of overhead costs to be allocated, and that an important argument for introducing ABC is the claimed change in cost structure in recent years.

Booth and Giacobbe (1997) found that companies with higher levels of overhead were more likely to initiate interest in ABC. The authors did not find a relationship for the later adoption stages of evaluation and adoption. O'Dea and Clarke (1994) on the other hand indicate that small percentage of overhead costs in the cost structure was one of the reasons of not implementing the ABC system.

Brown et al (2004) examine if the level of overhead is positively associated with the decision to adopt ABC. The results of the study indicate that the level of overhead is the only technological factor which has no association with the adoption of ABC (*P*-value=0.130).

Clarke et al (1999) examine the relationship between manufacturing overhead as a percentage of total cost and ABC implementation. The results show that no relationship exists between the percentage of manufacturing overhead to total cost and ABC. The results also indicate that of the 28 firms which report relatively substantial manufacturing overhead costs (comprising 26-50% of total costs), only 18% have adopted ABC, and nearly a third have not even considered ABC, while two-thirds of the firms with very little overhead have not considered ABC (64% of 62 firms).

Groot (1999) examines the difference between ABC-users and non-ABC-users in terms of overhead costs. The results show that there is no difference between the two groups regarding the total overhead costs in percentage of total costs.

Van Nguyen and Brooks (1997) provide empirical evidence relating to the overhead costs of firms adopting ABC compared to those not adopting ABC. They develop a hypothesis which states that firms which have a greater percentage of total cost as overheads are more likely to implement ABC than other firms. This implies that the proportion of overheads in total manufacturing costs for companies in group 1 (those which have adopted or intend to adopt ABC) would be greater than for companies in group 2 (those which do not intend to adopt ABC). The T-test results indicate that the mean values of the proportion of overheads (%) in total manufacturing costs between the two groups were not significantly different (t-value = -.48). This would indicate that no relationship exists between overheads and ABC adoption.

Bjornenak (1997) tests the argument that companies with high overhead costs compared to total value added costs (i.e. direct labour + overhead) were among the first adopters of ABC. The results show a weak significance in favour of the alternative hypothesis, i.e. adopters having a different cost structure than non-adopters. Bjornenak (1997) states that a higher percentage overhead costs for the adopters is consistent with the results found in Langholm (1965) who studied the adoption of variable costing and found strong (-er) statistical evidence of a link between cost structure and the adoption of variable costing.

Cinquini et al (1999) explore 'state of the art' management accounting practices in large and medium size manufacturing firms in Italy. They examine if the overhead cost structures drive firms to ABC systems. The results indicate that there is no evidence of any significant difference in the degree of adoption of ABC between firms and a high proportion of overhead to total cost. The results also show that the difference in the percentage of companies adopting or considering adoption is not significant in firms with high share of overhead from those with low share.

Based on the above, it is interesting to observe the conflict between the theoretical literature and the results of the surveys conducted on the implementation of the ABC. The theoretical literature (Cooper and Kaplan, 1988; Cooper, 1989; Drury, 2000; Mitchell, 1994) agrees that growth of overhead compounds the problematic distortion inherent in TCS; therefore implementing ABC is the solution to overcome these distortions. On the other hand, the findings of the surveys viewed above show very little evidence which is supportive of the argument that high overheads are associated with ABC adoption, in other words they report that there is no association between the percentage of manufacturing overhead to total costs and the implementation of the system. In an attempt to conclude this conflict, this study will include overhead proportion as a potential contingent factor and will seek to establish if it is associated with ABC adoption.

6.2.7 Business Unit Culture

Baird et al. (2004) examine the extent to which activity management practices are adopted by Australian business units at each of Gosselin's levels of Activity Analysis (AA), Activity Cost Analysis (ACA) and Activity-Based Costing (ABC). They also examine business unit cultural dimensions (innovation and outcome orientation) for their association with the extent of adoption of activity management at each of Gosselin's three levels mentioned above. The authors argue that cultural dimensions were not chosen as a comprehensive overview of the factors affecting adoption of activity management, but as examples of factors that have been suggested or found to affect adoption of activity management in general. They also indicate that the motivation for including selected business unit cultural dimensions (innovation and outcome orientation) is twofold. First, culture has been proposed as a factor with significant potential to affect adoption of activity management, and second, no study to date has empirically examined the association between culture and activity management adoption. Baird et al. (2004) have drawn 'innovation' and 'outcome orientation' for the O'Reilly et al. (1991) Organizational Culture Profile (OCP), stating that innovation represents a business unit's receptivity and adaptability to change, and its willingness to experiment, which is likely to be associated with adoption of activity management. Citing Parker (1997, p.120), they argue that "resistance to (innovation and) change represents one of the most profound sources of potential adoption and implementation problems for new management accounting techniques and systems such as ABC”.

The authors expected that business units with more innovative cultures will, therefore, be more likely to experiment with new practices, such as activity management, than units with less innovative cultures. Baird et al (2004) argue that outcome orientation refers to the extent to which business units emphasise action and results, exhibit high expectation for performance, and are competitive. The authors expected that business units with high outcome orientation are likely to be attracted to practices, such as activity management, that claim to facilitate improvements in processes and to enhance performance and competitiveness. A survey questionnaire was mailed to the financial controllers of a random sample of 400 Australian business units chosen from the Kompass Australia (2001) directory. The two business unit culture dimensions, innovation and outcome orientation were measured using the sum of the cultural value items which loaded on those dimensions following a factor analysis of the 26-item version of the organizational culture profile. The results show that the association between business unit culture and the extent of adoption of AA, ACA, and ABC is significant (.000). The results also indicate that business unit culture variables, in aggregate, are statistically significant and larger than the amount explained by business unit size and decision usefulness of cost information.

The authors noted that the focus of the study is on the association between each of the separate cultural variables and the extent of adoption of activity management practices. The results of the hierarchical regression however indicate that the cultural variables, in aggregate, are significant in their association with extent of adoption, providing the basis to examine the individual associations in the subsequent stepwise regression. Baird et al (2004) argue that considerable support was found for the expected association between the two business cultural dimensions and adoption of activity management at all three levels of AA, ACA and ABC. Innovation was associated with the first two levels of AA ($p = .016$) and ACA ($p = .023$), with more innovative business unit cultures adopting AA and ACA to a greater extent than less innovative cultures, but not with ABC. Outcome orientation was associated with extent of adoption at all three levels of AA ($p = .045$), ACA ($P = .036$) and ABC ($p = .009$), with business unit cultures higher in outcome orientation adopting all three levels to a greater extent than cultures lower in outcome orientation.

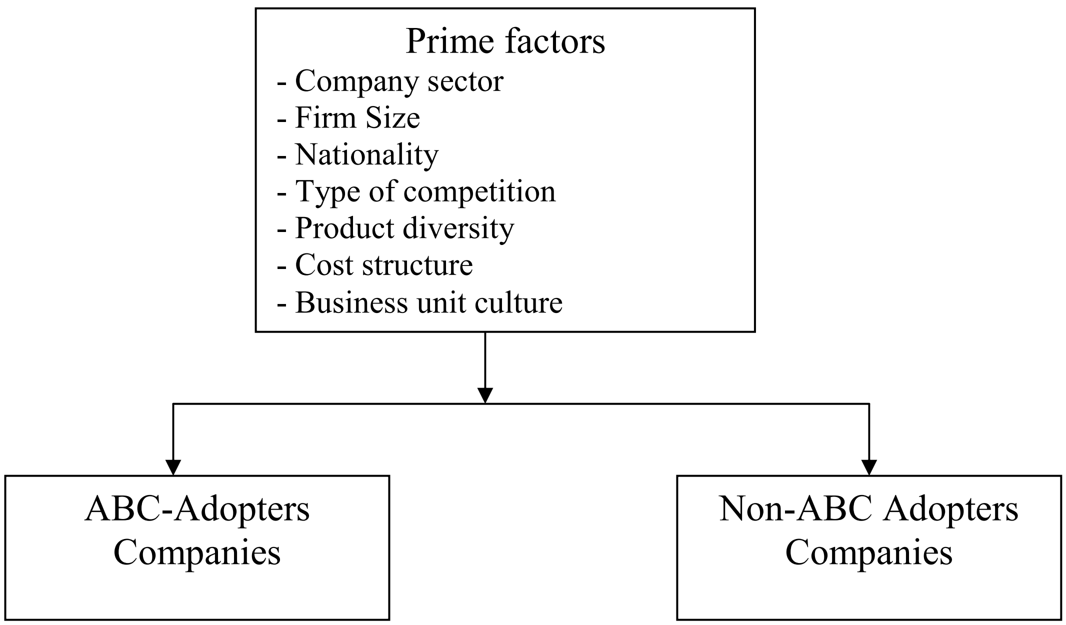
The above study is the only study which examines the association between business unit culture and adoption of activity management. The influence of business unit culture on ABC systems appears, as of yet, and by comparison with the other variables considered above, to be under-theorised. However, given the strength of the finding and the logic of the supporting argument the current study will use business unit culture as a contingent factor and examine its association with the implementation of ABC by Irish companies.

6.3. Developing the Research Model

The above review has identified seven factors, production diversity, cost structure, firm size, types of competition, company sector, nationality and business unit culture as, at least potentially, impacting upon the adoption of ABC. While the studies reviewed are not unanimous in their support of the impact of the individual variables upon ABC adoption, and while different studies of the same variable sometimes use different operational definitions of the variables, and indeed of ABC adoption, non the less there does appear to be support for a general argument that the seven identified variables potentially impact upon ABC adoption.

Based upon the above it is possible to develop a basic contingency model of ABC adoption, as is shown below in figure 6.1.

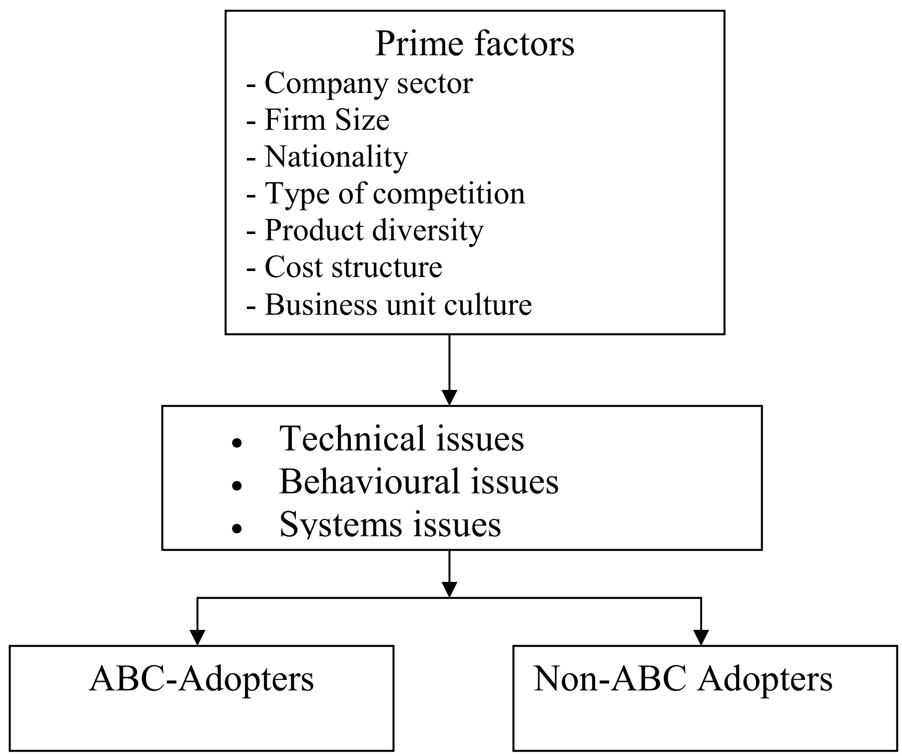
Figure 6.1: Basic contingency model of ABC adoption



The above "Basic Model" seeks to identify those factors which, the literature suggests, likely impact upon the adoption of ABC i.e. companies which have a particular "profile" relating to the above factors are more likely to find ABC useful and hence to adopt the system then companies which have alternative "profiles". However the above model does not encompass the findings relating to the barriers and difficulties to implementing the ABC system. These barriers and difficulties have been considered in chapter 3, and have been identified as technical, behavioural, and systems related.

Given the existence of such barriers and difficulties, the above "Prime Factors" alone may not of themselves adequately explain the actual take up of ABC systems. Rather, while the “Prime Factors” may indicate the contingencies which render ABC particularly appropriate to companies; unless the barriers and difficulties to the implementation of the system have been overcome in some way or other, companies that would otherwise find ABC appropriate will not have adopted it. This argument can be presented diagrammatically as in figure 6.2 below:

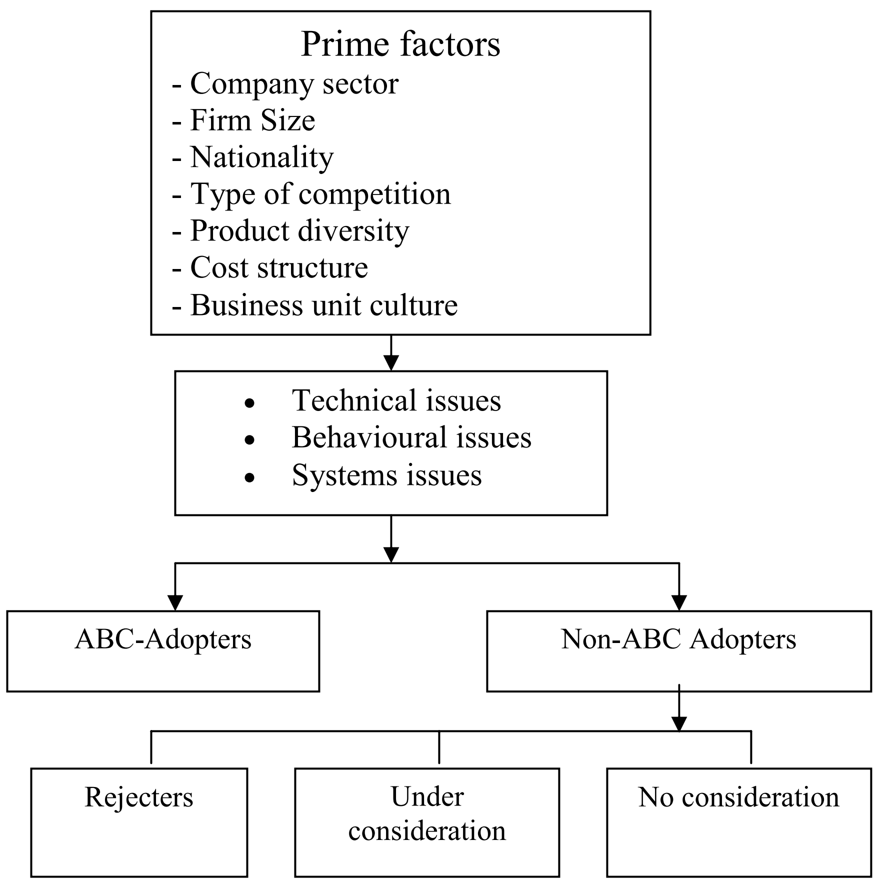
Figure 6.2: contingency factors and ABC difficulties



The model suggests that in the adoption of ABC, likely two sets of variables are at work. The “prime Factors” which likely render it appropriate or useful for the company to adopt the system, and the company’s ability, or willingness to address and overcome the barriers and difficulties associated with implementation. Thus the model would suggest that two companies which have similar profiles with regard to the prime factors may yet reach different decisions with regards to ABC adoption, due to their differing abilities or willingness to address and overcome the issues relating to implementation. It would also suggest that the non adoption of ABC may result either from a failure to overcome the implementation issues, or alternatively the company may have a profile with regard to the prime factors such that the system is not particular useful or appropriate to it.

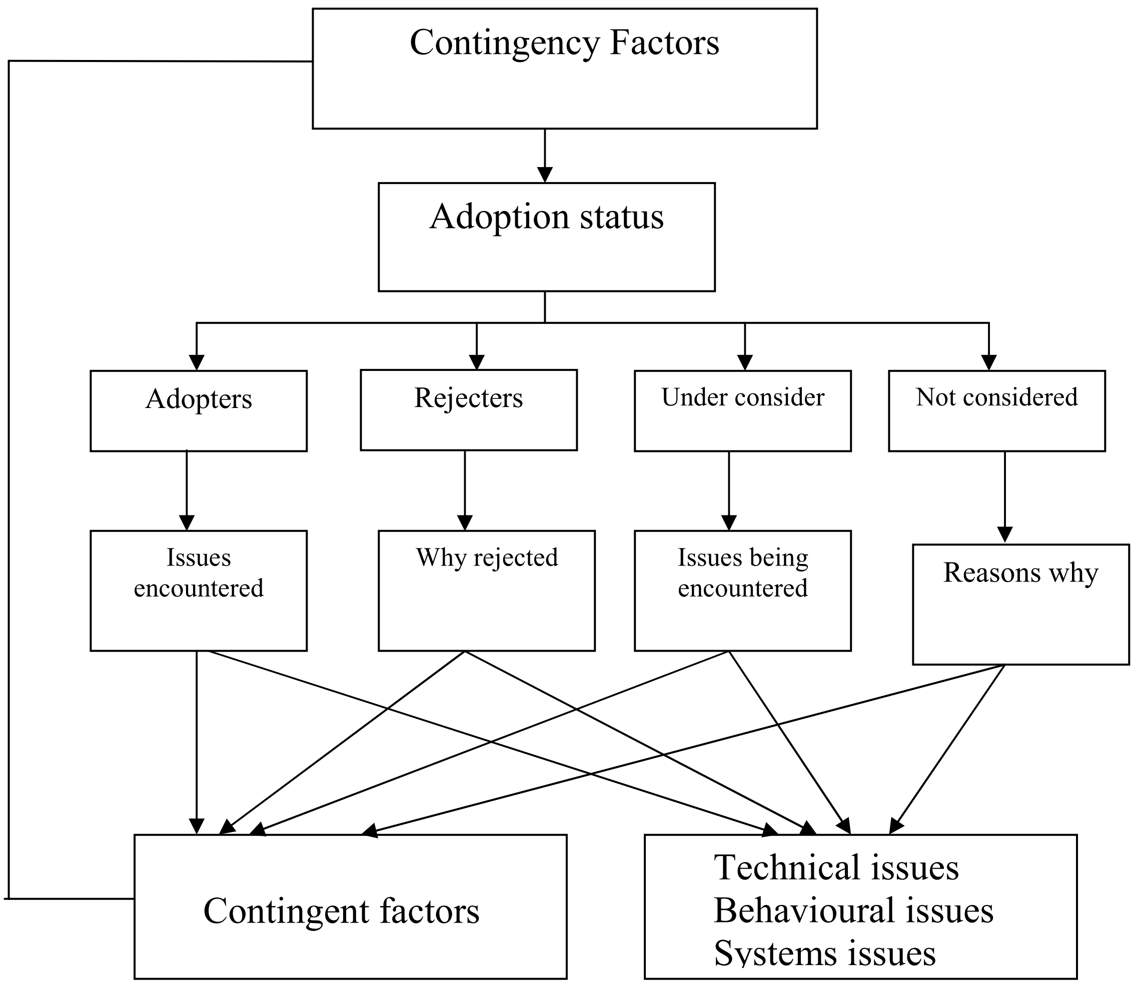
The above model can be further developed by the realisation that non-adopters may be divided into three distinct groups: companies which have rejected ABC, companies which currently have ABC under-consideration and companies which have not considered ABC. This is represented by figure 6.3 below

Figure 6.3: Contingency, ABC difficulties & implementation status



Furthermore, the model can be reversed to identify the barriers and difficulties associated with the implementation of ABC that have been overcome. This argument can be presented diagrammatically in figure 6.4 as below.

Figure 6.4: A contingency model of ABC adoption



6.4. Summary and Conclusion

This chapter reviews a series of seven 'prime' contingent factors and their relationship with ABC adoption. The chapter has presented these factors based on the results of a number of surveys conducted on the adoption of ABC systems.

In relation to product diversity, the review appears to be supportive of the impact of product diversity upon ABC adoption. There is strong evidence which argues that product diversity, depending upon how it is measured, is a potential contingent variable which impact upon the decision to adopt ABC system.

With respect to the manufacturing overhead costs as a contingency factor impacting the adoption of ABC system, the findings of the surveys report a non-significant relationship between overheads and ABC adoption, but the theoretical work is supportive of such a relationship.

Firm size has been examined as a potential factor effecting ABC adoption, the results indicate a significant association between firm size and ABC adoption, with the exception of two surveys as presented above.

With regarding to competition, the results are limited and generally non supportive of the association between competition and ABC adoption rates, despite of the supportive of the theory oriented work of such association. Company sector has also been considered and generally manufacturing companies are more likely to adopt ABC than those categorized in other sectors.

Few studies examined and addressed the association between nationality and ABC adoption within Irish firms. Those studies indicate contradictory results in relation to the nationality and ABC adoption.

In relation to business unit and culture, only one study has examined the association between business unit and culture and ABC adoption, and found strong association between business unit culture and the extent of adoption of AA, ACA, and ABC. The results also indicate that business unit culture variables, in aggregate, are statistically significant and larger than the amount explained by business unit size and decision usefulness of cost information.

Based upon a review of those contingent factors and the difficulties encountered during the ABC implementation (see chapter 3) , a model has been developed which suggests that in the adoption of ABC, likely two sets of variables are at work. The "Contingency Factors" which likely render it appropriate or useful for the company to adopt the system, and the company's ability, or willingness to address and overcome the barriers and difficulties associated with ABC implementation. The model has also been reversed to identify the barriers and difficulties associated with the implementation of ABC that have been overcome. Therefore, this research is an attempt to identify and investigate these relationships in the implementation of ABC within Irish companies.

The next chapter will present the methodology that is employed for this research to examine the possible linkages between the contingency factors and ABC adoption.

CHAPTER 7: RESEARCH METHODOLOGY

7.1 Introduction

Based upon a review of the available literature relating both to the implementation of ABC and contingency theory in management accounting, a model has been developed which suggests that in the adoption of ABC, likely two sets of variables are at work. The "Contingency Factors" which likely render it appropriate or useful for the company to adopt the system, and the company's ability, or willingness to address and overcome the barriers and difficulties associated with ABC implementation. The model has also been reversed to enable the barriers and difficulties associated with the implementation of ABC to be identified. This research is an attempt to identify and investigate these relationships in the implementation of ABC within Irish companies.

This chapter presents the methodology that is employed for this research, providing reasons and explanation where necessary.

The organisation of the rest of the chapter is as follows. Section 7.2 identifies the unique features of this research. Section 7.3 presents the research philosophy and paradigms. Section 7.4 and 7.5 develops the research questions and the research hypotheses. Section 7.6 deals with the questionnaire as a research methodology and data collection. Section 7.7 develops and justifies the statistical analysis used in this study. The last section contains the conclusion of the chapter.

7.2 Unique features of this research

Previous studies have been concerned to establish the levels of ABC implementation in countries such as Ireland (Clark et al, 1999; Pierce and Brown 2004), the UK (Innes and Mitchell, 1990, 1992, 1995, 1998; Innes et al. 2000), USA (Anderson 1995; Pohlen and Londe, 1998; Groot 1999) Australia (Booth and Giacobbe, 1997) South Africa (Sartorius et al. 2007). Other studies have focused on the impact of behavioural and systems factors on the successful implementation of ABC (Anderson 1995; Shields 1995).

This study seeks to incorporate both the impact of contingency variables and technical factors on the implementation of ABC. While previous authors, Shields and Young (1989), Armitage and Nicholson (1993), Clarke (1997), Cobb et al (1992), Innes and Mitchell (1990), (1995), Innes et al. (2000) have argued that technical variables are likely to impact upon adoption, as of yet there is no published empirical evidence that demonstrates the impact of technical variables on the successful implementation of ABC. This study seeks to address this deficit, and to do so within the overall context of contingency theory, since, as has been argued in the previous chapter, the model which has been developed suggests that companies may reject ABC for a number of reasons. These include one of which may be technical difficulties, other reasons may be that the profile of the company vis a vis the contingent factors may be such as to render the ABC system of little practical value to the company.

7.3 Research Philosophy and Paradigms

Creswell (2003) states that a research philosophy is a belief about the way in which data relating to a phenomenon should be gathered, analysed and used. Hussey and Hussey (1997) argue that the different types of research can be classified by: (1) the process of the research, (2) the logic of the research, and (3) the assumptions about the nature of social science. Research classified according to its process may be described as being either quantitative or qualitative. Quantitative research is objective in nature and concentrates on measuring phenomena. Therefore, quantitative research entails collecting and analysing numerical data and applying statistical tests. On the other hand, qualitative research is more subjective in nature and studies social and human phenomena (Hussey and Hussey1997).

Sannders et al (2000) argue that the way in which a researcher thinks about the development of knowledge is dominated by two views; positivism and phenomenology. Cassell and Symon (1994) state that the positivist paradigm is based on the assumption that there is an 'existing truth in the world' and that this truth can be revealed through scientific method. Positivism is a scientific approach to research where the researcher acts as an objective analyst. The methodology is usually highly structured to facilitate replication and the results are quantifiable. Statistical analysis can be conducted and the researcher is independent of the subject of the research. Because the focus of this research is on the systematic and statistical measurement of the relationship between variables, positivism acts as a guiding philosophy for this work.

Phenomenology on the other hand, can be seen as the research of human experiences that are examined through the detailed descriptions of the people being studied. Creswell

(2003) argues that the steps for data analysis may be less structured and the outcome will be typically made up of a descriptive narrative.

Hussey and Hussey (1997) indicate the main differences between the two paradigms; positivistic and phenomenological as shown in table 7.1 below:

Table 7.1: Features of the research paradigms

Positivistic paradigm	**Phenomenological paradigm**
Tends to produce quantitative data	Tends to produce qualitative data
Uses large samples	Uses small samples
Is concerned with hypothesis testing	Is concerned with generating theories
Data is highly specific and precise	Data is rich and subjective
The location is artificial	The location is natural
Reliability is high	Reliability is low
Validity is low	Validity is high
Generalises from sample to population	Generalises from one setting to another

Source: Hussey and Hussey (1997: 54).

Burrell and Morgan (1979) argue that assumptions regarding the nature of social science could be thought of in terms of the subjective/objective dimension, and assumptions about the nature of society in terms of a regulation/radical change dimension, which results a 2 x 2 matrix comprising four different research paradigms as follows:

Figure 7.1: Four paradigms for the analysis of social theory

Radical Change

Subjective			Objective
	Radical Humanist	Radical Structuralist	
	Interpretivist	functionalist	

Regulation

(Source: Burrell and Morgan 1979: 22)

Burrell and Morgan (1979) also indicate that to be located in a particular paradigm is to view the world in a particular way. The four research paradigms define four views of the social world based on different assumptions. The four research paradigms have been summarised by Gioia and Pitre (1990) in table 7.2 below:

Table 7.2: The differences between the four research paradigms

	Goals	**Theoretical Concerns**	**Theory-building Approaches**
Functionalist paradigm	To search for regularities and test in order to predict and control	Relationships caution generalization,	Refinement through causal analysis.
Interpretivist paradigm	To describe and explain in order to diagnose and understand.	Social construction of reality, reification process, interpretation	Discovery through code analysis.
Radical Humanist paradigm	To describe and critique in order to change (achieve freedom through revision of consciousness)	Social construction of reality distortion interests served.	Disclosure through critical analysis.
Radical Structuralist paradigm	To identify sources of domination and persuade in order to guide revolutionary practices (achieve freedom through revision of structures)	Domination, alienation, macro forces, emancipation.	Liberation through structural analysis.

Source: Gioia and Pitre (1990).

This study leans towards the contingency/functionalist (positivistic) paradigm, as it has been argued (Gioia and Pitre, 1990) that positivistic accounting theory is being developed and tested through observations, deduction, testing, and evaluation. Research designs are often composed of surveys and statistical methods. Application of the contingency approach within such a kind of research design results in detection of cause and effect relations for description or explanatory knowledge (Hass and Kleingeld 1999). Contingency-based studies have come to be seen as large scale, cross sectional, and postal questionnaire based research, to examine the interaction of a certain number of contingent variables (Chapman, 1997).

7.4 Research Questions

Though the reasons whether or not to adopt ABC are still not completely apparent, the existing literature sheds some light on the problem issue, particularly highlighting characteristics of those firms which might be suitable to ABC and those which may not be suitable.

This study however attempts to answer two interrelated questions:

1. Is the adoption of ABC by Irish companies associated with firm-specific characteristics, namely industry sector, firm size, nationality, product diversity, type of competition, cost structure and business unit culture?

The above question seeks to test those factors which the literature suggests are likely to impact upon the adoption of ABC i.e. companies which have a particular "profile" relating to the above factors are more likely to find ABC useful and hence to adopt the system than companies which have alternative "profiles". However the above question does not address the issue of the barriers and difficulties to implementing the ABC system. These barriers and difficulties have been considered in chapter 3, and have been identified as technical, behavioural, and systems related.

Previous studies have focused on the extent of ABC systems usage and on the identification of the main reasons and difficulties encountered during its implementation (Bjornenak 1997; Clarke 1997, 1999; Drury and Lamminmaki 2001; Groot 1999; Innes and Mitchell 1990, 1995; and Innes et al. 2000). The successful implementation of ABC has been associated with behavioural and organisational variables (Shields and Young's 1989). Shields (1995) argues that behavioural and organisational variables create opportunities for employees in an organisation to learn about ABC and encourage the employees to change their behaviours in accordance with the concept of ABC.

However, there is evidence (Armitage and Nicholson 1993; Clarke 1997; Cobb et al 1992; Innes and Mitchell 1990, 1992, 1998) that there are specific technical issues which might impact upon ABC implementations. It is on such technical issues that this research will focus. Consequently, the second research questions became defined as:

2. What is the extent of the technical difficulties encountered during the implementation of ABC system?

The technical difficulties focused upon are those identified in the literature review i.e.

(i) Identifying the major activities that take place in an organisation

(ii) Assigning resources to those activities

(iii) Aggregating activities to create cost pools/ activity centres

(iv) Determining the cost drivers for each activity

(v) Assigning the cost of activities to cost objects

7.5 Research Hypotheses:

This study may be considered as comprising two distinct stages: firstly, developing a contingency model which seeks to establish the factors associated with ABC adoption. Secondly, establishing whether or not "technical issues" pose barriers to the implementation of ABC. Therefore, the following hypotheses seek to test and examine these first and second stages.

7.5.1 Contingency factors hypotheses:

7.5.1.1 Company sector

Some studies (Innes and Mitchell 1995; Innes et al. 2000; Clarke et al 1999 and Pierce and Brown 2004) have tested and examined the relationship of company sector to ABC adoption. As the findings of the above studies were different, this study seeks to test if the company sector plays any significant in the implementation of the ABC systems by testing the following hypothesis:

> H1: Manufacturing companies are more likely to adopt ABC than companies within other sectors.

7.5.1.2 Firm size

It has been argued (Innes and Mitchell, 1995, 1998; Bjornenak, 1997; Van Nguyen and Brooks, 1997; Krumwiede, 1998; Clarke et al, 1999) that the company size is usually a factor in the rate of adoption of sophisticated cost accounting systems. In general, bigger size increases complexity, usually requiring greater accounting resources. The majority of surveys conducted on ABC have examined the impact of size on the implementation of ABC system. The findings differ from one study to another. In the studies by Innes and Mitchell (1995), Bjornenak (1997), Boot and Giacobbe (1997), Krumwiede (1998), Clarke et al (1999), Groot (1999), and Pierce and Brown (2004) which examine the relationship between company size (number of employees and annual turnover) and the implementation of ABC, the findings are that company size does provide a statistically significant source of differentiation among ABC adopters; a markedly significant higher rate of adoption is apparent in the larger firms surveyed. On the other hand, some research (Van Nguyen and Brooks, 1997; Cinquini et al, 1999; and Baird et al, 2004) indicates that a firm's size does not drive ABC adoption, and that no association between business unit size and ABC systems exists. This argument leads us to examine and test the following hypothesis:

H2: Larger companies are more likely to adopt ABC than smaller companies.

7.5.1.3 Nationality

Nationality has been examined to measure its association with the implementation of ABC system. Clarke et al (1999) and Pierce and Brown (2004) have examined the impact of multinational/national status on the implementation of ABC. The results were contradictory as mentioned in chapter 6. The current study seeks to examine this issue via the following hypothesis:

H3: Multinational companies are more likely to adopt an ABC system than national companies.

7.5.1.4 Competition

Bjornenak (1997) argues that competition affects the value of ABC through increasing the costs caused by errors in the traditional costing systems. Cooper (1988b) indicates that competition generally increases the cost of errors because there is a greater chance that a competitor will take advantage of any errors made. However, it is not known whether this argument applies to Irish firms. This study will test this argument by means of the following hypothesis:

H4: Firms which face high level of competition are more likely to adopt ABC than those which face less competitive.

7.5.1.5 Product diversity

According to Cooper (1988a) traditional systems report distorted product costs whenever companies produce a diverse range of products, by over-costing high-volume products and under-costing low-volume products, whereas ABC under-costs high-volume products and over-costs low-volume products. Therefore, the product costs reported by the ABC system are more accurate than those by the traditional volume-based system in many situations, including diversity of product size or volume (Cooper 1988a).

Product diversity has been examined by (Bjornenak 1997; Clarke et al 1999; Van Nguyen and Brooks 1997; Groot 1999; Abernethy et al 2001; Brown et al 2004)[3]. In summary the findings appear to be supportive of the impact of product diversity upon ABC adoption. The current study adopts the position that product diversity is a significant factor in the adoption of ABC systems. This will be tested by the following hypothesis:

> H5: Firms which have more production diversity are more likely to adopt ABC than firms which have less production diversity.

7.5.1.6 Cost structure

Regarding the cost structure of companies, studies by (Booth and Giacobbe 1987; Brown et al 2004; Bjornenak 1997; Clarke et al 1999; Groot 1999; Van Nguyen and Brooks 1997 and Cinquini et al 1999) examined the impact of overheads on the implementation of ABC system. The results are ambiguous, as Booth and Giacobbe (1997) found a positive association between the implementation of ABC and the percentage of overheads while others indicate that no relationship exists between the implementation of ABC and

[3] See chapter (6) for more details on the findings of these studies regarding product diversity and ABC.

level of overheads. This study therefore seeks to test this factor and its impact upon the implementation of ABC system by posing the following hypothesis:

> H6: Firms which have a greater percentage of total cost as overheads are more likely to implement ABC than other firms.

7.5.1.7 Business unit culture

Based on the literature (O'Reilly et al 1991, Baird et al 2004, Macarthur 2006, and Henri 2006), culture has been proposed as a factor with significant potential to affect adoption of activity management. One study by Baird et al. (2004) examines the extent to which activity management practices are adopted by Australian business units at each of Gosselin's levels of activity analysis, activity cost analysis and activity-based costing. They also examine the cultural dimensions (innovation and outcome orientation) of the business units for the extent of adoption of activity management at each of Gosselin's three levels mentioned above. The current study examines the impact of business unit culture on the adoption of ABC by Irish firms, utilising to the following hypothesis:

> H7: Business units which have a culture of innovation and outcome orientation will be more likely to adopt ABC.

The above review has identified seven hypothesized variables/factors based on the contingency model developed in chapter (6). While the studies reviewed are not unanimous in their support of the impact of the individual variables upon ABC adoption, and while different studies of the same variable sometimes use different operational definitions of the variables, and indeed of ABC adoption, nonetheless there does appear to be support for a general argument that the seven identified variables potentially impact upon ABC adoption. This study seeks to test the relationship of those variables with implementation of ABC systems.

7.5.2 Technical issues hypotheses

The above hypnotized contingency factors alone may not of themselves adequately explain the full reasons for ABC adoption rates. The barriers to implementation, identified in the model developed in chapter 6, likely also influence the adoption rate.

The model suggests that two companies which have similar profiles with regard to the prime factors may yet reach different decisions with regards to ABC adoption, due to their differing abilities or willingness to address and overcome the issues relating to implementation. It would also suggest that the non adoption of ABC may result either from a failure to overcome the implementation issues, or alternatively the company may have a profile with regard to the prime factors such that the system is not particular useful or appropriate. Therefore to test the extended model, the following sets of hypotheses seek to establish whether or not technical difficulties pose barriers to the implementation of ABC systems.

The seven 'prime' factors identified above will be individually tested to establish there relationship with ABC adoption. Should such relationships exist, it is then possible to produce a 'profile' of adopting companies e.g. adopting companies may be (relative to non adopting companies) larger with higher overheads, more product diversity etc. Once such a 'profile' is developed, it is then possible to "cluster" or group the companies based on their profiles. Once clustered it is anticipated that there will be significant differences in ABC adoption rates between the clusters (since after all they are clustered on the prime factors associated with adoption). However, if adoption is also influenced by barriers, within such clusters there will be differences in ABC adoption status.

The validity of the above argument will be tested by the following hypothesis:

When companies are clustered on the basis of their prime factor profiles:

H8: There will be significant differences in the ABC adoption status between clusters.

H9: There will be differences in ABC adoption status within each cluster.

It will be recalled that the model developed in the previous chapter (figure 6.4) differentiated "non adopting companies" into three categories, those who have rejected ABC after consideration, those who are currently considering ABC and those who have not considered ABC. Within each "cluster" of companies there will likely be each of these three types of non adopting companies.

The pivotal point of the adoption model developed in the previous chapter is that it is the combined effects of the primary contingent factors and the barriers to implementation, which results in adoption or non adoption. Therefore, the model suggests that even within the cluster which has an overall profile most closely aligned with the contingent factors associated with adoption, there will be some companies which have rejected ABC. Within the cluster with a profile which least matches the prime factors we would expect rejection. However, the reasons for rejection will (the model suggest) differ, the 'closely aligned' cluster will likely have "barriers" as the reasons for rejection, while the cluster which is least aligned, will likely perceive the system to be of little usefulness to these i.e. not appropriate to the information needs of the companies within that cluster.

This argument will be tested by the following hypothesis:

H10: There will be significant differences in the reasons for rejection of ABC, between clusters.

If the above argument, that within the 'closely aligned' cluster the reasons for rejection relate to barriers to implementation, it provides the opportunity to establish which of the three types of barriers i.e. Behavioural, Systems or Technical, is the dominante reason for such rejection. While there is support in the literature for all three types of barriers, it has been previously argued here that technical difficulties dominate.

This argument can now be tested by the following hypothesis:

> H11: Technical issues will be the most common cause for rejection of ABC within the cluster whose profile most closely matches the prime factors.

The same general argument as given above relating to companies which have rejected ABC can also be sustained for companies which are actively considering ABC adoption within each cluster there will likely be such companies. However, the factors mitigating against adoption will (the model suggest) differ between clusters. The cluster of companies whose profile is most closely aligned with the prime factors will, the model suggest, find 'barriers' to be the major mitigating factor, while the least aligned cluster will likely find that the overall system may just be unsuitable to those company.

This argument can be tested via the following hypothesis:

> H12: There will be significant differences in the factors mitigating against ABC adoption (within companies who are actively considering its adoption) between clusters.

If indeed the argument developed previously regarding the likely dominance of technical issues amongst the barriers to implementation is correct, then the following hypothesis will held up:

> H13: Technical issues will be the most common factor mitigating against ABC adoption (within companies who are actively considering its adoption) within the cluster whose profile most closely matches the prime factors.

7.6 Data Collection

Data Collection may be conducted in a variety of ways and from various sources, each data collection method having advantages and disadvantages. Sekaran (2000) argues that although personal interviews or face-to-face interviews have the advantages of flexibility in adapting and clarifying the questions, they have time, cost and geographical limitations. On the other hand, he states that a mail questionnaire survey is best suited for collection of a substantial amount of information at a reasonable cost from large number of people in a wide geographical area.

Several studies in the literature of ABC have used the mail questionnaire survey method for such reasons. For example, Shields (1995), who studied firms degree of success with ABC and the variables associated with ABC success, conducted a mail survey in gathering data, reasoning that it is a cost-effective method and suitable for analysing a large sample of firms' which have had experience with ABC. Several researchers in the area chose a mail survey to collect data to identify the most important areas of application of ABC information among ABC adopters (Innes and Mitchell 1990, 1995; Bjornenak 1997; Groot 1999; Clarke 1997, Clarke et al. 2000; Innes et al. 2000; and Drury and Lamminmaki 2001).

Furthermore, a mail questionnaire survey exerts less pressure on the respondent to provide an immediate answer and provide a comfortable feeling of anonymity (Gosselin 1997). Mail questionnaire survey was considered an appropriate method for this research for the following reasons:

(i) There is evidence that most contingency-based studies have used cross-sectional survey methods (Chenhall 2003).

(ii) Unlike interviews, a mail questionnaire focuses on facts rather than on personal opinions. It also places less pressure on an immediate response and provides the respondents with a feeling of anonymity (Gosselin 1997).

The survey comprised all firms listed on Business and Finance (2004) Irelands Top 1000 companies (only 925 companies listed and sent for the survey). The main reasons for choosing companies listed on Business and Finance Irelands Top 1000 firms were that contact details were readily available, and that this sample frame was used in previous Irish surveys, which allows comparisons between the results to be validly made. The choice of the sample frame does however limit the applicability of the finding, since those will relate only to 'top' companies i.e. those with relatively high turnover and capitalisation.

The questionnaire used in this study, comprising 12 pages, was pretested to ensure the suitability of the questions and to eliminate ambiguities. The objectives of the pretest were to establish the reliability of the survey instrument (the questionnaire) and the effectiveness of the data collection methodology in generating responses. To confirm clarity and validity of this questionnaire, it was pre-tested by eight academic staff in the school of Accounting and Finance, DIT. This confirmed that the estimate of the time required was reasonable and that the questions were suitable for the intended audience.

Sekaran (2000) suggests that sending follow-up letters, providing the respondent with self-addressed, stamped return envelopes and keeping the questionnaire brief are useful ways to improve the rate of response to mail questionnaires. Accordingly, the questionnaire in this study was sent with a covering letter and a reply envelope. The covering letter was addressed to the accounting/finance manger of each company, who was considered to be most likely to understand the cost accounting systems and whom it was assumed to be the key person responsible for decisions regarding ABC in the firm. The questionnaire was resent, approximately five weeks after the first mail-out with a second covering letter.

7.6.1 Rules on Ethics and Confidentiality

Before conducting the questionnaire survey, an information sheet, stating that the research was being conducted in cooperation with the Dublin Institute of Technology and the school of Accounting and Finance, was prepared in order to explain the purpose of the study and the ethical rules pertaining to this research. This was attached to each questionnaire and sent to participants (see Appendix A). The participants were informed that under the ethical code, they were participating voluntarily and no risks, such as psychological, moral, legal or other risks, would occur to them.

For administrative purposes, the questionnaires were coded. The codes were exercised for follow-up procedures. Access to the codes was restricted to the researcher. Completed questionnaires of the survey are kept in a secure place at Dublin Institute of Technology under the researcher's control and are available only to the researcher and supervisors. In addition, the results are reported only in aggregate form so as to prevent the identification of individual responses from the participants.

7.6.2 Research design and variables

7.6.2.1 Research Design

The research questionnaire (see Appendix A) comprises two types of questions:

Likert-types: this method is widely used in social science research to indicate the strength of agreement or disagreement (Jackson 1995) and is here employed to measure attitudinal issues, for example, asking the respondents to rate the level of success of the ABC system in relation to specific areas of application (Q.21). Current thinking suggests that 5- to 7-point scales are adequate for the majority of surveys that use ordered responses (Fink, 1995). All the Likert-questions were recorded on a 5-point type scale.

Multiple-choice: multiple-choice answers are those where the respondents is asked a closed question and selects his or her answer from a list of predetermined responses or categories (Hussey and Hussey 1997). This type was chosen because the study requires specific information needing yes or no responses, or an answer from one of four, five or six choices. However, some questions have the space for the respondent to add any answer not listed.

In general, most of the questions were designed as a closed from, which is considered to be more efficient and reliable than open questions for obtaining information from respondents (Fink 1995). Closed questions are, however more difficult to design than open ones because the answers or response choices should be known in advance. But the results lend themselves more readily to statistical analysis and interpretation, and this is particularly important in large surveys, because of the number of responses and respondents. Furthermore, because the respondent expectations are more clearly spelled out in closed questions, the answers have a better chance of being more reliable or consistent over time (Fink 1995).

Some questionnaire items were developed from existing studies (O'Reilly et al, 1991; Anderson & Young, 1999; Clarke et al, 1999; Innes, et al, 2000; Pierce & Brown 2004) as they had been shown to be reliable. Other questions were developed to suit the particularities of this study.

The written questionnaire (a copy of which is provided in appendix A) consists of 29 questions and was divided into two main sections, comprising 12 pages. The first section aimed to examine company characteristics. Therefore, questions 1-12 seek general information about the company such as its industry group, firm size, organizational structure, cost structure, and business unit culture. These questions relate to the link between contingency factors and its predisposition of ABC adoption.

The second section was designed to examine the adoption statues of ABC amongst the participants. This section (questions 13-29) relates to knowledge of ABC, status of ABC adoption and was requested of all respondents, involvement in the implementation of ABC, reasons for adopting ABC, the level of ABC success and importance, problems of ABC implementation, reasons for not adopting, rejecting and not considering of ABC. Questions 13-14 relate to the awareness of participants regarding ABC. Question 15 is intended to measure the degree of ABC adoption. Question 16-17 relate to the firm's initiation of ABC. Question 18 is to identify the stages of the ABC implementation by adopters or users. Question 19 is adapted from Pierce and Brown (2004), and seeks to indicate the involvement of each of the categories in implementing their ABC system. Question 20 relates to the reasons for adopting ABC. Questions 21-22 based on Pierce and Brown (2004), relate to the level of success and importance of implementation of ABC for specified purposes on a 5-point scale ranging from 1=low to 5=high. Question 23 seeks to identify the extent of technical difficulties encountered in implementing ABC. Questions 24-26 are to be answered by non-adopters of ABC, the purpose of these questions being to investigate the reasons for not adopting ABC.

As further justification for the questions asked, the relationship of each question to the above hypotheses is set out in table 7.3 below.

Table 7.3: The relationship between questions and hypothesis

Hypothesis	Questions and variables in the questionnaire relating to the hypotheses
1	Q15 (The adoption of ABC) Q1 (Company sector)
2	Q15 (The adoption of ABC) Q2+3 (Firm sizes)
3	Q15 (The adoption of ABC) Q4 (Nationality)
4	Q15 (The adoption of ABC) Q6 (Type of competition)
5	Q15 (The adoption of ABC) Q7 (Number of products provided)
6	Q15 (The adoption of ABC) Q10 (Cost structure)
7	Q15 (The adoption of ABC) Q12 (Business unit culture)
8+9	Q15 (The adoption of ABC) Q 1+2+3+4+6+7+10+12 (Contingency factors)
10+11	Q 25 (Reasons for ABC rejection)
12+13	Q 24 (Factors militating against ABC adoption)

7.6.2.2 Research variables

Several variables were determined as options for the respondents in the questionnaires. These variables can be classified into five categories: company characteristics, company environment, ABC implementation, reasons for not adopting ABC and future plan regarding ABC implementation. The first two categories were designed to seek general information about respondents and their firms. Hence, these variables applied to all respondents, table 7.4 below shows these variables in more details.

Table 7.4: Variables determined in the questionnaire

Category	Variables Determined in the Questionnaire	Question
	Variables determined for all respondents	
1	Company characteristics	
	1.1 Industry group	1
	1.2 Firm size	2-3
	1.3 Nationality and Company status	4-5
2	Company environment	
	2.1 Production and product characteristics	6-7
	2.2 Accounting systems, cost structure,	8-11, 27-28
	2.3 Business unit culture	12
3	ABC implementation	13-14
	3.1 Knowledge of ABC	15
	3.2 Status of ABC adoption	
	Variables determined for ABC adopters	
	4.1 ABC first introduced	16
	4.2 ABC initiation	17-18
	3.3 Involvement in the implementation of ABC	19
	3.4 Reasons for adopting ABC	20
	3.5 The level of ABC success	21
	3.6 The level of importance to the application of ABC	22
	3.7 Problems of ABC implementation	23
	Variables determined for non-adopters	
4	Reasons for not adopting ABC	
	4.1 Currently considering the adoption of ABC	24
	4.2 Considered and rejected ABC adoption	25
	4.3 Never considered the adoption of ABC	26
5	Future plans about ABC	29

The first category is associated with industry group, firm size, and organisational structure, while the second category consists of variables relevant to production and product/service characteristics (such as degree of diversity of product/services, and types of products/services competition), cost structure (such as the firm's type of cost management techniques, objectives in allocating overhead costs, and bases to allocate overhead costs) and business unit culture (such as innovation and outcome orientation).

The purpose of the third category was to uncover data about the implementation of ABC. Therefore the questions in this section were employed for those who have implemented ABC systems. In fact, there is some confusion between adoption of an ABC idea and implementation of it. Bjornenak (1997) states that 'If ABC is adopted as an idea, but not implemented, it still may affect the way of thinking in a company'. The number of adopters of the idea will be significantly greater than the number of firms implementing ABC. Bjornenak (1997) points out that the number of adopters depends on the definition of adoption. In this study, adopters are defined as firms that have already implemented or are currently implementing ABC. The third category includes variables involving experiences with ABC implementation (such as knowledge and learning about ABC, the status of ABC adoption, and the beginning year to implement ABC), involvement in the implementation of ABC, as well as the reasons for adopting ABC. In addition, this category includes variables involving the level of importance and success to the application of ABC, and the problems of ABC implementation.

The fourth category relates to those firms who have rejected or not considered the implementation of ABC systems. These questions applied to three different groups those currently considering the adoption of ABC, those which had considered and rejected ABC adoption, and those which had never considered the adoption of ABC.

7.6.3 Questionnaire, problems of data collection, and response rate

The questionnaire was developed during July 2004-February 2005 and involved a study of the literature and the pre-testing of the questionnaire in order to ensure that the final version was not misunderstood and was manageable length.

Bourque and Fielder (1995) suggest that mail questionnaire should be no longer than 12 pages; in general between 4 and 12 pages. The questionnaire employed in this study includes of 12 pages. The questionnaire was sent at the beginning of March 2005. To increase the response rate, a reminder was mailed four weeks after the first mail out. The questionnaire with a reminder letter (see Appendix A) and a return envelope were included in the reminder mail out. By the end of May 2005, 218 questionnaires were returned (23.6%, 218/925).

7.6.3.1 Problems of data collection

In this study, missing data was the major issues occurred in data collecting, outlined as follows:

7.6.3.1.1 Missing data

In total, 218 questionnaires (23.6%) were returned, a total of 51 responses were unusable or contained uncompleted responses as follows:

- 16 questionnaires (1.7%) were unusable responses, given the fact that they did not answer and complete some questions in the questionnaire. For instance, four respondents did not answer section 1 question 2 and 3, relating the number of employees and the annual turnover. Some questions in section 1 – question 6 and question 9 relating to the marketing strategy and objectives in allocating overhead were also left uncompleted by some respondents. Five respondents did not understand and complete question 10 relating the cost structure. Some respondents claimed that their firms consisted only of retail trade, not manufacturers. In section 2, some respondents answered question 15, but did not answer the questions which followed. For example, two respondents claimed that their ABC is currently under consideration, but neither answered question 24 nor question 27 and 28. Additionally, three respondents did not answer question 15 and left the rest of the questionnaire empty.

- 35 questionnaires (3.8%) were returned completely unanswered, with the following reasons provided:

- Company policy that we do not complete questionnaire (3 respondents)
- We do not use ABC to any great extent (7 respondents)
- No interest in completing a questionnaire regarding ABC (4 respondents)
- Unable to complete the questionnaire due to business travel and commitments (1 respondent)
- We are not in position to complete it, because most of the cost related decisions and budget setting takes place at our head office out of Ireland (2 respondents)
- The area of ABC is not particularly relevant to us (8 respondents)
- Do not have time to participate (4 respondents)
- The company has not used ABC for some time (5 respondents)
- The questionnaire is too long (1 respondent).

7.6.3.2 Response rate and a comparison with the previous research

Table 7.5 below shows the major surveys conducted in Ireland since 1992 relating to ABC systems. Excluding the current study, these comprise three studies, Clarke, 1992 and 1995, and Pierce and Brown 2002. The first two studies (1992, 1995) were focused on manufacturing firms, and were addressed to financial controllers and chief management accountants. The sample size was 320 and 511 respondents respectively, and the response rate was around 40% in both studies. The third study by Pierce and Brown (2002) extends the area of the target sample, and includes both manufacturing and finance firms, using a sample of 550 companies; they achieved a response rate of 23%.

Comparison with the three previous studies, this study is the most comprehensive in the target respondents. It targets different industrial sectors (manufacturing, financial, and service firms), and targeted a large number of companies (925 companies) shown below:

Table 7.5: A comparison of Irish surveys regarding ABC systems

	Clarke, P 1992	Clarke, P 1995	Pierce and Brown 2002	This study 2005
Target from	Irish Mfg firms	Irish Mfg firms	Irish Mfg and finance companies	Irish Mfg and financial services companies
Drawn from	Irish Business (1991) Top 750 Irish companies	Business and Finance (1995) Irelands Top 1000 Companies	The 2001 Business & Finance listing of top Irish companies	Business and Finance (2004) Irelands Top 1000 Companies
Addressed to	Financial Controllers	Chief Management Accountant	Head of finance Chief executive	Financial controllers Management Accountants Cost Accountants Financial Accountants
Numbers sent	320	511	550	925
Useable response	129	204	122	167
Unusable response	-	-	11	16
Non-response sheet	-	-	13	35
Response rate	40.3%	40%	23.2%	19.1 %

7.6.3.3 Reliability, Validity and Non-response Bias Analysis

Reliability of the multi-item measurement scale in the survey is estimated by using Cronbach's alpha, the most common method accepted by researchers (Francis 2001). Field (2005) argues that Cronbach's α assesses the reliability of a rating summarizing a group of test or survey answers which measure some underlying factor (e.g., some attribute of the test-taker). A score is computed from each test item and the overall rating, called a 'scale' is defined by the sum of these scores over all the test items. Then reliability is defined to be the square of the correlation between the measured scale and the underlying factor the scale was supposed to measure. Table 7.6 below shows the Cronbach's α coefficient for each key variable used in the statistical analysis. The table also presents the descriptive statistics in terms of mean scores and actual range. The findings below indicate overall reliability of all key variables because the values exceed conventional levels of acceptability (Francis 2001).

Table 7.6: Reliability statistics

Variables	Mean	Actual Range	Alpha Cronbach*
- Innovation	3.006	2.874-3.138	.797
- Outcome orientation	4.240	4.120-4.359	.846

* The conventional values = 0.7

It has been argued (Bourque and Fielder 1995; Sekaran (2000)) that when conducting mail surveys, two potential barriers are expected to occur: low response rate and non-response bias. In order to increase the response rate, a reminder was mailed four weeks after the first mail out.

In relation to the non-response bias, it is recommended to test the sample against responses to see if the sample has a different mix of some variables. Table 7.7 below reports the frequency and the percentages of the industry group as follows:

Table 7.7 Test of non-response bias (industry sector)

Industry group	Frequency	Percentage
Business services	198	21.4
Manufacturing	368	39.8
Transport & distribution	49	5.3
Retail trade	69	7.5
Financial services	149	16.1
Exporter	35	3.8
Importer	57	6.1
Total	925	100.0

Venkatraman (1989) argues that in order to assess response bias, a research precedent is to compare the profiles of early and late respondents. Therefore, the first 25 responses received were compared to the last 25 responses. A chi-square test was conducted to see if there was any response bias between business units that answered early and business units that answered late. No evidence of significant response bias was found.

Table 7.8 below shows that there are no differences between the characteristics of companies in the first and the second groups because all significance values are above the alpha level of 0.05. Therefore, evidence of non-response bias was not found and it is expected that 167 respondents in this study can be representative of the whole selected sample.

Table 7.8: Test of non-response bias

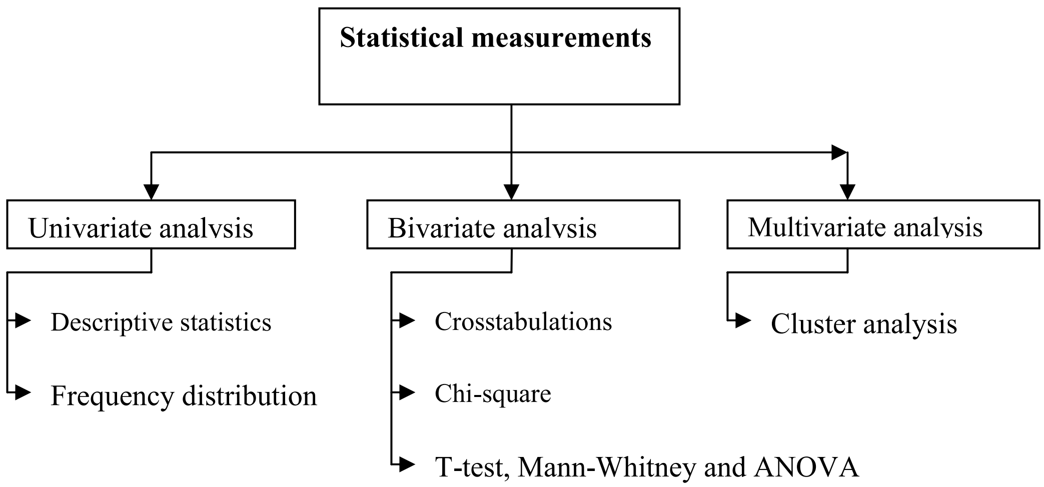
Variables	N	Mean	Standard Deviation	Significance*
Industry group				0.098
- first group	25	1.857	.779	
- second group	25	1.865	.711	
Number of employees				0.088
- first group	25	1.528	.590	
- second group	25	1.732	.700	
Annual turnover				0.071
- first group	25	2.163	.725	
- second group	25	2.111	.698	
Nationality				0.058
- first group	25	1.538	.500	
- second group	25	1.301	.462	
Marketing strategy/ price				0.074
- first group	25	2.413	.677	
- second group	25	2.539	.590	
Marketing strategy/ quality				0.077
- first group	25	2.500	.574	
- second group	25	2.523	.618	
Marketing strategy/ Promo. Act				0.089
- first group	25	1.442	.620	
- second group	25	1.571	.711	
Number of products				0.076
- first group	25	2.038	.858	
- second group	25	2.047	.811	
Cost structure				0.093
- first group	25	2.692	.776	
- second group	25	2.746	.739	
Innovation				0.130
- first group	25	3.788	.941	
- second group	25	3.777	1.038	
Outcome orientation				0.098
- first group	25	4.211	.820	
- second group	25	3.968	.782	

* At the 0.05 level of significance.

7.7 Statistical analysis techniques

Statistical analysis may be divided into three main types: univariate analysis, bivariate analysis and multivariate analysis. The following figure provides clear details of the design of the statistical analysis in this research.

Figure 7.2: Statistical analysis techniques



Developed by researcher

7.7.1 Univariate analysis

Univariate analysis is concerned with examining one single variable. Bryman and Cramer (2001, p5) define univariate analysis as "the various ways of analysing and presenting the information relating to a single variable". Univariate analysis mainly presents information about frequency distribution, central tendency and dispersion.

The nature of univariate analysis is based upon the nature of a variable. Frequency distributions, measures of dispersion and measures used to analyse nominal variables, for example, are not suitable in the case of variables of an interval nature (continuous) such as leverage and total assets (Babbie et al, 2003, p76). Therefore, in order to make use of these useful statistical tools, such as frequency distribution, the continuous variables should be analysed in categorical form (Bryman and Cramer 2001). However, in order to enrich the findings of this research, these variables should be analysed again in their form as continuous variables. Some descriptive statistics such mean, standard deviation, minimum and maximum are the type of univariate analysis that may be applied to continuous variables (Bryman and Cramer, 2001).

7.7.2 Bivariate Analysis

The statistical tools that can be used to analyse differences and associations namely significance tests (can be classified as univariable and bivariable analysis[4]) are employed to find differences between ABC adopters, rejecters, considering and not considering across the different variables (contingency variables).

These comprise the statistical techniques which make assumptions concerning the nature of the populations from which the observations or data were drawn (Siegel, 1996).

In order to establish the various hypotheses relating to the contingent variables, it is necessary to compare the responses to various relevant question of adopting companies with those of non adopting companies. The tests which were performed to achieve this were of the following kinds, and were chosen as being appropriate.

7.7.2.1 Parametric tests

7.7.2.1.1 The independent t-test (2-sample t-test):

This test is in general a parametric test employed to examine whether two means are significantly different from one another. There are three types of t-test: the single t-test,

[4] There is no real consensus on how to classify these tests. Whereas t-test, Mann-Whitney, and ANOVA and Kruskal-Wallis can be classified as univariable analysis because they analyse difference between groups in terms of a single variable, Chi-square and Crosstabulations can be classified as bivariable analysis because they study the relationship between two variables.

the independent t-test and the paired t-test (Brace et al, 2003). As in this research there are more than one group and these groups are independent of each other, the independent t-test is considered to be the appropriate choice. This test draws differences between the ABC adopters group and non ABC adopters. In the case with four groups of firms (implemented, rejected, still considered, and not considered), the independent t-test, can still be used. However, this requires running the test more than once (once between every two groups). A more efficient procedure than this is to run ANOVA (Brace et al 2003).

7.7.2.1.2 Analysis of variance (ANOVA):

ANOVA is considered an extension of the t-test that allows the comparison of the means of more than two groups. ANOVA shows us whether the scores of independent groups vary significantly across these groups (Bryman and Cramer 2001).

However, a disadvantage of ANOVA is that it does not show us whether the ABC adopters group is significantly different from the rejecters group, whether the adopters are significantly different from those still considering the system, or whether rejecters group is significantly different from not-considered group. This drawback can be overcome by Tukey post-Hoc multiple comparisons procedure. This procedure will show whether there is any significant difference between each pair of groups on all the parametric variables.

7.7.2.1.3 Assumptions of the Independent t-test and ANOVA:

The following are the assumptions on which Student's t-test and ANOVA are based, with a summary of their implications for the data set of the current work (Hosmer and Lemeshow 2000):

(i) The dependant variables should be of interval or ratio scale. Variable of interval scale are: employees number, turnover, product diversity and management ownership (before being transformed into a binary variable).

(ii) The variables are normally distributed.

(iii) The samples variances are all equal. Levene's test is run to check this assumption. In SPSS, this test can be run as an option under both ANOVA and the Independent t-test. For the Independent t-test, SPSS provide results under two conditions: equal variances assumed and equal variances not assumed.

Finally, even if the assumptions for these tests are not fully met, their results can be used to compare with those of non-parametric tests (Bryman and Cramer 2001). Furthermore, Hosmer and Lemeshow (2000) suggest that the results of the t-test can be used to indicate which variables qualify for inclusion in the multivariable models.

7.7.2.2 Non-parametric tests:

Non-parametric tests do not require assumptions to be made about the shape of the underlying distribution (Bryman and Cramer 2001). Non-parametric or distribution-free tests do not depend on assumptions about the particular form of the distribution of the sampled populations and are not based on strict assumptions (Bryman and Cramer, 2001; Siegel and Castellan, 1988).

For the purposes of this research, the need for this type of test applies to all the continuous variables except for industrial sector and company's status, which are the only normally distributed variables.

7.7.2.2.1 Mann-Whitney U tests:

For two independent samples, this test is the most commonly used alternative to the independent-samples t-test (Norusis, 2000). This test is employed to compare the two groups ABC adopters and Non-adopters.

7.7.2.2.2 Kruskal-Wallis:

In the case where there are three groups or more such as is the case with having adopters, rejecters and not considered, the Kruskal-Wallis test is the right choice (Norusis, 2000). This non-parametric test is the alternative to one-way analysis of variance (ANOVA).

7.7.2.2.3 Assumptions underlying the Mann-Whitney U test and Kruskal-Wallis:

In fact there is no absolute agreement between statisticians on the assumptions underlying non-parametric tests. Brace et al (2003) and Hart (2001) agree that these tests can be run when data are of interval or ratio scale, but with serious violation to the assumptions of parametric tests such as ANOVA or the Independent t-test (normality and equality of variances). Norusis (2000), on the other hand, emphasizes the assumption that samples tested be similar in shape. Although there is not any particular test to check such assumption, the SPSS 11.0 guide suggests that this can be achieved using “Explore”. Therefore, histograms with normal curve for all the variables in the different groups were plotted and compared. This comparison was mainly based on eyeball inspection[5]. The researcher did not see any significant differences which might cause concern.

[5] This was based on personal communication with a number of statisticians via email.

7.7.2.2.4 Chi-square:

The chi-square test may be employed to reveal the significance of differences between two or more independent samples. According to Siegel (1996), the measurement of the data analysed by this test "may be as weak as nominal or categorical scaling". Chi-Square can be also used for a combination between nominal and ordinal variables. It is described as "the most widely used test of significance, which estimates the probability that the association between variables is a result of random chance or sampling error by comparing the actual or observed distribution or responses we would expect if there were absolutely no association between two variables" (Babbie et al. 2003, p.305). For the purpose of this study, chi-square is employed to investigate the association between the choices of ABC adoption as a dependent variable and each of the independent variables (contingent variables).

7.7.2.2.5 Crosstabulations (Contingency tables):

It is necessary to explain contingency tables within the explanation of the chi-square test, because they are the bases for calculating the chi-square statistic (Siegel 1996).

Babbie et al (2003, p.137) define a crosstabulation as "a matrix that shows the distribution of one variable for each category of a second variable". Contingency tables should be prepared in order to calculate the chi-square statistic. However, it is not the sole function of these tables. Crosstabulations or contingency tables can be used to explore the relationship between two variables. They can give you an approximate idea of whether there is an association between two variables or how strong this association is. On the other hand, the direction of such a relationship cannot be determined through contingency tables unless both variables are ordinal.

7.7.2.2.6 Assumptions for Chi-square

The most commonly known assumptions for Chi-square test in the literature (Siegel 1996) are:

(i) The data are assumed to be a random sample.

(ii) In the contingency tables, the expected frequencies for each category should be at least 1.

(iii) No more than 20% of the categories should have expected frequencies of less than 5. Statisticians suggest that when the contingency tables have 20% of its cells with expected frequencies of less than five or when any of the cells has an expected frequency less than one (zero cell), that the resulting test statistic may be magnified and will lead to inappropriate conclusions (Siegel 1996). For such violation, chi-square corrected for continuity (Yates' correction) can be used; nevertheless, this correction is valid only for 2×2 tables.

7.7.3 Cluster analysis method

Everett, et al., (2001) define cluster analysis as a technique for categorizing observations into groups such that observations in each group are similar to each other while observation in one group should be different from those of other groups or, alternatively stated, cluster analysis seeks to identify a set of groups which both minimize within-group variation and maximize between-group variation. Hair et al (1998) state that cluster analysis is an objective methodology for quantifying the structural characteristics of a set of observations. Aldenderfer and Blashfield (1984) argue that cluster analysis is a multivariate statistical procedure that starts with a data set containing information about a sample of entities and attempts to reorganise these entities into homogeneous groups.

Hair et al (1998) indicate that cluster analysis usually involves two steps. The first is the measurement of some form of similarity or association between the entities to determine how many groups exist in the sample. The second step is to profile the variables to determine their composition. Aldenderfer and Blashfield (1984) argue that most of the varied uses of cluster analysis can be subsumed under four principal objectives: (i) development of a typology or classification, (ii) investigation of useful conceptual schemes for grouping entities, (iii) hypothesis generation through data exploration, and (iv) hypothesis testing, or the attempt to determine if types defined through other procedures are in fact present in a data set.

Chenhall and Langfield-Smith (1998) argue that critical issue in cluster analysis is determining the optimal number of clusters. While there are formal decision rules to guide this process, heuristics are commonly used.

SPSS offers several methods for forming clusters. *Hierarchical clustering* which allows users to select a definition of distance, then select a linking method of forming clusters, then determine how many clusters best suit the data (Sharma 1996). In *k-means clustering* the researcher specifies the number of clusters in advance, and then calculates how to assign cases to the K clusters. K-means clustering is much less computer-intensive and is therefore sometimes preferred when datasets are large .Finally, *two-step clustering* creates pre-clusters, and then it clusters the pre-clusters.

As in this study, there are a large number of cases with eight different variables to be examined; therefore, the K-means is appropriate.

7.7.3.1 K-means cluster analysis:

K-means cluster analysis uses Euclidean distance which is the most common distance measure (Hair et al, 1998). The researcher must specify in advance the desired number of clusters, K. Initial cluster centres are chosen in a first pass of the data, and then each additional iteration of the group's observations is based on the nearest Euclidean distance to the mean of the cluster. Cluster centres change at each pass. The process continues until cluster means do not shift more than a given cut-off value or the iteration limit is reached (Corter 1996).

Cluster centres are the average value on all clustering variables of each cluster's members. The "Initial cluster centres," in spite of its title, gives the average value of each variable for each cluster for the k well-spaced cases which SPSS selects for initialization purposes when no initial file is supplied. The "final cluster centres" table in the SPSS output gives the same thing for the last iteration step. The "iteration history" table shows the change in cluster centres when the usual iterative approach is taken. When the change drops below a specified cut off, the iterative process stops and cases are assigned to clusters according to which cluster centre they are nearest.

7.7.3.1.1 Assumptions of the K-means Cluster Analysis:

(i) Large datasets are possible with K-means clustering, unlike hierarchical clustering, because K-means clustering does not require prior computation of a proximity matrix of the distance/similarity of every case with every other case (Hair et al, 1998).

(ii) Normally in K-means clustering, a given case may be assigned to a cluster, and then reassigned to a different cluster as the algorithm unfolds. However, in agglomerative K-means clustering, the solution is constrained to force a given case to remain in its initial cluster.

(iii) Data are interval in level or are true dichotomies for k-means clustering, though two-step clustering can handle categorical data.

(iv) K-means cluster analysis is very sensitive to outliers. It is common to remove outliers before conducting k-means cluster analysis. In the SPSS Options button dialog for this type of cluster analysis, one can select "Outlier Treatment" to have outlier cases automatically segregated into their own cluster.

(v) K-means cluster analysis usually generates different solutions, depending on the sequence of observations in the dataset. Randomization of cases is recommended.

7.8 Summary and Conclusion

This chapter has addressed a number of issues relating to the choice of research methodology adopted within this study. The overall purpose of the methodology is to test the model, developed in Chapter 6, using an appropriate approach. In this chapter it has been argued that the unique dimension of the study is that it addresses the likely interaction between the contingent variables, which likely predispose companies to adopt or reject ABC, and the difficulties of actual implementation. It is this interaction which, it is argued, will better explain the actual take up of ABC.

The research philosophy is generally contingency/functional leaning and utilises observation, deduction, testing and evaluation. Data collection is by means of postal questionnaire. The survey was conducted amongst the companies comprising Business and Finance Top 1000 Companies. The response rates for the survey were 19.1% .

The questionnaire comprised 12 questions and statistical analysis including parametric and non parametric tests will be used to establish whether or not the seven hypothised contingent factors are individually significantly related to ABC adoption. Should this, the first stage of the model be validated, Cluster Analysis will be utilised to profile the companies according to the individually significant contingent variables. Within each cluster it is hypnotised that there will be companies which have, and companies which have not implemented ABC. For each such cluster the reasons for non implementation will be established. It is hypnotised that the reasons for rejection will differ between clusters and that Technical Issues will be a significant reason amongst those companies within the cluster which most closely matches the contingent variable model. Differences between the reasons will be tested.

The next three chapters will present the statistical results and findings.

CHAPTER 8: RESULTS, FINDINGS AND DISCUSSION: DESCRIPTIVE ANALYSIS

8.1 Introduction

Chapter 7 has addressed a number of issues relating to the choice of research methodology adopted within this research, the research philosophy and paradigms. Moreover, it developed the research questions and the research hypotheses and developed and justified the statistical analysis which will be used in this study.

This chapter presents the univariable analysis of the data collected from each question of the survey. These results are presented, question by question, in the sequence in which the questions appeared in the questionnaire.

The results are presented under the main headings as following: 8.2 Responses to questions asked of all companies. 8.3 Responses to questions asked of adopting companies. 8.4 Responses to questions asked of companies currently considering ABC adoption. 8.5 Responses to questions asked of companies who have rejected ABC. 8.6 Responses to questions asked of companies which had not considered ABC adoption

8.2 Responses to questions asked of all Responding Companies

This section relates to questions asked of all responding companies. Univariable analysis such as frequencies, percentages, means, standard deviations, ranges, and model value will be used to present the results. These questions relate to the Organisational and Environment Characteristics (industrial sectors, size, nationality of ownership, marketing strategy, product diversity, management techniques, objectives of overhead allocation, cost structure, expected change in overhead proportion, and business unit culture) and

ABC Systems (knowledge of ABC, initiate source of ABC knowledge and level of adoption) as per sections 1 and 2 of the questionnaire.

8.2.1 Organisational and Environment Characteristics

8.2.1.1 Industrial Sector

Respondents were asked to indicate the industrial sector in which their companies primarily operate. Table 8.1 below presents the responses by industry sector. All sectors were represented. The manufacturing sector constituted the largest percentage of respondents (44.3%), followed by Business Services (19.2%) and Financial Services (13.8%). Exporter and Importer respondent companies constituted by 1.8% and 4.8% respectively of all replies.

Table 8.1: Industrial sector

Industry group	Frequency	Percentage
Business services	32	19.2
Manufacturing	74	44.3
Transport & distribution	13	7.8
Retail trade	14	8.4
Financial services	23	13.8
Exporter	3	1.8
Importer	8	4.8
Total	167	100.0

Note: Data drawn from question 1 (industry group).

8.2.1.2 Firm Size

All responding companies were asked to indicate both the number of employees and annual turnover. The results are as follows:

8.2.1.2.1 Number of Employees

Respondents were asked to indicate the number of employees in their companies. The number of employees ranged from less than 100 to more than 2000. As shown in table 8.2 below 28.1% of the respondent companies had between 100-250 employees. 22.8% of the respondent companies had between 251-500 employees, and 21.0% of the respondent companies had less than 100 employees. Only 8.4% of respondent companies had more than 1000 employees.

Table 8.2: Number of employees

Number of employees	**Frequency**	**Percentage**
Less than 100	35	21.0
100 – 250	47	28.1
251 – 500	38	22.8
501 – 1,000	33	19.8
1,001 – 2,000	7	4.2
more than 2,000	7	4.2
Total	167	100

Note: Data drawn from question 2 (number of employees).

8.2.1.2.2 Annual Turnover

Respondent companies were asked to indicate the annual turnover in their companies. Annual turnover of respondent companies ranged from less than €5 million to more than €250 million. 29.3% of the respondent companies had turnover from €25 to €50 million

20.4% of the respondent companies had an annual turnover of €100 to €250 million, and 1.8% of the respondent companies had turnover of less than €5 million. Table 8.3 provides more details on annual turnover.

Table 8.3: Annual turnover

Annual turnover	Frequency	Percentage
Less than €5 million	3	1.8
Between €5 to €25 million	29	17.4
Between €25 to €50 million	49	29.3
Between €50 to €100 million	32	19.1
Between €100 to €250 million	34	20.4
More than €250 million	20	12.0
Total	167	100.0

Note: Data drawn from question 3.

8.2.1.3 Nationality of ownership

Table 8.4 shows the Nationality and Public/Private status of respondents. Nationality relates to the two categories of Irish and Non-Irish companies. The results indicate that 55.1% of respondent companies were wholly Irish-owned companies, whereas 44.9% were not wholly Irish-owned companies. Private companies represent 67.7% of respondents by comparison with 32.3% of respondents who indicated they were public companies.

Table 8.4: Company nationality and nature

Features	Frequency	Percentage
Company nationality		
Irish company	92	55.1
Non-Irish company	75	44.9
Company nature		
Public	54	32.3
Private	113	67.7

Note: Data drawn from questions 4, 5.

8.2.1.4 Marketing Strategy

Respondents were asked to rank the relative importance of six factors of competition in their marketing strategy, using 1=most important to 6= least important. The results are presented below in tables 8.5 and 8.6 below:

Table 8.5: Marketing strategy

Types of competition	Price		Quality		Range of products		Customer service		Product innovation		Marketing & Promotional activities	
Most important	52	31%	57	34%	16	10%	18	11%	15	9%	9	5%
Second important	40	24%	36	22%	20	12%	26	16%	39	23%	6	4%
Third important	35	21%	34	20%	28	17%	28	17%	17	10%	25	15%
Fourth important	26	16%	32	19%	47	28%	39	23%	5	3%	18	11%
Fifth important	9	5%	7	4%	32	19%	31	18%	47	28%	41	25%
Sixth important	5	3%	1	1%	24	14%	25	15%	44	27%	68	40%
Total	167	100	167	100	167	100	167	100	167	100	167	100

Note: Data drawn from question 6.

Table 8.6: Marketing strategy analysis

	Range	Average Value	Mode Value	Rank
Price	**1- 6**	**2.49**	**1. N=52**	**2**
Quality	**1- 6**	**2.40**	**1. N= 57**	**1**
Range of products	**1- 6**	**3.78**	**4. N= 47**	**4**
Customer service	**1- 6**	**3.68**	**4. N= 39**	**3**
Product/ Service innovation	**1- 6**	**3.97**	**5. N= 47**	**5**
Marketing and Promotional activities	**1- 6**	**4.68**	**6. N= 68**	**6**

Note: Data drawn from question 6. (1=Most important, 6= least important)

While each factor was scored across the entire range of 1 to 6, Quality and Price appear as the dominant factors. Quality has the highest average value, at 2.40 and the highest mode value of 1, with some 57% of respondents ranking it as either 1 or 2.

Price as an important factor in marketing strategy closely follows Quality in order of importance, with an average value of 2.49 and a model value of 1. Some 55% of respondents ranked Price as either the most important or second most important factor in their marketing strategy. The mode values for all other factors are all in the lower half of the scale, with Marketing and Promotional Activities having a mode value of 6 = least important.

There is however evidence of diversity in the responses, with each factor being scored, by different respondents, over the entire scale.

8.2.1.5 Product diversity

In terms of number of products/services, respondents were asked to indicate the number of products or services they provided. The question provided for six levels of number of products/services (single product/service, 1-10, 11-50, 51-100, 101-1000 and more than 1000). As shown in table 8.7 below, all levels of product diversity are represented in the responses. The results appear almost binomial with high frequencies for product ranges of between 1 and 10, (22.8% of respondents) and of between 101 and 1000, (23.3% of respondents).

Table 8.7: Number of products

Number of products/services	Frequency	percentage
- single product/service	17	10.2
- 1-10	39	23.5
- 11-50	31	18.7
- 51-100	17	10.3
- 101-1000	39	23.5
- more than 1000	23	13.8

Note: Data drawn from question 7.

8.2.1.6 Use of Accounting and Management techniques

Respondents were also asked to indicate the Accounting and Management techniques utilised within their companies. The question provided a list of accounting and management techniques which might be used.

Budgeting was reported as being used by over eighty percent (87.4%) of all respondents. Standard costing was used by over sixty percent (61.1%) of respondents. Return on investment (ROI) was used by over one-half (53.3%) of respondents. The rest of techniques were used by under one-half of respondents, as shown in table 8.8. For example, payback period, net present value and job costing were used by 47.3%, 34.1% and 27.5% respectively. ABC was used by 26.3% of all respondents. Whereas, Balance Scorecard (BCS), Process Costing, Target Cost Planning and Cost-Volume Analysis are utilised by 16.8%, 16.8%, 13.8% and 13.2% of respondents respectively.

Table 8.8: Cost management techniques

Accounting and Management techniques	Frequency	Percentage
- Budgeting	146	87.4
- Standard Costing	102	61.1
- Return On Investment (ROI)	89	53.3
- Payback Period	79	47.3
- Net Present Value (NPV)	57	34.1
- Job Costing	46	27.5
- Activity-Based Costing (ABC)	44	26.3
- Process Costing	28	16.8
- Balance Scorecard (BCS)	28	16.8
- Target Cost Planning	23	13.8
- Cost-Volume-Profit analysis (CVP)	22	13.2
- Quality Cost Analysis (COQ)	9	5.4
- Activity-Based Management (ABM)	7	4.2
- Activity Cost Analysis (ACA)	4	2.4

Note: Data drawn from question 8 (cost management techniques).

8.2.1.7 Objectives of overhead allocation

Respondents were asked to indicate the importance of a range of objectives in allocating overhead costs, on a 5-point Likert-scale, ranging from 1= not important to 5=critically important. As shown in tables 8.9 and 8.10 below, Product/Service Pricing was rated, overall, as the most important objective in the allocation of overhead, with an average value of 3.74 and a mode value of 4 (N=70). Cost Control was ranked, overall as the second most important objective with an average value of 3.68 and a mode value of 4 (N=54).. External Reporting and Production/Service Planning were 'medium important' as objectives in allocating overheads, the average values were 2.78 and 2.88 respectively and mode values of 3 (N=46 and 53). Departments Evaluation and Managers' Performance Evaluation were, overall, 'very important' objectives in allocating overheads with an average value of 3.14 and 3.17 and a mode value of 4 (N= 57 and 58) respectively. Control of cost incidence was rated, overall, as the third most important objective with an average value of 3.25 and a mode value of 4 (N=52).

Table 8.9: Importance of various objectives in allocating overhead costs

Factors in allocating overhead	Not important	Little importance	Medium importance	Very important	Critically important	Total
Product/service cost control	12 7.7%	10 6.5%	36 23.3%	54 34.8%	43 27.7%	155 100.0%
Product/service pricing	11 7.1%	7 4.5%	30 19.4%	70 45.2%	37 23.8%	155 100.0%
External reporting	23 14.7%	42 26.9%	46 29.5%	36 23.1%	9 5.8%	156 100.0%
Production/service planning	17 11.0%	38 24.7%	53 34.5%	38 24.6%	8 5.2%	154 100.0%
Departments evaluation	14 8.9%	27 17.4%	48 30.8%	57 36.5%	10 6.4%	156 100.0%
Managers' performance evalua	15 9.5%	31 19.8%	38 24.3%	58 36.9%	15 9.5%	157 100.0%
Control of cost incidence	14 8.9%	25 15.9%	46 29.4%	52 33.1%	20 12.7%	157 100.0%

Note: Data drawn from question 9 (factors in allocating overhead costs).

Table 8.10: Objectives in allocating overhead costs

	Range	Average Value	Mode Value
Product/service cost control	**1- 5**	**3.68**	**4. N=54**
Product/service pricing	**1- 5**	**3.74**	**4. N= 70**
External reporting	**1- 5**	**2.78**	**3. N= 46**
Production/service planning	**1- 5**	**2.88**	**3. N= 53**
Departments evaluation	**1- 5**	**3.14**	**4. N= 57**
Managers' performance evaluation	**1- 5**	**3.17**	**4. N=58**
Control of cost incidence	**1-5**	**3.25**	**4.N = 52**

Note: Data drawn from question 9. (1=Not important, 5=Critically important)

8.2.1.8 Cost structure

Respondents were asked to indicate the approximate percentage of their total costs by each of the three categories: direct material, direct labour and production/service overhead. The results are presented in table 8.11:

Table 8.11: Cost structure

Statistics	Direct material %	Direct labour %	Overheads %
Mean	42.14	30.06	27.78
Median	40.00	30.00	25.00
Mode	45.00	20.00	20.00
Std. Deviation	16.76	13.42	12.42
Range	75.00	63.00	60.00
Minimum	10.00	10	5.00
Maximum	85.00	73.00	65.00

Note: Data drawn from question 10.

As can be seen from table 8.11 above, the reported cost structure varies between firms. Direct material was the highest cost element, with a mean value of 42.14%, median value of 40% and mode value of 45%, it also recorded the highest range of 75% (Max 85% and Min 10%). Direct labour was the second highest cost element, with a mean value of 30.06%, median 30% and mode value of 20%. The range was 63% between the maximum and minimum range of 73% and 10%. The lowest cost element was Production/Service overheads, with an average value of 27.78%, median value of 25% and mode value of 20%, the range was 60%.

The high variation in cost structure as evidence by the very high range of the responses in each of the three categories of cost may be attributed to the difference in industry characteristics, and the degree of automation.

8.2.1.9 Expectation of changes in overhead costs

Respondents were asked to indicate their expectation of variation in the proportion of production/service overhead costs to total costs over the next five years. 37.7% of respondents indicated that they expected their proportion of overhead costs to total product/service cost would be stable. 31.7% of respondent companies expected that their overhead costs would increase slightly. 12%, 10.2% and 4.8% of respondent companies believed that the proportion of overhead costs would increase substantially, decrease slightly and decrease substantially in the period as shown in table (8.12) below.

Table 8.12: Expected change in proportion of overhead costs

Proportion of overhead costs	Frequency	percentage
To increase substantially	20	12.0
To increase slightly	53	31.7
To be stable	63	37.7
To decrease slightly	17	10.2
To decrease substantially	8	4.8
Do not know	6	3.6

Note: Data drawn from question 11.

8.2.1.10 Business unit culture

Respondents were asked to indicate the extent to which each of 10 items of possible cultural value was in fact valued by their companies. A 5-point scale was used, ranging from 1= not valued at all, to 5= valued to a very great extent. The question was divided into two categories, namely; Innovation and Outcome orientation. The overall results are shown below in table 8.13, the summary statistics of the "Innovation" finding are presented in table 8.14, and the summary statistics for "Outcome Orientation" are presented in table 8.15.

Table 8.13: Business unit culture

Business unit culture	Not valued	Little valued	Medium valued	Very valued	Valued to a very great extent	Total
Innovation						
A willingness to experiment	6 3.6%	34 20.4%	71 42.5%	43 25.7%	13 7.5%	167 100.0%
Not being constrained by many rules	11 6.6%	42 25.1%	74 44.3%	37 22.2%	3 1.8%	167 100.0%
Being quick to take advantages of opportunities	3 1.8%	8 4.8%	33 19.9%	75 45.2%	47 28.3%	166 100.0%
Being innovative	4 2.4%	13 7.8%	38 22.8%	72 43.1%	40 24.0%	167 100.0%
Risk taking	9 5.4%	51 30.5%	69 41.3%	34 20.4%	4 2.4%	167 100.0%
Outcome orientation						
Being competitive	1 0.6%	4 2.4%	18 10.8%	55 32.9%	89 53.3%	167 100.0%
Being achievement oriented	1 0.6%	4 2.4%	28 16.8%	75 44.9%	59 35.3%	167 100.0%
Having high expectation for performance	1 0.6%	3 1.8%	31 18.6%	71 42.5%	61 36.5%	167 100.0%
Being results oriented	1 0.6%	7 4.2%	32 19.2%	56 33.5%	71 42.5%	167 100.0%
Being action oriented	1 0.6%	13 7.8%	50 29.9%	61 36.5%	42 25.1%	167 100.0%

Note: Data drawn from question 12. 1= not valued at all. 5= valued to a very great extent

As can be seen from table 8.13, all questions were scored across the full range of possible answers, indicating high diversity in the responses. In general, the mode scores of the 5 questions relating to "Innovation" indicate that the factors are of "medium value" or "very valued". The 5 factors relating to "Outcome orientation" are more highly valued, with "very valued" and "valued to a very great extent" being the mode responses.

Table 8.14: Business unit culture (Innovation)

Innovation	Range	Mean value	Mode value	Rank
Being quick to take advantage of opportunities	1-5	3.93	4. N= 75	1
Being innovative	1-5	3.78	4. N= 72	2
Willing to experiment	1-5	3.14	3. N= 71	3
Not being constrained by many rules	1-5	2.87	3. N= 74	4
Risk taking	1-5	2.84	3. N= 69	5

1= not valued at all. 5= valued to a very great extent

Table 8.14 above shows the mean scores and the mode values for each item that loaded on this dimension, the highest mean score and mode value was reported on ‘being quick to take advantage of opportunities’ (mean value of 3.93 and mode value of 4: 75). ‘Being innovative’ ranked second by mean score =3.78 and a mode value of (4: 72 company). In contrast ‘Not being constrained by many rules’ and ‘Risk taking’ ranked as the latest valued items in innovation, the mean scores respectively (2.87 and 2.84) and the mode value recorded 3 (N=74 and 69 respectively).

Table 8.15: Business unit culture (outcome orientation

Out come orientation	Range	Mean value	Mode value	rank
Being competitive	1-5	4.36	5. N= 89	1
Being results oriented	1-5	4.13	5. N= 71	2
Having high expectations for performance	1-5	4.13	4. N= 71	3
Being achievement oriented	1-5	4.12	4. N= 75	4
Being action oriented	1-5	3.78	4. N= 61	5

1= not valued at all. 5= valued to a very great extent

The results show higher scores among the factors of outcome orientation than for the innovation factors. The highest factor in this dimension was ‘Being competitive’ (mean score = 4.36 and mode value of 5: 89 company). ‘Being action oriented’ was the lowest scored factor in this group with a mean score of 3.78 and mode value 4.

8.2.2 Activity-Based Costing system (ABC)

This second section of the questionnaire soughs to explore various issues relating to ABC within Irish companies.

8.2.2.1 Knowledge of ABC

Respondents were asked to indicate their level of knowledge relating to ABC systems. 45.8% (76 firms) of respondent companies indicate that they have a general knowledge of ABC, followed by 35% of respondent companies who have a good knowledge of the system. Almost 9% of 167 individual participants claimed that they had no knowledge of ABC. Just 2 participants stated that they had expert knowledge of ABC system, as shown in table 8.16.

Table 8.16: ABC knowledge

ABC knowledge	Frequency	percentage
No knowledge	14	8.4
General knowledge	76	45.8
Good knowledge	58	35.0
Extensive knowledge	16	9.6
Expert knowledge	2	1.2
Total	166	100.0

Note: Data drawn from question 13.

8.2.2.2 Initial source of knowledge of ABC

Respondents were asked to indicate where they first learnt of ABC. The results indicate that 33.3% and 32.7% of respondents first learnt of ABC at university and professional training respectively, followed by seminars or conference (14.7%), in-house training (10.3%) and own readings (9%), as shown in table 8.17 below.

Table 8.17: ABC first learn

Initial source of ABC knowledge	Frequency	percentage
University	52	33.3
Professional training	51	32.7
Seminars or conference	23	14.7
In-house training	16	10.3
Own readings (books, journals and so on)	14	9.0
Total	156	100.0

Note: Data drawn from question 14.

8.2.2.3 Level of ABC adoption

Respondents were asked to indicate the current level of ABC adoption within their organisation. Table 8.18 divides respondents into two groups, (ABC adopters and non ABC adopters). The majority of respondent companies 73.7% (123 firms) reported that they did not use ABC, 26.3% (44 firms) of respondent companies indicate that they use ABC.

Table 8.18: ABC adoption rates

ABC adoption rates	Frequency	percentage
Adopted	44	26.3
Not adopted	123	73.7
Total	167	100.0

Note: Data drawn from question 15.

Table 8.19 below provides a more detailed analysis of the result. It shows that 44 firms (26.3% of respondents) have already implemented ABC. Of those 44 firms who implemented ABC, 86.4% (38 firms) implemented ABC in selected areas, whereas 6 firms have fully implemented ABC. 47.9% (80 firms) of respondent companies had not considered ABC, and 14.4% (24 firms) has rejected ABC after assessment. 11.4% (19 firms) of respondent companies indicates that they are currently considering ABC system.

Table 8.19: ABC adoption rates

ABC adoption rates	Frequency	percentage
Full implementation	6	3.6%
Implemented in selected areas	38	22.7%
Currently under consideration	19	11.4%
Rejected ABC after assessment	24	14.4%
No consideration of ABC to date	80	47.9%
Total	167	100.0

Note: Data drawn from question 15.

8.3 Responses to questions asked of adopting companies

8.3.1 First ABC introduced

Respondents were asked to indicate when ABC was first introduced in their companies. Of the 44 firms which have implemented ABC, 6 firms (13.6%) implemented the system before 1995, and 14 firms (31.8%) of ABC adopters implemented the system between 1995 to 1999. More than a half (54.6%) of ABC adopters implemented the system during the last five years.

Table 8.20: ABC first introduced

ABC first introduced	Frequency	percentage
Before 1995	6	13.6
1995-1999	14	31.8
2000 to date	24	54.6
Total	44	100.0

Note: Data drawn from question 16.

8.3.2 Initiators of ABC

Respondents were asked to indicate who initiated the adoption of ABC. The results are presented in table 8.21 below which indicates that 56.8% of ABC adopters reported that ABC adoption was initiated in their firms by senior management, followed by accounting/finance managers (38.6%). Production managers and research and development personnel each constitute just 2.3% of the responses. Furthermore, the results reported no initiation by Marketing Managers, Customer Service Managers and Information Systems personnel.

Table 8.21: Initiators of ABC adoption

Initiated of ABC adoption	Frequency	percentage
Senior management	25	56.8
Accounting/Finance managers	17	38.6
Production managers	1	2.3
Research & development personnel	1	2.3
Marketing managers	0	0
Customer service managers	0	0
Information systems personnel	0	0
Total	44	100.0

Note: Data drawn from question 17.

8.3.3 ABC introduction strategy

Adopting companies were asked to indicate if they initially introduced ABC across the whole organisation or in selected areas. Table 8.22 below shows that the majority of implementers (81.8%) introduced ABC in selected areas, whereas (18.2%) introduced ABC across the whole organisation.

Table 8.22: Introduction strategy

Introduction strategy	Frequency	percentage
Across the whole organisation	8	18.2
In selected areas	36	81.8
Total	44	100.0

8.3.4 Involvement with ABC implementation

Respondents were asked to identify how much involvement each of a variety of parties had in implementing ABC. As reported in table 8.23, in-house accountants were the most highly involved parties in implementing ABC (mean scores = 4.45) and had the highest mode (5: 25 firms). Some other parties had a mean score above the mid range of the scale used. For example Senior Executives, Production Personnel and Information System Personnel and External Consultants (mean scores = 2.95, 2.88, 2.86 and 2.53 respectively). Table 8.23 reports these results in more details.

Table 8.23: Involvement in ABC implementation

	N	**Range**	**Mean**	**Mode value**
In-house accountants	44	1-5	4.45	5.N=25
Senior executives	43	1-5	2.95	3. N=23
Production personnel	43	1-5	2.88	3.N=20
Information system personnel	44	1-5	2.86	3.N=21
External consultants	43	1-5	2.53	3.N=19
Sales/marketing personnel	42	1-5	2.38	3.N=15
Purchasing/procurement personnel	43	1-5	2.35	3.N=21
Distribution personnel	42	1-5	2.29	3.N=21
Research & development personnel	43	1-5	2.07	3.N=20

Note: Data drawn from question 19.
(5-point scale where 1= low involvement and 5= high involvement).

8.3.5 Reasons for ABC adoption

The adopters of ABC (44 firms) were asked in question 20 to rate the importance of six factors in their decision to adopt ABC using a five-point scale where 1 represented ‘not important’ and 5 represented ‘critically important’. Table 8.24 below shows the results.

ABC users indicated that inability of the traditional cost systems to provide relevant cost information (mean scores = 4.40, mode=5) was the most highly ranked reason in their decision to adopt ABC. The results also show that increased competition (mean scores =

3.59, mode=4), increased range of product/service (mean scores = 3.53, mode = 4) and increased overhead (mean scores = 3.52, mode = 4) were also highly ranked reasons for adopting ABC, as shown in table 8.24.

Table 8.24: Reasons for ABC adoption

Importance in ABC decisions	N	Range	Mean	Mode	SD
- Inability of the traditional systems to provide relevant cost information	44	1-5	4.40	5. N=24	0.84
- Increasing competition	44	1-5	3.59	4. N=22	0.99
- Increasing range of product/service	43	1-5	3.53	4. N=19	1.09
- Increasing overhead	44	1-5	3.52	4. N=25	1.02
- Increasing regulatory environment	43	1-5	2.49	2. N=12	1.12

Note: Data drawn from question 20. (5-point scale where 1= not important & 5=critically important).

8.3.6 Success of ABC implementation

Respondents were asked to give their opinions on the level of success they ascribed to the ABC system in relation to each of 19 specified areas of application, on a 5-point scale ranging from 1= low success level to 5= high success level.

Table 8.25 below shows that each of the areas received scores across the full range of possible responses, indicating highly different "success" scores across the responding companies. In general, "Pricing" was the area of application with the highest mean score (4.17), followed by "Budgeting", (mean score 4). Both have high and equal mode values of 4. "Cost Reduction", "Customer Profitability Analysis" and "Performance Measures" also in general, score highly, with model values of 3 and mean values in excess of the midpoint of the range.

Table 8.25: ABC applications (Success)

	N	Range	Mean	Mode	SD
Product/service pricing	42	1-5	4.17	4. N=23	0.66
Budgeting	43	1-5	4.00	4. N=29	0.72
Cost reduction	43	1-5	3.49	4. N=18	0.94
Customer profitability analysis	41	1-5	3.47	4. N=19	1.21
Performance measurement	42	1-5	3.45	4. N=18	1.17
Forecasting	43	1-5	3.37	3. N=19	1.00
Output decisions	41	1-5	3.19	3. N=12	1.17
Cost modelling	42	1-5	3.10	3. N=15	1.12
Strategic planning	43	1-5	3.02	3. N=13	1.10
Process/operating management	41	1-5	2.80	3. N=15	0.95
Value added analysis	42	1-5	2.76	3.N=13	1.14
New product/service design	40	1-5	2.75	3. N=15	1.13
Outsourcing decisions	42	1-5	2.71	3. N=14	1.22
Restructuring decisions	43	1-5	2.65	3. N=16	1.11
Capital investment decisions	40	1-5	2.60	2. N=14	1.05
Stock valuation	41	1-5	2.37	2. N=19	1.18
Quality initiative	40	1-5	2.35	2. N=13	1.07
Reward system	41	1-5	2.17	2. N=18	1.02
JIT/speed initiative	39	1-5	1.72	1. N=17	0.82

Note: Data drawn from question 21.
(5-point scale where 1= low success, importance & 5= high success, importance).

8.3.7 Importance of ABC implementation

Respondents were asked to give their opinions on the degree of importance they ascribed to the ABC system in relation to each of 19 specified areas of application, on a 5-point scale ranging from 1= low importance level to 5= high importance level

Table 8.26 below indicates that each of the areas of application received scores over the full range of possible responses, indicating high differences between the companies in tier rating of the importance of ABC to the particular application.

In general, the five areas of “Product and Service Pricing”, “Budgeting”, “Cost Reduction”, “Performance Measurement” and “Customer Profitability Analysis” received high rankings, as was the case with “Success”.

Table 8.26: ABC applications (importance)

	N	Range	Mean	Mode	SD
Product/service pricing	42	1-5	4.60	5. N=28	0.63
Budgeting	43	1-5	4.33	5. N=19	0.68
Cost reduction	42	1-5	4.07	4. N=19	0.95
Performance measurement	41	1-5	3.90	5. N=16	1.26
Customer profitability analysis	41	1-5	3.68	4. N=21	1.11
Output decisions	41	1-5	3.54	3. N=13	1.21
Cost modelling	42	1-5	3.43	3. N=22	0.94
Forecasting	42	1-5	3.40	3. N=20	0.94
Process/operating management	41	1-5	3.12	3. N=15	1.07
Strategic planning	42	1-5	3.09	3. N=21	1.00
New product/service design	41	1-5	3.09	3. N=22	0.99
Value added analysis	42	1-5	3.07	3. N=18	1.05
Outsourcing decisions	43	1-5	2.93	3. N=17	1.18
Restructuring decisions	43	1-5	2.77	3. N=18	1.09
Capital investment decisions	40	1-5	2.75	3. N=20	1.03
Stock valuation	42	1-5	2.62	3. N=12	1.32
Quality initiative	40	1-5	2.40	2. N=14	1.01
Reward system	41	1-5	2.34	2. N=18	1.04
JIT/speed initiative	40	1-5	1.90	2. N=17	0.81

Note: Data drawn from question, 22.
(5-point scale where 1= low success, importance & 5= high success, importance).

8.3.8 Difficulties encountered

Respondents who have already implemented ABC (44 firms) were asked to indicate the extent of the difficulties encountered in 5 areas in designing and implementing their ABC system. The level of difficulty encountered was ranked on a five-point scale (1= very easy and 5= very difficult). Table 8.27 summarises the findings.

Table 8.27: Difficulties of ABC implementation

Difficulties in implementing ABC	N	Range	Mean	Mode	SD
- In selecting cost drivers	44	1-5	4.18	5. N=22	0.97
- In designing the system	44	1-5	4.02	4. N=16	0.85
- In assigning activity's costs to cost objects	44	1-5	3.86	4. N=16	0.88
- In defining activities	44	1-5	3.75	4. N=19	0.89
- In assigning resources to activities	44	1-5	3.59	4. N=18	0.84

Note: Data drawn from question 23. (5-point scale where 1= very easy & 5= very difficult).

As shown above, selection of cost drivers was generally scored as being the most difficult area with a mean score of 4.18 out of 5 and a model score of 5 out of 5.

The second highest scored difficulty was 'Designing the system' with a mean score of 4.02 and with a model score of 4 out of 5. Moreover, the remaining technical difficulties such as assigning activity's cost to cost objects, identifying activities and assigning resources to activities were all scored as being as 'quite difficult' (mean scores= 3.86 , 3.75 and 3.59) respectively.

8.4 Responses to questions asked of companies currently considering ABC adoption

8.4.1 Factors militating against ABC adoption

Companies currently considering the adoption of ABC (19 firms) were asked to identify factors militating against its adoption, by ticking a range of possible factors, the results are presented in table 8.28 below. Difficulty in selecting cost drivers and difficulty in defining activities were both ranked as the most common difficulties (73.7% and 68.4% respectively), followed by high costs of ABC implementation, uncertainty of ABC benefits, difficulty in assigning resources to activities and data collection difficulties(63.2%, 63.2%, 57.9% and 52.6%) respectively.

The bottom half of table 8.28 shows the least important reasons, such as internal resistance, higher priority of other changes/projects, lack of top management support and inadequate computer software by (26%, 26%, 21% and 21% respectively).

Table 8.28: Factors against adoption of ABC

Factors	Frequency	percentage
- Difficulty in selecting cost drivers	14	73.7
- Difficulty in defining activities	13	68.4
- High costs of ABC implementation	12	63.2
- Uncertainty of ABC benefits	12	63.2
- Difficulty in assigning resources to activities	11	57.9
- Data collection difficulties	10	52.6
- Difficulty in assigning activity's costs to cost objects	8	42.1
- internal resistance	5	26.3
- A higher priority of other changes/projects	5	26.3
- Lack of top management support	4	21.0
- Inadequate computer software	4	21.0
- Other reasons	0	0

Note: Data drawn from question 24 (multiple responses).

8.5 Responses to questions asked of companies who have rejected ABC

The 24 companies which had rejected ABC were asked to identify the reasons why they had rejected. As shown in table 8.29 below, technical difficulties were most commonly reported as reasons for their rejection of the system. For example, 83 % of rejecting companies (24 companies) indicate difficulty in selecting cost drivers as a reason for rejecting ABC. In addition, difficulty in defining activities and in assigning the cost of activities to cost object were reported as reasons for rejecting ABC in 75.0% and 70.8% respectively. Data collection difficulties and high costs of ABC implementation were both stated as reasons by 62.5% of responses of firms which had rejected ABC.

Table 8.29: Reasons for rejecting ABC

Factors	Frequency	percentage
- Difficulty in selecting cost drivers	20	83.3
- Difficulty in defining activities	18	75.0
- Difficulty in assigning activity's costs to cost objects	17	70.8
- Data collection difficulties	15	62.5
- High costs of ABC implementation	15	62.5
- Difficulty in assigning resources to activities	13	54.2
- Satisfied with current system	12	50.0
- ABC is not relevant to our business	10	41.7
- Uncertainty of ABC benefits	9	37.5
- Inadequate computer software	7	29.2
- Internal resistance	6	25.0
- Small percentage of overhead costs	6	25.0
- Lack of top management support	6	25.0
- A higher priority of other changes/projects	5	20.8
- Manufacturing process is simple, easy to track costs	4	16.7
- The number of products/service is low	3	12.5
- Lack of knowledge regarding ABC	0	0
- Other reasons	0	0

Note: Data drawn from question 25 (multiple responses).

Behavioural and System's reasons are also indicated in table 8.29. 12 firms which had rejected ABC indicate that they were satisfied with their current system and 10 firms indicated that ABC was not relevant to their business. Uncertainty of ABC benefits, inadequate computer software and internal resistance were indicated as reasons for rejection by some companies that rejected ABC.

Finally, the least cited reasons for rejecting ABC include Internal resistance (25%), Small percentage of overhead costs (25%), Lack of top management support (25%), a higher priority of other projects (20.8%), manufacturing process is simple (16.7%), and the number of products/service is low (12.5%). Lack of knowledge regarding ABC was not mentioned by any rejected companies

8.6 Responses to questions asked of companies which had not considered ABC adoption

8.6.1 Reasons for not considering ABC

Companies which had not considered the adoption of ABC (80 firms) were asked to indicate the possible reasons for their decision. Table 8.30 below reports the results.

'Small percentage of overhead costs' was the most frequent reason given for not considering ABC adoption by (95% of respondent companies), followed by 'small number of products/ services' (86.3%). 66 companies indicate that they are satisfied with their current system, and 61 companies indicated that ABC was not relevant to our business.

Table 8.30: Reasons for not considering ABC

Factors	Frequency	percentage
- Small percentage of overhead costs	76	95.0
- The number of products/service is low	69	86.3
- Satisfied with current system	66	82.5
- ABC is not relevant to our business	61	76.3
- Manufacturing process is simple, easy to track costs	54	67.5
- Lack of knowledge regarding ABC	48	60.0

Note: Data drawn from question 26 (multiple responses).

8.6.2 Currently used basis for overhead allocation

In allocating overhead costs to cost objects, respondents who did not adopt ABC were asked to indicate the current bases used to allocate overheads to cost objects. The most common base was direct labour hours reported by 79.7% of respondent companies. Machine hours were used by 59.3% of respondent companies. Units of products and direct material costs were used by 31.7% and 22.8 respectively of respondent companies, as shown in table 8.31.

Table 8.31: Basis in cost allocation

Basis in Cost Allocation	Frequency	percentage
- Direct labour hours	98	79.7
- Machine hours	73	59.3
- Units of products	39	31.7
- Direct materials costs	28	22.8
- Other	0	0

Note: Data drawn from question 27 (basis in cost allocation).

8.6.3 Satisfaction with the current cost system

All respondents were asked to indicate their satisfaction with the current overhead cost allocation. 46.7% of respondent companies were reasonably satisfied with their systems. 13.2% of respondent companies claimed that their systems needed improvements. 10.8% of respondent companies indicated that they were very satisfied with their current system. 1.8% of respondents were dissatisfied with the current overhead allocation system as showed in table 8.32 below.

Table 8.32: Satisfaction with the current cost system

Satisfaction status	Frequency	percentage
Very satisfied	18	10.8
Reasonably satisfied	78	46.7
Needs improvements	22	13.2
dissatisfied	3	1.8

Note: Data drawn from question 28.

8.6.4 ABC future anticipation

Respondents (non-adopters) were asked to indicate whether they anticipated that their company would adopt ABC in the next five years. Table 8.33 below shows that 11.5% anticipated expect that ABC would be implemented. 66.5% expected to not implement the system, (22%) do not know if they are going to implement the system or not.

Table 8.33: ABC future anticipation

Future anticipation	Frequency	percentage
Yes	14	11.5%
No	81	66.5%
I do not know	27	22%

Note: Data drawn from question 29.

8.7 Summary and Conclusion

This chapter reports the findings of a survey of ABC used in Irish companies. The questionnaire used in this study, consists of 29 questions and was divided into two main sections (see chapter 7 for more details). The first section aimed to examine company characteristics, whereas the second section was designed to examine the adoption statues of ABC amongst the participants. Moreover, the results are presented, question by question, in the sequence in which the questions appeared in the questionnaire. The results of the survey outline a general picture for the Irish companies.

The manufacturing sector constituted the largest percentage of respondents, followed by Business Services and Financial Services. Exporter and Importer respondent companies constituted the smallest percentage of respondents as presented in table 8.1.

Number of employees and annual turnover have been used and examined in the survey as variables for analysing the firm sizes. The results show that the most frequent number of employees ranged between 100-250 employees, followed by the range between 251-500 employees, and the range between 501-1000. A small percentage of respondents companies are in the range of more than 1000 employees as reported in table 8.2. Annual turnover ranged from less than €5 million to more than €250 million. The largest percentage of the respondent companies had turnover from €25 to €50 million followed by the range from €100 to €250 million, and the smallest percentage of the respondent companies had turnover of less than €5 million, see table 8.3 for more details.

The findings show the Nationality and Public/Private status of respondents. Nationality relates to the two categories of Irish and Non-Irish companies. The results indicate that 55.1% of respondent companies were wholly Irish-owned companies, whereas 44.9%

were not wholly Irish-owned companies. Private companies present a large percentage of respondents by comparison with public companies.

Six factors of competition have been examined in relation to the marketing strategy of among the Irish companies. Quality and Price appear as the dominant and the most important factors in their marketing strategy. The mode values for all other factors (customer service, range of products, product/service innovation and marketing activities) are all the lower half of the scale. There is however evidence of diversity in the responses, with each factor being scored, by different respondents, over the entire scale, tables 8.5 and 8.6 reported the analysis for more details.

Regarding production diversity, the results appear almost binomial with high frequencies for product ranges of between 1 and 10, and of between 101 and 1000 products (table 8.7).

In relation to the management accounting techniques utilised within Irish companies, the results reveal that Budgeting was reported as being used by over eighty percent of all respondents. Standard costing was used by over sixty percent of respondents. Return on investment (ROI) was used by over one-half of respondents. The rest of techniques were used by under one-half of respondents (table 8.8).

Respondents were asked to indicate the importance of a range of objectives in allocating overhead costs. Product/Service Pricing was rated, overall, as the most important objective in the allocation of overhead, cost Control was ranked, overall as the second most important objective. External Reporting and Production/Service Planning were 'medium important' as objectives in allocating overheads, Departments Evaluation and Managers' Performance Evaluation were overall, 'very important' objectives in allocating overheads. Control of cost incidence was rated, overall, as the third most important objective (Tables 8.9 and 8.10).

It is interesting to note that cost structure varies between firms, the main reason that a different industrial sectors included in the sample. Direct material was the highest cost element, direct labour was the second highest cost element, and the lowest cost element was Production/Service overheads (table 8.11). The high variation in cost structure as evidence by the very high range of the responses in each of the three categories of cost may be attributed to the difference in industry characteristics, and the degree of automation. Furthermore, respondents were asked to indicate their expectation of variation in the proportion of production/service overhead costs to total costs over the next five years. The highest percentage of respondents indicated that they expected their proportion of overhead costs to total product/service cost would be stable (Table 8.12).

The findings indicate the extent to which each of the chosen items of possible cultural value was in fact valued by their companies. The question was divided into two categories, namely; Innovation and Outcome orientation. Tables (8.13, 8.14, and 8.15) show the overall results which based on the mean scores and the mode values for each item that loaded on this dimension. In general, the mode scores of the 5 questions relating to "Innovation" indicate that the factors are of "medium value" or "very valued". The 5 factors relating to "Outcome orientation" are more highly valued, with "very valued" and "valued to a very great extent" being the mode responses.

The second section of the survey reports the results of various issues relating to ABC within Irish companies. Respondents were asked to indicate their level of knowledge relating to ABC systems. The highest percentage of respondent companies indicates that they have a general knowledge of ABC, followed by companies who have a good knowledge of the system (table 8.16). The results also indicate that 33.3% and 32.7% of respondents first learnt of ABC at university and professional training respectively, followed by seminars or conference (14.7%), in-house training (10.3%) and own readings (9%), as shown in table 8.17.

The implementation rate of ABC has been examined, the highest percentage of respondent companies 73.7% reported that they did not use ABC, while 26.3% of respondent companies indicate that they use ABC. The results also reveal a more detailed analysis regarding the ABC adopters and non-adopters. It shows that 44 firms have already implemented ABC, 38 firms implemented ABC in selected areas, whereas 6 firms have fully implemented ABC. 80 firms of respondent companies had not considered ABC, and 24 firms have rejected ABC after assessment. 19 firms of respondent companies indicate that they are currently considering ABC system (table 8.18, 8.19).

In relation to the involvement with the ABC implementation, the results reveal that in-house accountants was the most highly involved parties in implementing of ABC, the rest of the parties had a mean score above the mid range of the scale used, such as Senior Executives, Production Personnel and Information System Personnel and External Consultants (table 8.23).

Reasons for ABC adoption were examined, the results show that inability of the traditional cost systems to provide relevant cost was the most highly ranked reason in their decision to adopt ABC. The results also show that increased competition, increased range of product/service and increased overhead were also highly ranked reasons for adopting ABC, (table 8.24).

Respondents were asked to give their opinions on the level of success and on importance they ascribed to the ABC system in relation to each of 19 specified areas of application. In general, Pricing was the area of application with the highest success and importance application, followed by Budgeting. Cost Reduction, Customer Profitability Analysis and Performance Measures also in general, score highly in both questions (table 8.25, 8.26).

Regarding the difficulties of ABC implementation, the results reveal that selection of cost drivers was generally scored as being the most difficult area, followed by the difficulty of designing the system. Moreover, the remaining technical difficulties such as assigning activity's cost to cost objects, identifying activities and assigning resources to activities were all scored as being 'quite difficult' (table 8.27).

In relation to the factors militating against ABC adoption, the findings report that difficulty in selecting cost drivers and difficulty in defining activities were both ranked as the most common difficulties, followed by high costs of ABC implementation, uncertainty of ABC benefits, difficulty in assigning resources to activities and data collection difficulties. The bottom of the table shows the least important reasons, such as internal resistance, higher priority of other changes/projects, lack of top management support and inadequate computer software (table 8.28).

Reasons for rejecting ABC reveal that technical difficulties were most commonly reported reasons for their rejection of the system. Behavioural and System's reasons are also indicated as the least cited reasons for rejecting ABC include Internal resistance, Small percentage of overhead costs, Lack of top management support, a higher priority of other projects, manufacturing process is simple, and the number of products/service is low, Lack of knowledge regarding ABC was not mentioned by any rejected companies (table 8.29).

Reasons for not considering ABC report that small percentage of overhead costs was the most frequent reason given for not considering ABC adoption, followed by small number of products/ services, satisfied with their current system, and ABC was not relevant to our business (table 8.30).

In relation to the current bases used to allocate overheads to cost objects, the results indicate that the most common base was direct labour hours, followed by machine hours, units of products and direct material costs (table 8.31).

Regarding the Satisfaction with the current cost system, the highest percentage of respondent companies was reasonably satisfied with their systems, followed by those who claimed that their systems needed improvements, very satisfied with their current system and dissatisfied with the current overhead allocation system (table 8.32).

For the ABC future anticipation, the highest percentage expected to not implement the system, comparison with those who anticipated that ABC would be implemented (8.33).

As this chapter is concerned with examining one single variable, the next chapter will analyse differences and associations namely significance tests to find differences between ABC adopters, rejecters, considering and not considering across the different variables (contingency variables).

CHAPTER 9: BIVARIATE STATISTICAL ANALYSIS

9.1 Introduction

This chapter presents and discusses the results of the bivariable analysis of the underlying relationships between independent variables (industrial sector, size, nationality, type of competition, product diversity, cost structure, overhead expectation and business unit culture) and levels of ABC adoption (implemented, under consideration, rejected and no consideration).

Crosstabulations or contingency tables and Mann-Whitney will be used to explore the relationships among these variables. This will provide an approximate idea of whether there is an association between these variables and how strong this association may be.

The rest of the chapter is organised as follows. Section 9.2 outlines the results of the chi-square test. Section 9.3 describes the results of the Mann-Whitney technique which undertaken to test the differences between the variables. The last section contains the main conclusion.

9.2 Crosstabulations and Chi-square results:

Crosstabulations (contingency tables) were initially employed to examine the relationship between the four levels of ABC adoption and each hypothesized contingent variable separately. This relationship was examined by establishing the distribution of each independent variable separately over the four groups of firms (implemented, under consideration, rejected, and no consideration). If the distribution of the independent variable across the four groups of firms is equal, or near equal, then the hypnotized relationship does not exist. Where there is a difference in the distribution of the variable across the groups, then the larger the difference the stronger is the association between the independent variable and the grouping, as is pointed out by Babbie et al. (2003). This relationship may be tested by means of a chi-squared test. In the analysis which follows, a 95% confidence level was used in establishing the existence of the relationship.

As part of the crosstabs procedures SPSS produces a [6]table that includes the chi-square statistics and its significant value.

9.2.1 Industrial Sector and ABC adoption

The initial crosstabulation of the four levels of ABC adoption and seven industrial sectors, as used in the questionnaire, resulted in a 28 cell matrix (4 by 7). A number of the cells in this matrix had zero observations. As is emphasized by Menard (2001) and Siegel and Castellan (1988), such zero cells distort the Chi-Square value. The initial table was therefore collapsed by combining the results of the four sectors, Transport and Distribution, Retail Trade, Exporter, and Importer, into one classification, entitled "Other". This resulted in table 9.1, shown below.

Table 9.1: Industry sectors and levels of ABC adoption

Group	Business service	Manufacturing	Financial service	Others	Total
Implemented	4 12.5%	25 33.8%	9 39.1%	6 15.8%	44 26.3%
Under consideration	2 6.3%	5 6.8%	5 21.7%	7 18.4%	19 11.4%
Rejected	8 25.0%	7 9.4%	2 8.8%	7 18.4%	24 14.4%
No consideration	18 56.2%	37 50.0%	7 30.4%	18 47.4%	80 47.9%
Total	32 100.0%	74 100.0%	23 100.0%	38 100.0%	167 100.0%

[6] The basic rule of thumb is that with 2X2 contingency tables no expected values should be below 5. In larger tables the rule is that all expected values should be greater than 1 and no more than 20% of expected counts should be less than 5 (Siegel and Castellan 1988).

Some 60% of financial service companies have implemented or are considering the implementation of ABC, as opposed to 40% of Manufacturing companies, 34% of others, and 18% of Business service.

The chi-squared test (table 9.2) below shows that the relationship between industry classification and ABC adoption status is significant (p-value=.037).

Table 9.2: Chi-square tests for industry sectors

	Value	df	Asymp. Sig (2- sided)
Pearson Chi-Square N of Valid cases	17.874 167	9	.037

9.2.2 Firm size and ABC adoption

The size of companies was measured both by the number of employees and annual turnover.

9.2.2.1 Number of employees

The number of employees ranged from less than 100 to more than 2000 employee, within six different levels. A cross tabulation of the six levels of employees and the four levels of ABC adoption resulted in a 24 cell matrix (4 by 6), some cells of which had zero observations. As has been noted above, such zero cells can distort the interpretation of the data. Therefore, these six levels were collapsed into three different size groups (Small, Medium and Large). It should be noted that these terms are relative as the sample was derived from the top 1000 Irish company's. A small company in this context is one with less than 100 employees, a medium sized company is one with 100-500 employees and large companies are those with employees' number more than 500 employees.

Table 9.3 below indicates that the proportional distribution of the different size categories is very different across the four categories of ABC adoption status. The largest proportion of ABC implementers are classified as "Large", around 49% of large sized companies have implemented ABC, as opposed to around 6% of small sized companies. Likewise 80% of small sized companies have not considered ABC implementation, as opposed to 23% of large sized companies. In effect, "Small" companies have lower levels of implementation and higher levels of "no consideration" than the other sized companies.

Table 9.3: Size categories and levels of ABC adoption

Group	Small <100	Medium 100-500	Large >500	Total
Implemented	2 5.7%	19 22.3%	23 48.9%	44 26.3%
Under consideration	3 8.6%	11 12.9%	5 10.6%	19 11.4%
Rejected	2 5.7%	14 16.5%	8 17.1%	24 14.4%
No consideration	28 80.0%	41 48.3%	11 23.4%	80 47.9%
Total	35 100.0%	85 100.0%	47 100.0%	167 100.0%

The chi-squared test (31.453) shows that the relationship between number of employees and ABC adoption status is a very significant (*p*-value=.000), as shown in table 9.4 below.

Table 9.4: Chi-square tests for size categories

	Value	df	Asymp. Sig (2- sided)
Pearson Chi-Square N of Valid cases	31.453 167	6	.000

9.2.2.2 Annual turnover

The annual turnover ranged from less than €5 million to more than €250 million, within six different levels (Less than €5 million, €5 to €25, €25 to €50, €50 to €100, €100 to €250 and more than €250 million). The crosstabulation between these six levels and ABC adoption status resulted in some zero cells. Therefore, these six levels of annual turnover were collapsed into three different size groups (Small, Medium and Large). Small companies within this context are those with less than €25 million annual turnover; medium sized companies as those with €25 - €100 million annual turnover and large companies are those with turnover of more than €100 million annually.

As shown in table 9.5 below, that some 55% of large companies have implemented or are considering the implementation of ABC, as opposed to 25% of small sized companies. Likewise, only 28.6% of "Large" companies have never considered ABC, as opposed to 62.5% of "small companies".

Table 9.5: Annual turnover categories and levels of ABC adoption

Group	Small < €25 mio	Medium 25-100	Large > €100	Total
Implemented	3 9.4%	17 21.5%	24 42.9%	44 26.3%
Under consideration	5 15.6%	7 8.9%	7 12.5%	19 11.4%
Rejected	4 12.5%	11 13.9%	9 16.1%	24 14.4%
No consideration	20 62.5%	44 55.7%	16 28.6%	80 47.9%
Total	32 100.0%	79 100.0%	56 100.0%	167 100.0%

The high value of the chi-square statistics (23.017) indicates that the relationship between turnover and ABC adoption status is significant (*p*-value= 0.001), table 9.6 below shows the results.

Table 19.6: Chi-square tests for annual turnover

	Value	df	Asymp. Sig (2- sided)
Pearson Chi-Square N of Valid cases	23.017 167	6	.001

9.2.3 Nationality of ownership and ABC adoption

Table 9.7 provides the results of a cross tabulation of nationality with ABC adoption status. Nationality relates to two categories, Irish and non-Irish. The results show that some 43% of Irish companies have implemented or are considering the implementation of ABC, around 15% of Irish companies have rejected ABC, and 41.3% are not considering the implementation of ABC. For "Non Irish companies" some 30% have implemented or are considering the implementation of ABC, 13.3% have rejected ABC, and 56% are not considering the implementation of ABC system.

Table 9.7: Nationality categories and levels of ABC adoption

Group	**Irish company**	**Non-Irish company**	**Total**
Implemented	28 30.4%	16 21.4%	44 26.3%
Under consideration	12 13.1%	7 9.3%	19 11.4%
Rejected	14 15.2%	10 13.3%	24 14.4%
No consideration	38 41.3%	42 56.0%	80 47.9%
Total	92 100.0%	75 100.0%	167 100.0%

The value of the chi-squared test (3.764) shows that the relationship between nationality and ABC adoption status is insignificant (p-value = .288) as shown in table 9.8 below.

Table 9.8: Chi-square tests for nationality

	Value	df	Asymp. Sig (2- sided)
Pearson Chi-Square N of Valid cases	3.764 167	3	.288

9.2.4 Public/Private Status and ABC adoption

Table 9.9 reports the relationship between company status (Public or Private) and ABC adoption status. Some 40% of public companies have implemented or are considering the implementation of ABC, 16.7% have rejected and around 42% of public companies are not considering ABC. In private companies, 36.6% have implemented or are considering ABC, 13.4 have rejected, and 50% of private companies are not considering the implementation of ABC.

Table 9.9: Company status categories and levels of ABC adoption

Group	**Public**	**Private**	**Total**
Implemented	16 29.6%	28 25.0%	44 26.5%
Under consideration	6 11.1%	13 11.6%	19 11.5%
Rejected	9 16.7%	15 13.4%	24 14.4%
No consideration	23 42.6%	56 50.0%	79 47.6%
Total	54 100.0%	112 100.0%	166 100.0%

The value of the chi-square test (.993) shows that the relationship between Public/Private Status of the company and ABC adoption status is insignificant (p-value=.803) as shown in table 9.10 below.

Table 9.10: Chi-square tests for company status categories

	Value	df	Asymp. Sig (2- sided)
Pearson Chi-Square	.993	3	.803
N of Valid cases	166		

9.2.5 Marketing Strategies and ABC adoption

Types of competition are represented by six variables: Price, Quality, Range of product/service, Customer service, Product/service Innovation and Marketing and Promotional Activities. As the questionnaire asks respondents to rank from 1 to 6 the relative importance of the marketing factors, the descriptive analysis (see previous chapter) indicates that Quality and Price appear as the dominant highest important factors, therefore this section concentrates on those two factors.

9.2.5.1 Price

Price was scored across the entire Likert-scale of 1 to 6, using 1=most important to 6= least important. A cross tabulation of these six values with the ABC adoption status, resulted in some unvalued results (zero cells). The initial table was therefore collapsed into three levels by combining the results of the values 1 and 2 into "Highly important", 3 and 4 into "Medium important" and 5 and 6 into "Lesser important". The results are presented in table 9.11.

Table 9.11: Price category and levels of ABC adoption

Group	Highly important	Of medium important	Lesser important	Total
Implemented	31 33.7%	7 14.6%	6 22.2%	44 26.3%
Under consideration	14 15.2%	2 4.2%	3 11.1%	19 11.4%
Rejected	11 12.0%	8 16.7%	5 18.5%	24 14.4%
No consideration	36 39.1%	31 64.6%	13 48.2%	80 47.9%
Total	92 100.0%	48 100.0%	27 100.0%	167 100.0%

Table 9.11 above shows that 92 firms (55% of respondents) indicated that “Price” was a highly important factor in their marketing strategy; some 48% of them have implemented or are considering the implementation of ABC, as opposed to 39% who have not considered ABC and 12% who rejected ABC. On the other hand, 27 firms (16% of respondents) indicated that “Price” was a lesser important factor in their marketing strategy, 13 (48%) of which have never considered ABC, and 6 (22%) who have implemented ABC.

The chi-square is (16.076) and significant (p-value=.013) as shown in table 9.12 below. This indicates that there is a significant relationship between price and ABC adoption status.

Table 9.12: Chi-square test for price category

	Value	df	Asymp. Sig (2- sided)
Pearson Chi-Square N of Valid cases	16.076 167	6	.013

9.2.5.2 Quality

Quality was scored across the entire Likert-scale of 1 to 6, using 1=most important to 6= least important. The initial crosstabulation of the four levels of ABC adoption and the six ranges of importance in quality as used in the questionnaire, resulted in a 24 cell matrix (4 by 6). A number of the cells in this matrix had zero observations. The initial table was therefore collapsed by combining the results of the values 1 and 2 into "Highly Important", 3 and 4 into "Medium Important" and 5 and 6 into "Lesser Important". The results are presented in table 9.13 below.

Table 9.13: Quality category and levels of ABC adoption

Group	Highly important	Of medium important	Lesser important	Total
Implemented	30 32.3%	10 17.3%	4 25.0%	44 26.3%
Under consideration	8 8.6%	6 10.3%	5 31.3%	19 11.4%
Rejected	15 16.1%	6 10.3%	3 18.7%	24 14.4%
No consideration	40 43.0%	36 62.1%	4 25.0%	80 47.9%
Total	93 100.0%	58 100.0%	16 100.0%	167 100.0%

Table 9.13 above shows that 93 firms (56% of respondents) indicated that "Quality" was a highly important factor in their marketing strategy, some 40% of them have implemented or are considering the implementation of ABC, as opposed to 43% never considered ABC and 16% who rejected ABC. On the other hand, 16 firms (9% of respondents) indicated that "Quality" was a lesser important factor in their marketing strategy. The chi-square value is (15.021) and significant (p-value=.020). This indicates that there is a significant relationship between quality and ABC adoption status. Table 9.14 below reports the results.

Table 9.14: Chi-square tests for quality category

	Value	df	Asymp. Sig (2- sided)
Pearson Chi-Square N of Valid cases	15.021 167	6	.020

9.2.6 Product Diversity and ABC adoption

Table 9.15 below reports the relationship between number of products and the levels of ABC adoption. As the cross tabulation of the original six categories of numbers of products/services provided by the responding companies, and the four categories relating to ABC adoption status resulted in a number of cells with zero values, the original six categories were collapsed to three; Low (less than 10 products), Medium (11-100) and High (more than 101 products). The table shows that 41.9% of "High" companies have implemented ABC, as opposed to 3.6% of "Low" companies. Likewise, only 27.5% of "Large" companies have never considered ABC, as opposed to 82.2% of "Small" companies.

Table 9.15: Product diversity category and levels of ABC adoption

Group	Low <10	Medium 11-100	High > 101	Total
Implemented	2 3.6%	16 33.3%	26 41.9%	44 26.5%
Under consideration	4 7.1%	7 14.6%	8 12.9%	19 11.5%
Rejected	4 7.1%	9 18.8%	11 17.7%	24 14.5%
No consideration	46 82.2%	16 33.3%	17 27.5%	79 47.5%
Total	56 100.0%	48 100.0%	62 100.0%	166 100.0%

Table 9.16 below reports the chi-square test value (45.618) and shows that the relationship between product diversity and ABC status is a very significant at (p-value=.000).

Table 9.16: Chi-square tests for product diversity

	Value	df	Asymp. Sig (2- sided)
Pearson Chi-Square N of Valid cases	45.618 166	6	.000

9.2.7 Cost Structure (Overhead) and ABC adoption

Respondents were divided into three categories those with "Low overheads" (5% to 20%), Medium overheads (20% to 35%) and High overheads (35% to 65%). These three categories were based on a division of the range of the overheads (5% to 65%) into three, and by using the 'categorize variables' function within the SPSS, which divides this range into three categories.

Table 9.17 below reports the results of a cross tabulation of these three categories of overheads with ABC adoption status:

Table 9.17: Overheads category and levels of ABC adoption

Group	Low Overheads	Medium Overheads	High Overheads	Total
Implemented	7 10.0%	9 23.7%	28 47.5%	44 26.3%
Under consideration	5 7.1%	5 13.2%	9 15.3%	19 11.4%
Rejected	9 12.9%	2 5.3%	13 22.0%	24 14.4%
No consideration	49 70.0%	22 57.8%	9 15.2%	80 47.9%
Total	70 100.0%	38 100.0%	59 100.0%	167 100.0%

The table shows that 47.5% of "High overheads" companies have implemented ABC, as opposed to 10% of "Low overheads" companies. Likewise, only 15.2% of "High overheads" companies have never considered ABC, as opposed to 70% of "Low overheads" companies.

The results in table 9.18 below, show that companies with larger overheads are more likely to adopt ABC (Chi-squared 46.248, *P*-value= 0.000), and the relationship between overheads and ABC adoption statues is a very significant.

Table 9.18: Chi-square tests for overheads category

	Value	df	Asymp. Sig (2- sided)
Pearson Chi-Square N of Valid cases	46.248 167	6	.000

9.2.8 Expectation of overheads and ABC adoption status:

Table 9.19 below shows the distribution of the expectation of changes in overhead costs over the next five years with ABC adoption status. The initial crosstabulation of the four levels of ABC adoption and six levels of expectation, as used in the questionnaire, resulted in a 24 cell matrix (4 by 6). A number of the cells in this matrix had zero observations. The initial table was therefore collapsed by combining the results of the first two choices, to increase substantially and to increase slightly, into one classification, entitled “To Increase”. The third choice was maintained as “To be Stable”. The results of the fourth and fifth choices have been collapsed into one classification entitled “To Decrease”. The last choice “Do not know” has been excluded for its unvalued results.

As reports in table 9.19 below, that some 49% of companies who expect that their overheads “To Increase” have implemented ABC or are considering the adoption of ABC, as opposed to 40%, and 11% of those have never considered ABC and have rejected the ABC implementation. Likewise, only 20% of companies who expect that their overheads “To Decrease” have implemented ABC or are considering ABC implementation, as opposed to 60% and 20% of companies which have never considered and have rejected the implementation of ABC.

Table 9.19: Expectation of overheads and ABC adoption status

Group	To increase	To be stable	To decrease	Total
Implemented	28 38.9%	12 19.4%	3 12.0%	43 27.0%
Under consideration	7 9.7%	9 14.5%	2 8.0%	18 11.3%
Rejected	8 11.1%	10 16.1%	5 20.0%	23 14.5%
No consideration	29 40.3%	31 50.0%	15 60.0%	75 47.2%
Total	72 100.0%	62 100.0%	25 100.0%	159 100.0%

In terms of the relationship between the overhead expectation and ABC adoption status, table 9.20 below reports the chi-square test value (12.898) and shows that the relationship between overhead expectation and the ABC adoption status is significant at (*p*-value=.045).

Table 9.20:Chi-square tests for overhead expectation

	Value	df	Asymp. Sig (2- sided)
Pearson Chi-Square N of Valid cases	12.898 159	6	.045

9.2.9 Business Unit Culture and ABC adoption

Two business unit culture dimensions, "Innovation" and "Outcome Orientation", were measured. Respondents were asked to indicate the extent to which each of ten items was valued in their business unit. A 5-point Likert-type scale with anchors of 5 "valued to a very great extent" and 1 "not valued at all" was used and scores for each dimension were calculated as the sum of responses. The ten items were grouped into two cultural dimensions "Innovation" and "Outcome Orientation" as following.

9.2.9.1. Innovation

The first five items which relate to "Innovation" were analyzed in aggregation. Group of cases were combined using SPSS into a single summary case and a newly aggregated data which resulted into one dimension "Innovation" was created. As the cross tabulation of the original five levels of innovation of the responding companies, and the four categories relating to ABC adoption status resulted in a number of cells with zero values, the original five levels were collapsed into three, by combined the results of scores (1 and 2) into "Not valued", (3) into "Medium Valued" and (4and 5) into "Critically valued" table 9.21 below reports the results.

The chi-squared test shows that the relationship between innovation and ABC adoption status is significant. Some 31% of companies for whom innovation was "critically valued" have implemented ABC, as opposed to 29% which innovation was not valued. Moreover, 35% of companies where innovation was not valued have never considered ABC, as opposed to only 29% who have implemented ABC. In general, the majority of companies (112 companies) had a critically valued innovation, as opposed to only 17 companies for whom innovation was not valued.

Table 9.21: Innovation category and levels of ABC adoption

Group	Not valued	Medium valued	Critically valued	Total
Implemented	5 29.4%	4 10.5%	35 31.3%	44 26.3%
Under consideration	2 11.8%	6 15.8%	11 9.8%	19 11.4%
Rejected	4 23.5%	5 13.2%	15 13.4%	24 14.4%
No consideration	6 35.3%	23 60.5%	51 45.5%	80 47.9%
Total	17 100.0%	38 100.0%	112 100.0%	167 100.0%

The chi-square test (table 9.22) below shows that the relationship between Innovation and ABC adoption status is significant (*P*-value = .018).

Table 9.22: Chi-square tests for innovation

	Value	df	Asymp. Sig (2- sided)
Pearson Chi-Square	15.297	6	.018
N of Valid cases	167		

9.2.9.2 Outcome orientation

The same procedures adopted with "Innovation" have been followed with "Outcome Orientation". The five items of "Outcome Orientation" were analyzed in aggregate which resulted in one dimension "Outcome orientation". As the cross tabulation of the original five levels by the responding companies, and the four categories relating to ABC adoption status resulted in a number of cells with zero values, the original five levels were collapsed into three; following the same procedures with the innovation above. Table 9.23 below reports the results.

As shown in table 9.23 below, that those of companies which classified 'Outcome orientation' as "Critically valued" (81 companies), divided among the four levels of ABC adoption as, implemented (37.1%); under consideration (14.8%), rejected (18.5%) and not considered (29.6%). The results also indicate that business units with critically valued Outcome oriented (37.1%) have implemented ABC to a greater extent than those with not valued outcome oriented (11.8%). In other words, around 74.5% of companies with a less Outcome oriented culture are not considering the implementation of ABC system.

Table 9.23: Orientation category and levels of ABC adoption

Group	Not valued	Medium valued	Critically valued	Total
Implemented	6 11.8%	8 22.9%	30 37.1%	44 26.3%
Under consideration	2 3.9%	5 14.3%	12 14.8%	19 11.4%
Rejected	5 9.8%	4 11.4%	15 18.5%	24 14.4%
No consideration	38 74.5%	18 51.4%	24 29.6%	80 47.9%
Total	51 100.0%	35 100.0%	81 100.0%	167 100.0%

Table 9.24 below shows that the chi-square test is very high (70.571) and the relationship between outcome orientation and ABC adoption status are very significant (p-value=.000).

Table 9.24: Chi-square tests for outcome orientation

	Value	df	Asymp. Sig (2- sided)
Pearson Chi-Square N of Valid cases	70.571 167	6	.000

9.3 Mann-Whitney U tests:

Mann-Whitney U test is a non-parametric test alternative to the t-test for independent samples, unlike the parametric t-test, this non-parametric test makes no assumptions about the distribution of the data (e.g., normality) (Pallant 2001). This, like many non-parametric tests, uses the ranks of the data rather than their raw values to calculate the statistic. Since this test does not make a distribution assumption, it is not as powerful as the t-test (Norusis, 2000). Mann-Whitney U test is employed to support the results achieved by the t-test and also to compare the two groups ABC adopters or non-adopters. The hypotheses for the comparison of two independent groups used by Mann-Whitney are: H_o: The two groups come from identical populations

H_a: The two groups come from different populations

Notice that the hypothesis makes no assumptions about the distribution of the populations. These hypotheses are also sometimes written as testing the equality of the central tendency of the populations. The test statistic for the Mann-Whitney test is U. This value is compared to a table of critical values for U based on the sample size of each group. If U exceeds the critical value for U at some significance level (usually 0.05) it means that there is evidence to reject the null hypothesis in favor of the alternative hypothesis (Hart 2001). Table 9.25 below indicates that there are statistically significant differences in variation in size, product number, cost structure, expectation and business culture between the two groups of companies. Thus the results produce evidence to reject the null hypothesis mentioned above. The results also show that there are no statistically significant differences in the types of competition (price and quality) between the two groups; therefore the null hypothesis should be accepted and that the two groups of companies come from identical population in terms of competition.

Table 9.25: Results of Man-Whitney for adopters and non-adopters

Variable	Mann-Whitney U	Wilcoxon W	Z value	P value (2-tailed)
Employees Number	1452.000	9078.000	-5.074	**.000**
Turnover	1780.500	9406.500	-3.648	**.000**
Price	2372.000	9998.000	-1.368	.171
Quality	2705.000	10331.000	-.004	.997
Product diversity	1456.500	9082.500	-4.822	**.000**
Overhead structure	1259.500	8885.500	-5.296	**.000**
Overhead expectation	1803.500	2793.500	-3.074	**.002**
Innovation	2164.500	9320.000	-2.121	**.034**
Orientation	2179.500	9805.500	-2.123	**.034**

Table 9.26: Descriptive statistics for contingency variables and ABC adoption

Variables		N	Mean rank	Sum of ranks
Employees Number	Not adopted	123	73.80	9078.00
	Adopted	44	112.50	4950.00
Turnover	Not adopted	123	76.48	9406.50
	Adopted	44	105.03	4621.50
Price	Not adopted	123	81.28	9998.00
	Adopted	44	91.59	4030.00
Quality	Not adopted	123	83.99	10331.00
	Adopted	44	84.02	3697.00
Product diversity	Not adopted	123	73.84	9082.50
	Adopted	44	112.40	4945.50
Overhead structure	Not adopted	123	72.24	8885.50
	Adopted	44	116.88	5142.50
Overhead expectation	Not adopted	117	87.59	10247.50
	Adopted	44	63.49	2793.50
Innovation	Not adopted	123	75.77	9320.00
	Adopted	44	107.00	4708.00
Orientation	Not adopted	123	79.72	9805.50
	Adopted	44	95.97	4222.50

9.4 Summary and Conclusion:

The main goal of this chapter was to obtain a picture of how the contingent variables of this study are related to the adoption status of ABC systems. The hypotheses tested in this chapter are on the impact of contingency variables on the implementation of ABC systems.

The statistical analysis presented above aims to test each of the study's hypotheses extensively through four types of analysis. Chi-square tests identified whether there were any significant differences between the variables of interest in the study.

Table 9.27 below compares the results of the Chi-square, Mann-Whitney and (t-test, and ANOVA which applied as supporting the non parametric statistical) for each of the contingency variables.

Table 9.27: Summary of results of all statistical analysis

Contingency	Chi-square[7]		t-test		Mann-Whitney		ANOVA	
Variables	t value	*p*-value	t value	*p* value	Z value	*p*-value	F value	Sig
Industrial Sector	17.874	**.037**	N/A[8]	N/A	N/A	N/A	N/A	N/A
Employees Number	31.453	**.000**	-5.521	**.000**	-5.074	**.000**	10.132	**.000**
Turnover	23.881	**.000**	-3.752	**.000**	-3.648	**.000**	7.132	**.000**
Nationality	3.764	.288	N/A	N/A	N/A	N/A	N/A	N/A
Price/ competition	16.076	**.013**	3.748	**.000**	-1.368	.171	.991	.399
Quality/competition	15.021	**.020**	1.514	.132	-.004	.997	.998	.395
Product diversity	45.618	**.000**	-6.369	**.000**	-4.822	**.000**	16.596	**.000**
Overhead structure	46.248	**.000**	-5.658	**.000**	-5.296	**.000**	28.444	**.000**
Innovation	15.297	**.018**	-2.582	**.011**	-2.121	**.034**	5.304	**.002**
Orientation	70.571	**.000**	-4.281	**.000**	-2.123	**.034**	1.650	.180

[7] One should remember that chi-square is used with all variables even the continuous ones (after being categorized).

[8] Not applicable because it is a categorical and binary variables.

The null hypothesis on **Industrial sector** (there is no relationship between ABC adoption and industrial sector) is rejected on the basis of the chi-square test which indicates that the relationship between industrial sector and ABC adoption is significant (*P*=.037). Referring to table 9.1, more than 50% (25 companies) of the 44 companies which have implemented ABC, was “Manufacturing”. Interestingly, of the 80 companies which have never considered the implementation of ABC around 46% (37 companies) were manufacturing companies.

The two null hypotheses on **Size** (there is no relationship between ABC adoption and firm size when measured by number of employees or annual turnover) are rejected on the basis of all tests. The chi-square establishes a significant relationship between size (EMPNO, TURNOV) and ABC adoption status (.000 and .001) respectively. Referring to table 9.3, the percentages of the companies which have implemented ABC, 4.5% are “Small” 43.2% are “Medium” and 52.3 are “Large” respectively[9]. One can see that the percentage of large companies which have implemented ABC is much higher than that of small and medium. On the other hand, Table 9.5 relating to turnover indicates that the fast majority of companies which have implemented ABC were in the large size category as compared with Small and Medium: 54.6%, 6.8% and 38.6% respectively[10]. This supports the hypotheses (firm size positively correlated to the adoption of ABC). The Student t-test also tests the previous hypotheses, by examine whether the two means of non-adopters and ABC adopters are significantly different from one another. The results indicate that the mean of ABC adopters is much higher than non-adopters and shows a significant different between the two groups

[9] Percentage presented in the Table 9.3 are calculated vertically, whereas these percentages are calculated horizontally and not presented in the table.
[10] Percentage presented in the Table 9.5 are calculated vertically, whereas these percentages are calculated horizontally and not presented in the table.

(*P*=.000). It also shows a 95% confidence about this direction. Tests of Mann-Whitney and ANOVA show significant results in both variables.

The null hypothesis on **Nationality** (there is no relationship between nationality and ABC adoption) is accepted based on the results of the Chi-square test, indicating a non-significant relationship between nationality and ABC adoption status (*P*=.288). Referring to table 9.7, 28 Irish companies (64%) have implemented ABC, compared with 16 non-Irish companies (36%) from the total of 44 companies which have implemented ABC.

In the case of marketing strategy, which tested both **Price** and **Quality**, the null hypotheses (there is no relationship between ABC adoption and Price and Quality) are rejected in all statistics tests (Chi-square and *t*-test). The results of the Chi-square tests show that there is a significant relationship between (price, quality) and the ABC adoption status (*P*-value = .013 and .020) respectively. The results of a crosstabulation of three levels of price and the four ABC adoption groups presented in table 9.11 above indicate a significant difference in the ABC adopters group. 31 companies (70%) of ABC adopters had price as the most important factor in their marketing strategy, as opposed to 16% and 14% who ranked price as medium and least important factor in their marketing strategy. Surprisingly, the majority of those who have never considered ABC adoption (36 companies) ranked price as the most important factor in their marketing strategy as well. There are no results from the extent literature to be compared with those presented here, because this hypothesis has not been tested before.

The same results have been reported in table 9.13 above, the fast majority of ABC adopters had quality as the highly important factor in their marketing strategy (30 companies out of 44), and furthermore, 50% of those who have never considered ABC had quality as the highly important factor in their marketing strategy.

The Student t-tests report different results for price and quality. The null hypothesis with regard to price (non-adopters have a higher mean than ABC adopters) is rejected, based on a significant positive mean difference (*P*=.000) between the two groups (non-adopters and adopters). The null hypothesis with regard to quality is accepted, as the Levene's test was non-significant (*P*=.132) and the difference between the variance is zero[11]. Mann-Whitney results also show that there are no statistically significant differences in the types of competition (price and quality) between the two groups; therefore the null hypothesis should be accepted and that the two groups of companies come from identical population in terms of competition.

In relation to **product diversity,** the results of the chi-square test show that the relationship between product diversity and the ABC adoption status is very significant (*P*=.000). Table 9.15 above indicates that large companies (with more than 101 different products) are more likely to adopt ABC than medium or small counterpart (59%, 36% and 5%). Furthermore, the same table reports that small companies (with less than 10 different products) are more likely to never consider the implementation of ABC.

The results of the t-test shows that the variances (-6.369) between non adopters and adopters are significantly different in product diversity (*P*=.000), and one can be confident about direction of these differences. Mann-Whitney and ANOVA results report significant variances between the groups of ABC adopters and non-adopters.

With regard to **overhead,** the model indicates that a company which has a high overhead is more likely to adopt ABC. All the statistical results (chi-square test and *t*-test) presented above support the rejection of the null hypothesis, supporting the arguments that Irish companies that have a high percentage of overhead are more likely to adopt ABC. The chi-

[11] See table 9.25 above for more details.

square test shows a strong relationship between levels of overheads and ABC adoption status (*P*=.000), furthermore a crosstabulation between those two variables (table 9.17) indicates that 28 company (64%) who have a high level of overhead (between 35% to 65% of total costs) have implemented ABC, as opposed to (20% and 16%) who had a medium and small overheads. Percentages of companies which have never considered the implementation of ABC in Low, Medium and High categories are approximately: 61.3%, 27.5% and 11.2%, respectively[12], and indicates that companies' with low overheads are more likely not to have considered ABC adoption. The results of Mann-Whitney and ANOVA show a significant difference between the groups.

Innovation and **Outcome orientation** are chosen as represented Business unit culture to examine their association with the extent of ABC adoption. Chi-square tests show a significant association between the two dimensions (Innovation and Outcome orientation) and the ABC adoption status (*P*=.018 and .000) respectively. Table 9.21 relating to Innovation, indicates that around 80% of ABC adopters had a critically valued innovation, as opposed to 11% and 9% (not valued and medium valued) respectively[13]. On the other hand, 51 companies (64%) of those who have never considered ABC had a critical valued innovation, as opposed to 29% and 7% (medium valued and not valued). That leads to the interpretation that Innovation is very highly valued among all companies regardless ABC implementation. The t-test results report that the variances are significantly different (*P* value=.011), and record a mean different of (-.3145) which means that the mean of ABC adopters is higher than non ABC adopters.

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[12] Percentage presented in the Table 9.17 are calculated vertically, whereas these percentages are calculated horizontally and not presented in the table.

[13] Percentage presented in the Table 9.21 are calculated vertically, whereas these percentages are calculated horizontally and not presented in the table.

The results of a crosstabulation of three levels of value within the outcome orientation and the four ABC adoption groups presented in table 9.23 above indicate a significant difference in the ABC adopters group. 30 companies (68%) of ABC adopters had orientation as critically valued in their business culture, as opposed to 18% and 14% who ranked orientation as medium valued and not valued. Moreover, 38 companies (48%) of those who have never considered the implementation of ABC had a not valued orientation, as opposed to 30% and 22% who ranked orientation as critically and medium valued respectively. The t-test results indicate a significant difference between the two groups (non-adopters and ABC adopters) and a negative mean difference (-.6321) which means that ABC adopters have a higher mean than non-adopters.

Now that the significant relationships have been identified, the attention shifts to ascertaining the overall fit of the research contingency model of ABC systems. Unfortunately, the statistical techniques used in this chapter do not facilitate an overall model containing the technical difficulties to the implementation of ABC. This suggests that cluster analysis should be undertaken in the next chapter.

CHAPTER 10: CLUSTER ANALYSIS

10.1 Introduction

This chapter presents the findings of the cluster analysis. This technique sorts cases (companies) into groups, or clusters. A cluster is a group of relatively homogeneous cases or observations, so that the degree of association is strong between companies of the same cluster and weak between companies of different clusters. The statistical procedure for identifying clusters was available in the SPSS software, and the Euclidean technique was adopted. Three clusters have been utilised in this study, each cluster describes, in terms of the data collected, the characteristics of companies (size, number of products, cost structure, marketing strategy and business unit culture) using a descriptive statistics. Moreover, an association between these clusters and ABC adoption status is examined.

The organisation of the rest of the chapter is as follows: section 10.2 reviews an introduction to cluster analysis technique. Section 10.3 presents the K-means cluster analysis results, which includes the characteristics of the clusters, and analyzing the reasons for considering, rejecting and never considering ABC. The last section contains the conclusion of the chapter.

10.2 Cluster analysis method

Everett, et al. (2001) define cluster analysis as a technique for categorizing observations into groups such that observations in each group are similar to each other while observation in one group should be different from those of other groups. Cluster analysis seeks to identify a set of groups which both minimize within-group variation and maximize between-group variation. Hair et al. (1998) argue that cluster analysis is an objective methodology for quantifying the structural characteristics of a set of observations. This section will examine the two main cluster methods as following.

10.2.1 Hierarchical Cluster Analysis

Everitt et al. (2001) argue that hierarchical clustering is appropriate for smaller samples (typically< 150). To accomplish hierarchical clustering, the researcher must specify how similarity or distance is defined, how clusters are aggregated (or divided), and how many clusters are needed. Corter (1996) adds that hierarchical clustering generates all possible clusters of sizes 1 … K, but is used only for relatively small samples. In hierarchical clustering, the clusters are nested rather than being mutually exclusive, as is the usual case, that is, in hierarchical clustering; larger clusters created at later stages may contain smaller clusters created at earlier stages of agglomeration (Sharma 1996). The following results show a sample of the results of the hierarchical clustering, which results in a two clusters. The results are ambiguous for giving clear clusters for the firms under investigation, moreover the sample size is greater than it is recommended for the usage of hierarchical clustering.

10.1 Agglomeration Schedule under Hierarchical clustering

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	52	56	1.000	0	0	67
2	12	53	.976	0	0	29
3	55	117	.975	0	0	39
4	17	67	.973	0	0	17
5	18	95	.972	0	0	33
6	74	103	.971	0	0	7
7	74	110	.968	6	0	23
8	115	157	.968	0	0	46
9	47	122	.963	0	0	36
10	8	91	.962	0	0	64

Since the number of final clusters under the hierarchical clustering are unknown and the agglomerative methods are preferred to the divisive ones because they are widely implemented in software, the K-means cluster analysis would be the most appropriate technique for clustering cases within this study.

10.2.2 K-means Cluster Analysis:

K-means cluster analysis uses Euclidean distance which is the most common distance measure (Hair et al, 1998). The researcher must specify in advance the desired number of clusters, K. Initial cluster centres are chosen in a first pass of the data, and then each additional iteration group's observations based on nearest Euclidean distance to the mean of the cluster. Cluster centres change at each pass. The process continues until cluster means do not shift more than a given cut-off value or the iteration limit is reached (Corter 1996). Cluster centres are the average value on all clustering variables of each cluster's members. The "Initial cluster centres," in spite of its title, gives the average value of each variable for each cluster for the k well-spaced cases which SPSS selects for initialization purposes when no initial file is supplied. The "Final cluster centres" table in SPSS output gives the same thing for the last iteration step. The "Iteration history" table shows the change in cluster centres when the usual iterative approach is taken. When the change drops below a specified cut-off, the iterative process stops and cases are assigned to clusters according to which cluster centre they are nearest.

In k-means clustering the researcher specifies the number of clusters in advance, and then calculates how to assign cases to the K clusters. K-means clustering is much less computer-intensive and is therefore sometimes preferred when datasets are large .Finally, two-step clustering creates pre-clusters, and then it clusters the pre-clusters.

In this study as there are a large number of cases and eight different variables to be examined, the K-means is chosen as being appropriate.

10.3 K-means Cluster Analysis Results

10.3.1 Number of clusters and Cluster centres

The 167 cases (companies) were clustered based on eight variables (Number of employees, Annual turnover, Product diversity, Price, Quality, Overheads, Innovation and Outcome orientation). Under K-means method, SPSS allows the specification in advance of the desired number of clusters. A critical issue in cluster analysis is the determination of the appropriate number of clusters. Unfortunately, no generally accepted criterion exists. Researchers are therefore reduced to using existing theory to identify a natural number of clusters that are interpretable in terms of the research question.

Based upon the above, it is important to examine the different results based on a different number of clusters (2, 3 and 4), thereafter a selection of the most appropriate number of clusters would be chosen.

10.3.1.1 Two Cluster results

The following results are based on a two clusters desired, three stages of the K-means to be processed to achieve the final results as following:

Table 10.2: Number of cases in each cluster

Cluster	**1**	92	55%
	2	75	45%
valid		167	100%
missing		000	000

Table 10.3: Initial cluster centres

	Cluster	
	1	2
EMPLONO	6	1
TURNOV	6	1
PRICE	3	2
QUALITY	3	3
PRODNO	6	1
OVERHEAD	2	5
INNOVATION	2	4
ORIENTATION	4	5

Table 10.4: Final cluster centres

	Cluster	
	1	2
EMPLONO	3.32	1.99
TURNOV	4.37	3.01
PRICE	2.57	2.36
QUALITY	2.53	2.51
PRODNO	4.77	2.09
OVERHEAD	2.89	2.48
INNOVATION	3.29	2.95
ORIENTATION	4.46	4.23

The results above shows a two clusters of the whole cases in the sample with different and conflicted information. it is difficult to decide the nature of each cluster (large, small or medium). Therefore, it is important to find out results of another number of clusters.

10.3.1.2 Four Cluster results

Table 10.5: Number of cases in each cluster

Cluster	**1**	38	23%
	2	42	25%
	3	59	35%
	4	28	17%
valid		167	100%
missing		000	000

Table 10.6: Initial cluster centres

	Clusters			
	1	2	3	4
EMPLONO	6	1	1	5
TURNOV	3	6	1	6
PRICE	2	2	2	3
QUALITY	3	3	3	3
PRODNO	6	3	1	1
OVERHEAD	3	3	5	2
INNOVATION	3	1	4	2
ORIENTATION	5	1	5	5

Table 10.7: Final cluster centres

	Clusters			
	1	2	3	4
EMPLONO	4.13	2.25	1.75	3.50
TURNOV	5.08	3.20	2.75	4.86
PRICE	2.55	2.58	2.34	2.50
QUALITY	2.53	2.50	2.53	2.54
PRODNO	5.11	5.08	1.97	2.61
OVERHEAD	2.89	2.75	2.39	3.04
INNOVATION	3.45	3.13	3.00	3.00
ORIENTATION	4.50	4.43	4.31	4.14

The results above reports a four number of clusters (firms), the results above are ambiguous in somewhat to fit the results of the previous chapter. Therefore, three clusters would be more accurate and appropriate for the results of this study.

10.3.1.3 Three Cluster results

The three-cluster solution was chosen because it provides clusters that were consistent with previous chapter analysis (three categories of independent variables; Small, Medium and Large). Table 10.8 below shows the number of cases in each cluster and their percentages, the first cluster includes 77 companies (46%), whereas cluster 2 consists of 34 companies (20%) of the sample and the third cluster includes 56 companies (34%) of the sample.

Table 10.8: Number of cases in each cluster

Cluster	**1**	77	46%
	2	34	20%
	3	56	34%
valid		167	100%
missing		000	000

Table 10.9 below shows the initial cluster centres, which includes three clusters as desired, and gives the average value of each variable in each cluster. It can be observed that cluster (1) has the highest averages with all variables, for example (6) on size, product diversity, overheads, innovation and outcome orientation. The second cluster shows a medium average value and the third cluster reports the lowest average value.

Table 10.9: Initial cluster centres

	Cluster		
	1	2	3
EMPLONO	6	4	2
TURNOV	6	5	2
PRODNO	6	3	1
PRICE	3	2	2
QUALITY	3	4	2
OVERHEAD	3	3	2
INNOVATION	6	3	4
ORIENTATION	6	4	4

The final cluster centres table 10.10 below gives the mean averages of each variable in each cluster, which enables a descriptive name to be given to each cluster based on their dominant averages.

Table 10.10: Final cluster centres

	Cluster		
	1	2	3
EMPLONO	3.467	2.588	1.732
TURNOV	4.519	3.764	2.636
PRODNO	4.649	2.911	2.381
PRICE	2.558	2.460	2.321
QUALITY	2.532	2.383	2.155
OVERHEAD	2.909	2.558	2.535
INNOVATION	4.103	2.970	3.839
ORIENTATION	4.324	3.529	4.196

cluster 1 above reports a high mean in size (number of employees and turnover) 3.46 and 4.516 out of 6 respectively as compared with the mean scores within both second and third clusters. Product diversity has also a high mean score in the first cluster (4.649) whereas, cluster 2 and 3 have a less mean score 2.911 and 2.381 respectively. As explained above, that Price and Quality have a different order in scores (1= most important, 3=least important), the final cluster centres above shows that all clusters have the nearly same mean for price and quality. Innovation and Orientation recorded a highest mean score within cluster 1 (4.103 and 4.324) and least mean scores in the other two clusters, even though cluster 3 has a high mean than cluster 2.

According to the results above, cluster 1 includes those companies (77 companies) which have a high mean scores of all variables (Large company's cluster), cluster 2 (34 companies) consists a medium mean scores (Medium company's cluster) and cluster 3 (56 companies) reports the smallest mean scores (Small company's cluster).

10.3.2 Clusters and ABC adoption status

Table 10.11 below shows a crosstabulation of the four groups of ABC adoption status and the three clusters, resulting in a 12 cell matrix (3 by 4). Cluster one includes 77 companies (46%) of the sample, 38 company (49.3%) have implemented ABC, 16 company (20.8%) have never considered ABC adoption, 12 company (15.6%) rejected ABC and 11 company (14.3%) are still considering the implementation of ABC. Cluster two consists of 34 companies (20%) of the sample, in which 20 companies (58.8%) have never considered ABC, 7 companies (20.6%) had rejected ABC, 4 companies (11.8%) are considering ABC and only 3 companies (8.8%) have implemented ABC. The third cluster (56 Companies) includes 44 companies (78.6%) who have never considered ABC, only 5 companies who had rejected ABC and 7 companies who are implemented or still considering the implementation of ABC.

Table 10.11: Clusters and ABC adoption status

Group	1 Large	2 Medium	3 Small	Total
Implemented	38 49.3%	3 8.8%	3 5.4%	44 26.3%
Under consideration	11 14.3%	4 11.8%	4 7.1%	19 11.4%
Rejected	12 15.6%	7 20.6%	5 8.9%	24 14.4%
No consideration	16 20.8%	20 58.8%	44 78.6%	80 47.9%
Total	77 100.0%	34 100.0%	56 100.0%	167 100.0%

10.3.3 Characteristics of the clusters

This section describes the main characteristics of the three clusters. As is explained above, the first cluster consists of the large type companies in (Size, Number of products, intensive competition in price and quality, percentage of Overheads, and business unit culture dimensions). The second cluster includes the medium type companies and the third cluster is related to those companies who are small. Each cluster will be analysed to establish the value of the independent variables, reasons for ABC rejection, factors against ABC adoption and reasons for not considering ABC.

10.3.3.1 Type 1 companies (Cluster 1)

Table 10.12 below shows the descriptive statistics of the 77 company with the eight contingent variables, and reports the range, minimum, maximum, sum, means, standard deviation and the variances of each of those variables. From the table below, it can be seen that size (number of employees and turnover) is high (mean scores = 3.467 and 4.519) respectively, number of products has also a high mean (mean scores=4.649, Minimum=1, maximum=6). Price and quality had the opposite order, as 1 represents the most important and 3 represents the least important, the mean scores were 2.558 and 2.532 respectively. Overheads show mean scores of 2.909 in this cluster which is quiet high with comparison with the two other clusters. Innovation and Orientation have high mean scores in this cluster (4.103 and 4.324 respectively).

Table 10.12: Descriptive statistics for cluster 1

Variables	Range	Min	Max	Sum	Mean	Std.Deviation	Variance
Employees	5.00	1.00	6.00	267	3.467	1.252	1.568
Turnover	4.00	2.00	6.00	348	4.519	1.154	1.332
Product diversity	5.00	1.00	6.00	358	4.649	1.167	1.362
Price	2.00	1.00	3.00	197	2.558	.638	.408
Quality	2.00	1.00	3.00	195	2.532	.552	.305
Overhead	3.00	2.00	5.00	224	2.909	.764	.584
Innovation	3.00	2.00	5.00	316	4.103	.836	.700
Orientation	3.00	2.00	5.00	333	4.324	.751	.564

N=77 Companies.

10.3.3.1.1 ABC adoption status

This cluster consists of the largest companies in the sample (77 company), 38 company which represents the highest percentage (49%) have implemented ABC, 16 company (21%) have never considered ABC, 12 company (16%) rejected ABC and 11 company (14%) are considering the implementation of ABC. Table 10.13 below represents the results.

Table 10.13: ABC adoption status in cluster 1

Groups	**N**	**%**
Implemented	38	49%
Under consider	11	14%
Rejected	12	16%
Never consider	16	21%
Total	77	100%

10.3.3.1.2 First ABC introduced

This cluster (cluster 1) shows that more than a half (55%) of ABC adopters implemented ABC after 2000, 12 company (31%) implemented the system between 1995 to 1999 and just 5 companies implemented the system before 1995. table 10.14 presents the results.

Table 10.14: ABC first introduced

ABC first introduced	N	%
Before 1995	5	13.2%
1995-1999	12	31.6%
2000-date	21	55.2%
Total	38	100%

10.3.3.1.3 Factors against adoption of ABC

11 companies are currently considering the adoption of ABC in this cluster. Table 10.15 below presents the factors militating against its adoption.

Table 10.15: Factors against adoption of ABC

Factors	Frequency	percentage
- Difficulty in selecting cost drivers	10	90.9
- Difficulty in defining activities	8	72.7
- High costs of ABC implementation	7	63.6
- Uncertainty of ABC benefits	6	54.5
- Difficulty in assigning resources to activities	8	72.7
- Data collection difficulties	6	54.5
- Difficulty in assigning activity's costs to cost objects	7	63.6
- internal resistance	2	18.2
- A higher priority of other changes/projects	3	27.3
- Lack of top management support	2	18.2
- Inadequate computer software	3	27.3

(11 cases of under consideration)

Difficulty in selecting cost drivers and difficulty in defining activities were the most common difficulties militating against its adoption (90.9% and 72.7%). Difficulty in assigning resources to activities was also ranked as a common problem (72.7%). High costs of ABC implementation, Uncertainty of ABC benefits, Data collection difficulties and Difficulty in assigning activity's cost objects were ranked in the middle of the table (63.6%, 54.5%, 54.5% and 63.6%) respectively. The bottom of the table shows the least important reasons, such as internal resistance, higher priority of other changes/projects, and lack of top management support.

10.3.3.1.4 Reasons for rejecting the adoption of ABC

This cluster includes 12 large companies which rejected the implementation of ABC. Table 10.16 below describes the frequency and percentage of each of the reasons why they had rejected ABC.

Table 10.16: Reasons for rejecting ABC

Factors	Frequency	percentage
- Difficulty in selecting cost drivers	12	100.0
- Difficulty in defining activities	12	100.0
- Difficulty in assigning activity's costs to cost objects	11	91.7
- Data collection difficulties	11	91.7
- High costs of ABC implementation	7	58.3
- Difficulty in assigning resources to activities	11	91.7
- Satisfied with current system	5	41.7
- ABC is not relevant to our business	4	33.3
- Uncertainty of ABC benefits	2	16.7
- Inadequate computer software	5	41.7
- Internal resistance	3	25.0
- Lack of top management support	3	25.0
- A higher priority of other changes/projects	2	16.7
- Manufacturing process is simple, easy to track costs	1	8.3
- Small percentage of overhead costs	0	0
- The number of products/services is low	0	0
- Lack of knowledge of ABC	0	0

(12 cases of rejecters)

As shown in table 10.16 above, technical difficulties were most commonly reported as reasons for their rejection of ABC. Difficulty in selecting cost drivers and defining activities were mentioned by the 12 companies (100%). Difficulty in assigning activity's costs to cost objects, data costs of ABC implementation and difficulty in assigning resources to activities were also common reasons for ABC rejection by (91.7%) of responses of companies in this cluster. Organisational and behavioural difficulties were mentioned by some companies in this cluster, for example those which indicated satisfied with current system, ABC is not relevant to our business, uncertainty of ABC benefits, internal resistance, and lack of top management support. Surprisingly, small percentage of overhead costs, the number of products/services is low and lack of knowledge of ABC were not mentioned by any rejected companies in this cluster.

10.3.3.1.5 Reasons for not considering the adoption of ABC

16 companies in this cluster indicate that they have never considered the adoption of ABC. Table 10.17 below shows the frequency and percentage of companies and the reasons for their decision.

Table 10.17: Reasons for not considering ABC

	Frequency	**percentage**
- Small percentage of overhead costs	6	37.5
- The number of products/service is low	5	31.2
- Satisfied with current system	8	50.0
- ABC is not relevant to our business	10	62.5
- Manufacturing process is simple, easy to track costs	6	37.5
- Lack of knowledge regarding ABC	5	31.2

(16 cases for not considering)

Irrelevance of the ABC and the satisfaction with the current system were the most reasons for not considering ABC in this group (62.5% and 50%) respectively, followed by small percentage of overheads, small number of products/services, manufacturing process is simple and lack of knowledge regarding ABC.

10.3.3.2 Type 2 companies (Cluster 2)

Table 10.18 below shows the descriptive statistics of the 34 company with the eight contingent variables. In general, the results are medium with comparison with the first cluster. Regarding size (number of employees and turnover) mean scores = 2.588 and 3.764) respectively, number of products had a mean scores=2.91. Price and quality had the opposite order, as 1 represents the most important and 3 represents the least important, the mean scores were 2.460 and 2.383 respectively and Overheads show mean scores of 2.558. Innovation and Orientation have mean scores (2.970 and 3.529 respectively).

Table 10.18: Descriptive statistics for cluster 2

	Range	Min	Max	Sum	Mean	Std. Deviation	Variance
Employees	4.00	1.00	5.00	88	2.588	1.157	1.340
Turnover	4.00	2.00	6.00	128	3.764	1.046	1.094
Product diversity	5.00	1.00	6.00	99	2.911	1.464	2.143
Price	2.00	1.00	3.00	84	2.460	.563	.317
Quality	2.00	1.00	3.00	81	2.383	.551	.304
Overhead	3.00	2.00	5.00	87	2.558	.746	.557
Innovation	4.00	1.00	5.00	101	2.970	1.086	1.181
Orientation	4.00	1.00	5.00	120	3.529	.861	.742

* (1=most important, 3=least important). N=34

10.3.3.2.1 ABC adoption status

This cluster consists of the medium 34 company in the sample. 20 companies which represent the highest percentage in this group (59%), have never considered the implementation of ABC. 7 companies (20%) rejected ABC, 4 companies (12%) are considering the implementation of ABC and 3 companies (9%) have implemented ABC. Table 10.19 below represents the results.

Table 10.19: ABC adoption status

Groups	Cluster 1 N	%
Implemented	3	9%
Under consider	4	12%
Rejected	7	20%
Never consider	20	59%
Total	34	100%

10.3.3.2.2 Factors against adoption of ABC

This cluster includes 4 companies which are considering the implementation of ABC. Table 10.20 below shows the factors militating against the adoption of system.

Table 10.20: Factors militating against adoption of ABC

Factors	Frequency	percentage
- Difficulty in selecting cost drivers	3	75.0
- Difficulty in defining activities	4	100.0
- High costs of ABC implementation	3	75.0
- Uncertainty of ABC benefits	2	50.0
- Difficulty in assigning resources to activities	3	75.0
- Data collection difficulties	4	100.0
- Difficulty in assigning activity's costs to cost objects	1	25.0
- internal resistance	2	50.0
- A higher priority of other changes/projects	1	25.0
- Lack of top management support	1	25.0
- Inadequate computer software	1	25.0

(4 cases of under consideration)

As seen above, technical difficulties were the most common difficulties among those companies, difficulty in defining activities, data collection difficulties, difficulty in selecting cost drivers, difficulty in assigning resources to activities and high costs of the implementation were ranked as the most factors against ABC adoption (100%, 100%, 75%, 75%, and 75%) respectively. Organisational and behavioural difficulties were the least important factors against ABC adoption within this group.

10.3.3.2.3 Reasons for rejecting the adoption of ABC

7 companies had rejected the implementation of ABC in this group. As shown in table 10.21 below, technical difficulties were most commonly reported as reasons for their rejection of the implementation of ABC.

Table 10.21: Reasons for rejecting ABC

Factors	Frequency	percentage
- Difficulty in selecting cost drivers	7	100.0
- Difficulty in defining activities	5	71.4
- Difficulty in assigning activity's costs to cost objects	5	71.4
- Data collection difficulties	3	42.9
- High costs of ABC implementation	4	57.1
- Difficulty in assigning resources to activities	2	28.6
- Satisfied with current system	3	42.9
- ABC is not relevant to our business	2	28.6
- Uncertainty of ABC benefits	3	42.9
- Inadequate computer software	1	14.3
- Internal resistance	1	14.3
- Lack of top management support	1	14.3
- A higher priority of other changes/projects	1	14.3
- Manufacturing process is simple, easy to track costs	1	14.3
- Small percentage of overhead costs	2	28.6
- The number of products/services is low	0	0
- Lack of knowledge of ABC	0	0

(7 cases of rejecters)

All responding companies in this cluster (7 companies) indicate that difficulty in selecting cost drivers was a difficulty. This was followed by difficulty in defining activities, difficulty in assigning activity's costs to cost objects and high costs of the system (71%, 71% and

57%). Organisational and behavioural issues were also indicated by some companies within this group, for example, 42% of rejecting companies (3 companies) indicate difficulty in data collection, satisfied with their current system, and uncertainty of the ABC benefits. Furthermore, 1 company indicates inadequate computer software, internal resistance, lack of top management support, higher priority of other changes/projects and manufacturing process is simple, easy to track costs as a reason for rejecting the system.

10.3.3.2.4 Reasons for not considering the adoption of ABC

20 companies (59%) in this cluster have never considered the implementation of ABC. The most commonly stated reasons related to the small percentage of overhead costs and small number of products and services (100%). Satisfaction with their current system and irrelevant of ABC to their business were also given as reasons for not considering the system (90% and 75%). In the bottom of table 10.22 below, simplicity of manufacturing process and lack of knowledge regarding ABC were given as reasons for their decision (45% and 25%).

Table 10.22: Reasons for not considering ABC

Factors	Frequency	percentage
- Small percentage of overhead costs	20	100.0
- The number of products/service is low	20	100.0
- Satisfied with current system	18	90.0
- ABC is not relevant to our business	15	75.0
- Manufacturing process is simple, easy to track costs	9	45.0
- Lack of knowledge regarding ABC	5	25.0

(20 cases for not considering)

10.3.3.3 Type 3 companies (Cluster 3)

The third cluster consists of 56 companies (34%) of the sample. Eight contingent variables have been used in this cluster to examine the characteristics of the companies.

Table 10.23 below presents the results.

Table 10.23: Descriptive statistics for cluster 3

	Range	Min	Max	Sum	Mean	Std. Deviation	Variance
Employees	3.00	1.00	4.00	97	1.732	.797	.636
Turnover	4.00	1.00	5.00	145	2.636	.910	.828
Product diversity	5.00	1.00	6.00	131	2.381	1.254	1.574
Price	2.00	1.00	3.00	130	2.321	.690	.477
Quality	2.00	1.00	3.00	143	2.155	.658	.433
Overhead	3.00	2.00	5.00	142	2.535	.712	.508
Innovation	3.00	2.00	5.00	215	3.839	.804	.646
Orientation	2.00	3.00	5.00	235	4.196	.698	.488

N= 56 Companies

It can be seen from the table 10.23 above that the mean scores of size (Employees number and Turnover) were quite small with comparison to the previous two clusters (1.732 and 2.636). The cluster also indicates small mean scores for number of products and the level of overhead costs (2.381 and 2.535). Furthermore companies had a little price and quality competition than the first and second clusters. Finally, the cluster shows a high mean scores of innovation and orientation (3.839 and 4.196) respectively.

10.3.3.3.1 ABC adoption status

The vast majority of companies within this cluster 44 company (79%) have never considered the implementation of ABC, as opposed to 3 companies (5%) which have implemented ABC. 5 companies have rejected ABC and 4 companies are currently considering ABC implementation. Table 10.24 below shows the results.

Table 10.24: ABC adoption status

Groups	Cluster 1 N	Cluster 1 %
Implemented	3	5%
Under consider	4	7%
Rejected	5	9%
Never consider	44	79%
Total	56	100%

10.3.3.3.2 Factors against adoption of ABC

4 companies in this cluster were considering the implementation of ABC, all of them (4 companies) indicate that the uncertainty of ABC benefits was a factor against ABC adoption. Technical difficulties were the least important factors against the adoption within this group, only 1 company indicates the difficulty in selecting cost drivers and defining activities, and no companies indicate the difficulty in assigning resources to activities or activity's costs to cost objects. Internal resistance, higher priority of other projects and lack of top management support were indicated by only one company. Table 10.25 below shows the results.

Table 10.25: Factors against adoption of ABC

Factors	Frequency	percentage
- Difficulty in selecting cost drivers	1	25.0
- Difficulty in defining activities	1	25.0
- High costs of ABC implementation	2	50.0
- Uncertainty of ABC benefits	4	100.0
- Difficulty in assigning resources to activities	0	0
- Data collection difficulties	0	0
- Difficulty in assigning activity's costs to cost objects	0	0
- internal resistance	1	25.0
- A higher priority of other changes/projects	1	25.0
- Lack of top management support	1	25.0
- Inadequate computer software	0	0

(4 cases of under consideration)

10.3.3.3.3 Reasons for rejecting the adoption of ABC

This group of companies (5 companies) within this cluster which rejected the implementation of ABC identified their reasons for ABC rejection; the results are presented in table 10.26 below.

Table 10.26: Reasons for rejecting ABC

Factors	Frequency	percentage
- Difficulty in selecting cost drivers	1	20.0
- Difficulty in defining activities	1	20.0
- Difficulty in assigning activity's costs to cost objects	1	20.0
- Data collection difficulties	1	20.0
- High costs of ABC implementation	4	80.0
- Difficulty in assigning resources to activities	0	0
- Satisfied with current system	4	80.0
- ABC is not relevant to our business	4	80.0
- Uncertainty of ABC benefits	4	80.0
- Inadequate computer software	1	20
- Internal resistance	2	40.0
- Lack of top management support	3	60.0
- A higher priority of other changes/projects	2	40.0
- Manufacturing process is simple, easy to track costs	2	40.0
- Small percentage of overhead costs	4	80.0
- The number of products/services is low	3	60.0
- Lack of knowledge of ABC	0	0

(5 cases of rejecters)

As shown in table 10.26 above, technical difficulties were rarely stated to be the least reasons for rejecting the implementation of ABC within this group of companies. Only 1 company indicates the difficulty in selecting cost drivers, defining activities, and assigning activity's costs to cost objects. The majority of companies in this group (4 companies) indicate that high costs of ABC implementation, satisfied with current system, ABC is not relevant to their business and uncertainty of ABC benefits were the most common reasons for rejecting ABC. In the bottom of table 10.20 above, a high number of companies indicate that small percentage of overhead costs, the low number of products/services and the lack of top management support were crucial reasons for ABC rejection.

10.3.3.3.4 Reasons for not considering the adoption of ABC

44 companies which have not considered the adoption of ABC were clustered in this group. Table 10.27 below reports the reasons for their decision.

Table 10.27: Reasons for not considering ABC

Factors	Frequency	percentage
- Small percentage of overhead costs	44	100.0
- The number of products/service is low	44	100.0
- Satisfied with current system	40	90.9
- ABC is not relevant to our business	36	81.8
- Manufacturing process is simple, easy to track costs	39	88.6
- Lack of knowledge regarding ABC	38	86.4

(44 cases for not considering)

All companies (44 companies) indicate that small percentage of overhead costs and the low number of products and services were the reasons for not considering the adoption of ABC. 40 companies (90%) were satisfied with their current system, and 39 companies (88%) had a simple manufacturing process. 38 companies (86%) indicate that they have a lack of knowledge regarding ABC, and 36 companies (81%) referred to the irrelevant of ABC to their business as a reason for not considering the adoption of ABC.

10.3.3.4 A comparison between the clusters and non ABC adopters

This section shows the main differences within the three clusters for the three classes of Non ABC Adopters, Rejecters, Under consideration and Never considered. It is possible to test for differences in frequencies between tables 10.15, 10.20, and 10.25 then test for differences between tables 10.10, 10.15 and 10.20 and also test between tables 10.17, 10.22 and 10.27 mentioned above. This will establish the common reasons for non-adoption of the system.

10.3.3.4.1 ABC under Consideration Companies

In total 19 companies were still considering the implementation of ABC, they have been asked to indicate the factors militating against its adoption. Those 19 companies were distributed over the three clusters, 11 company in cluster 1 (large), 4 companies in cluster 2 (Medium) and 4 companies in cluster 3 (small). Table 10.28 below shows the main differences between those three clusters within this group (Under consideration).

Table 10.28: Under consideration companies

Factors mitigating against ABC adoption	**Cluster 1 Large**	**Cluster 2 Medium**	**Cluster 3 Small**
- Difficulty in selecting cost drivers	**10 (91%)**	**3 (75%)**	1 (25%)
- Difficulty in defining activities	**8 (73%)**	**4 (100%)**	1 (25%)
- High costs of ABC implementation	**7 (64%)**	**3 (75%)**	2 (50%)
- Uncertainty of ABC benefits	6 (55%)	2 (50%)	**4 (100%)**
- Difficulty in assigning resources to activities	**8 (73%)**	**3 (75%)**	0
- Data collection difficulties	6 (55%)	**4 (100%)**	0
- Difficulty in assigning activity's costs to cost objects	**7 (64%)**	1 (25%)	0
- internal resistance	2 (18%)	2 (50%)	1 (25%)
- A higher priority of other changes/projects	3 (27%)	1 (25%)	1 (25%)
- Lack of top management support	2 (18%)	1 (25%)	1 (25%)
- Inadequate computer software	3 (27%)	1 (25%)	0
Total companies	11	4	4

- (19 companies of under consideration of ABC system)
- Note: **bold** typeface indicates a significant frequency.

Table 10.28 above shows the results of the comparison between the three clusters of non adopters (under consideration). It is clear from the above that within the large company cluster and the medium company cluster (clusters 1& 2) the main reason mitigating against adoption are Technical issues such as (difficulty in selecting cost drivers, difficulty in defining activities and difficulty in assigning resources to activities). Whereas, within the small company cluster (cluster 3) the main reason for non adoption is uncertainty of the benefits of ABC system.

10.3.3.4.2 ABC Rejecters Companies

The 24 companies which had rejected the implementation of ABC system were asked to indicate the reasons for its rejection of the system. The 24 rejecting companies were distributed over the three clusters. 12 companies in cluster (1), 7 companies in cluster (2) and 5 companies in cluster (3). Table 10.29 below indicates the results of the comparison between those three clusters.

Table 10.29: ABC rejecters companies

Factors	**Cluster 1 Large**	**Cluster 2 Medium**	**Cluster 3 Small**
- Difficulty in selecting cost drivers	**12 (100%)**	**7 (100%)**	1 (20%0
- Difficulty in defining activities	**12 (100%)**	**5 (71%)**	1 (20%)
- Difficulty in assigning activity's costs to cost objects	**11 (92%)**	**5 (71%)**	1 (20%)
- Data collection difficulties	**11 (92%)**	3 (43%)	1 (20%)
- High costs of ABC implementation	7 (58%)	4 (57%)	**4 (80%)**
- Difficulty in assigning resources to activities	**11 (92%)**	2 (29%)	0
- Satisfied with current system	5 (42%)	3 (43%)	**4 (80%)**
- ABC is not relevant to our business	4 (33%)	2 (29%)	**4 (80%)**
- Uncertainty of ABC benefits	2 (17%)	3 (43%)	**4 (80%)**
- Inadequate computer software	5 (42%)	1 (14%)	1 (20%)
- Internal resistance	3 (25%)	1 (14%)	2 (40%)
- Lack of top management support	3 (25%)	1 (14%)	3 (60%)
- A higher priority of other changes/projects	2 (17%)	1 (14%)	2 (40%)
- Manufacturing process is simple, easy to track costs	1 (8%)	1 (14%)	2 (40%)
- Small percentage of overhead costs	0	2 (29%)	**4 (80%)**
- The number of products/services is low	0	0	3 (60%)
- Lack of knowledge of ABC	0	0	0
Total companies	12	7	5

- Note: **bold** typeface indicates a significant frequency.

The results above indicate that within the large company cluster and the medium company cluster (clusters 1&2) the main reasons for non adoption of ABC (rejected) are technical issues, while within small company cluster (cluster 3) the main reasons for non adoption is perceived unsuitable of the ABC system such as (Satisfied with current system, ABC is not relevant to our business, uncertainty of ABC benefits and small percentage of overhead costs).

10.3.3.4.3 ABC Not-considering Companies

The 80 companies which have not considered the implementation of ABC system were asked to indicate the possible reasons for its decision. The 80 companies were distributed over the three clusters, which resulted 16 companies in cluster (1), 20 companies in cluster (2) and 44 companies in cluster (3). Table 10.30 below indicates the results of the comparison between those three clusters.

Table 10.30: Reasons for not considering ABC

Factors	**Cluster 1 Large**	**Cluster 2 Medium**	**Cluster 3 Small**
- Small percentage of overhead costs	6 (38%)	**20 (100%)**	**44 (100%)**
- The number of products/service is low	5 (31%)	**20 (100%)**	**44 (100%)**
- Satisfied with current system	8 (50%)	**18 (90%)**	**40 (91%)**
- ABC is not relevant to our business	10 (63%)	15 (75%)	**36 (82%)**
- Manufacturing process is simple, easy to track costs	6 (38%)	9 (45%)	**39 (89%)**
- Lack of knowledge regarding ABC	5 (31%)	5 (25%)	**38 (86%)**
Total company	16	20	44

- (80 companies of not considering of ABC system)
- Note: **bold** typeface indicates a significant frequency.

Table 10.24 above shows the significant reasons for not considering the implementation of ABC systems. The results show that within the small company cluster the main reasons for non adoption is perceived unsuitable of ABC system which includes all the reason asked to this group, such as (small percentage of overhead costs, small number of products/services, and satisfaction with the current system). On the other hand, within the large company cluster, these variables (perceived unsuitable of ABC system) have not been the main reasons for not considering the ABC system, as it represents the small percentages comparing with the two other clusters.

10.4 Summary and Conclusion

Based upon the contingency variables of firm size, product diversity, marketing strategy, cost structure, and business unit culture, K-means clustering was utilized to identify homogeneous subgroups of companies in a sample. Using a Euclidean distance measure, a good separation of the sample into three company types was achieved, the technique aims to minimize within cluster variation, and to maximize between cluster variations, where in the latter case distance between clusters is measured from respective centred.

In terms of clustering, three clusters were achieved. Type 1 companies (77 companies) had the following characteristics: large number of employees and turnover; large product diversity, intensive price and quality competition, high level of overheads, and critical business unit culture (innovation and outcome orientation).

As compared to other company types, type 3 companies (56 company) have considerably lower number of employees (mean scores= 1.732, compared to 3.467 for type 1 companies). They also had smaller annual turnover, smaller number of products, lower competition, lower overheads and quite high innovation and orientation. The type 2 companies (34 companies) show medium mean results on all variables except innovation and orientation which were the latest within this cluster as shown in table 10.10.

A crosstabulation of the three clusters and the four levels of ABC adoption resulted in a high significant relationship (p-value=.000). Referring to table 10.11, around 85% of companies (38 company) which implemented ABC were type 1 companies (cluster 1), whereas 55% of companies (44 company) which have never considered the adoption of ABC were in type 3 companies, which means that large companies are more likely to adopt ABC and smaller companies are more likely to not considering the adoption of ABC.

By analyzing the factors militating against ABC adoption for those who were considering ABC adoption within the three clusters, the results show that larger companies (type 1 and 2 companies) indicate the technical issues as the most commonly stated difficulties mitigating against its adoption. The results therefore confirm the relationship between technical difficulties and companies characteristics from one side and ABC adoption status from the other side.

Regarding those who rejected the implementation of ABC (24 company), the results show that for the larger companies (type 1 and 2) (12 and 7 companies), technical issues were the most common difficulties encountered during their implementation.

Type 3 companies indicate that organisational and behavioural issues were the most common reasons for their rejection and technical issues were the least cited.

The 80 companies in the sample which have never considered the adoption of ABC divided among the three clusters as following: 16, 20 and 44 (cluster1, 2, and 3). All companies within the second and third clusters indicate that small percentage of overheads and low number of products was the most common reasons for not considering the adoption of ABC, those two clusters were medium and small in their characteristics.

CHAPTER 11: EVALUATION OF THE RESEARCH MODEL

11.1 Introduction

This chapter presents the results of the analysis conducted in chapters 8, 9 and 10, and shows how these results support the theoretical model developed in chapter 6 and how they support each of the thirteen hypotheses been posed in chapter 7. Seven of these hypotheses relate to the contingency model of ABC adoption, and six hypotheses relate to the barriers to the implementation of ABC systems. Various statistical analyses have been used (Univariate, Bivariate and Cluster analysis), which were deemed appropriate to examine and evaluate the research model and hypotheses.

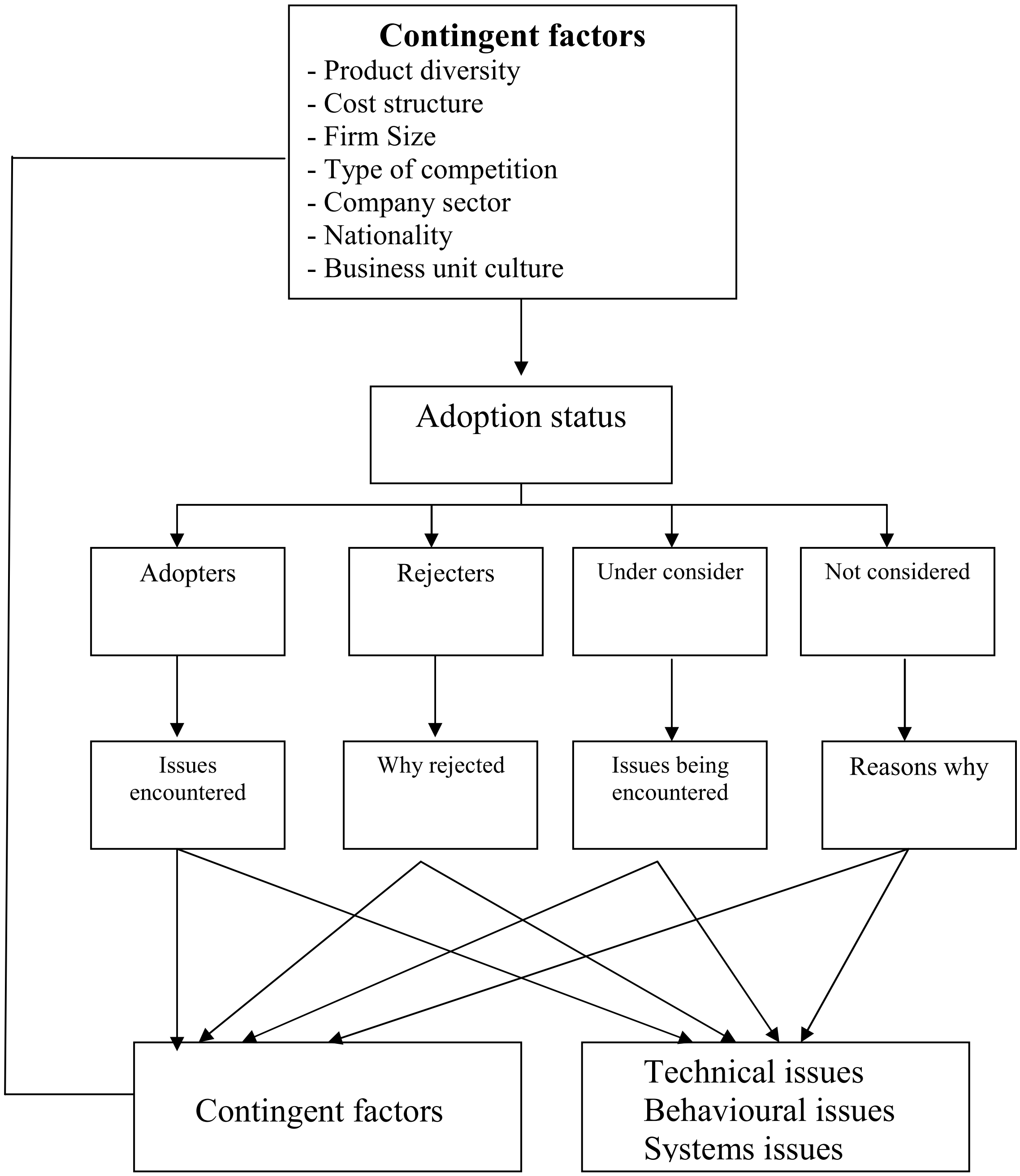
The rest of the chapter is organised as follows: Section 11.2 reviews the research model. Section 11.3 examines the relationship of contingency variables and ABC adoption by testing the first seven hypotheses. Section 11.4 presents the results of cluster analyses regarding the barriers to the implementation of ABC systems. The last section 11.5 contains the conclusion of the chapter.

11.2 Research Model

Chapter 6 has developed a model of ABC adaptation. The model suggests that in the adoption of ABC, likely two sets of variables are at work. The contingency factors and the company's ability to address and overcome the barriers and difficulties associated with ABC implementation.

The overall model which has been developed is as given in chapter 6, reproduced below:

Figure 11.1: A contingency model of ABC adoption



11.3 Relationship of contingency variables and ABC adoption

Chapter 9 presents and discusses the results of the bivariate analysis of the underling relationship between the contingent factors and levels of ABC adoption. Four statistical methods have been utilised (Chi-square, t-test, Mann-Whitney and ANOVA) to establish whether the seven hypothesized variables are individually associated with ABC adoption. The summary of bivariate analysis results are represented below:

Table 11.1: Summary of results of bivariate analysis

Contingency variables	Chi-square t value	Chi-square *p*-value	t-test t value	t-test *p* value	Mann-Whitney Z value	Mann-Whitney *p*-value	ANOVA F value	ANOVA Sig
INDUSTRIAL	17.874	**.037**	N/A	N/A	N/A	N/A	N/A	N/A
EMPNOMBE	31.453	**.000**	-5.521	**.000**	-5.074	**.000**	10.132	**.000**
TURNOVER	23.881	**.000**	-3.752	**.000**	-3.648	**.000**	7.132	**.000**
NATIONAL	3.764	.288	N/A	N/A	N/A	N/A	N/A	N/A
PRICE	16.076	**.013**	3.748	**.000**	-1.368	.171	.991	.399
QUALITY	15.021	**.020**	1.514	.132	-.004	.997	.998	.395
PRODNOMB	45.618	**.000**	-6.369	**.000**	-4.822	**.000**	16.596	**.000**
OVERHEAD	46.248	**.000**	-5.658	**.000**	-5.296	**.000**	28.444	**.000**
INNOVATIO	15.297	**.018**	-2.582	**.011**	-2.121	**.034**	5.304	**.002**
ORIENTATI	70.571	**.000**	-4.281	**.000**	-2.123	**.034**	1.650	.180

Based on the above table, a discussion of the contingent factors individually and their association with the adoption of ABC systems is presenting as follows:

11.3.1 Company sector

This study seeks to establish if the economic sector in which the company operates has any significance for the implementation of ABC systems. It was expected that manufacturing companies are more likely to adopt ABC than companies within other sectors. The results indicate that financial companies are more likely to adopt ABC than companies within other sectors. The chi-squared test (see table 11.1 above) shows that the relationship between industry classification and ABC adoption status is significant (*p*-value = .037). The findings of this study therefore, support the hypothesis posed, moreover, the results support the findings of previous studies (Innes and Mitchell 1995. 2000; Clarke et al. 1999; Pierce and Brown 2004). The main finding is that there is a strong association between economic sector and the adoption of ABC systems, for the companies examined.

11.3.2 Firm size

Firm size has been measured both by the number of employees and annual turnover. The findings report a significant association exists between both number of employees, annual turnover and the implementation of ABC systems. The chi-squared test shows that the relationship between firm size (number of employees and annual turnover) and ABC adoption status is significant (*p*-value = .000 and .001 respectively). The Levene's test (t-test) is significant with firm size (*p* = .000 and .000), which means that the variances are significantly different between non-adopters and adopters, and the mean differences scored (-.5366 and -.4529 respectively). The results of Mann-Whitney U test, which support the results achieved by the t-test indicate that there are statistically significant differences in variation in number of employees and annual turnover (P value = .000 and .000 respectively). The results of ANOVA shows a significant mean differences between the four groups of companies in size (adopters, rejecters, under considers and non-considers), these differences are highly significant (.000 and .000 respectively), (see table 11.1). It was expected that large companies in terms of number of employees and turnover were more likely to adopt ABC than smaller companies. The results above support this hypothesis and moreover indicate that there is a significant difference among the different groups of companies in terms of firm size. The findings of this study also support the argument that 'the size of the company is usually a factor in the rate of adoption of sophisticated cost accounting systems' (Innes and Mitchell, 1995, 1999; Bjornenak, 1997; Van Nguyen and Brooks, 1997; Krumwiede, 1998; Clarke et al, 1999). The results of this study support some previous ABC studies which indicate that company size does provide a statistically significant source of differentiation between ABC adopters and non-adopters; a markedly significant higher rate of adoption is apparent in the larger firms surveyed (Innes and Mitchell, 1995; Bjornenak, 1997; Boot and Giacobbe, 1998; Krumwiede, 1998; Clarke et al. 1999; Groot, 1999; and Pierce and Brown, 2004).

11.3.3 Nationality

Nationality has been examined to establish its association with the implementation of ABC system. It was expected that multinational companies were more likely to adopt ABC system than national companies. The findings indicate that a higher percentage of Irish companies (43 %) have implemented or are considering the implementation of ABC than do multinational companies (30%). Moreover, 56% of multinational companies have not considered ABC compared to 41% of national companies. The value of the chi-squared test (3.764) shows insignificant relationship between nationality and ABC adoption (*p*-value = .288). The results of this study support the findings of Pierce and Brown (2004) whose found that ABC adoption rates are higher among indigenous Irish firms than multinational, although not significantly higher. However, the results are in conflict with Clark et al. (1999) who report a greater percentage of multinational subsidiaries using ABC than do national firms. Therefore, the results do not support the hypothesis posed in this study.

11.3.4 Product diversity

This study adopts the position that product diversity is a significant factor in the adoption of ABC systems. It was expected that firms which have more production diversity were more likely to adopt ABC than firms which have less production diversity. The findings report that a greater percentage of highly diversified companies (55%) have implemented or are considering the implementation of ABC than do lowly diversified companies (10%), moreover, 82% of lowly diversified companies have not considered ABC compared to 27% of highly diversified companies. The chi-square results indicate a significant association between product diversity and ABC adoption (p-value = .000). The differences in means between the two groups (adopter and non-adopters) and the four groups (adopters, rejecters, under considered, and not considered) are also significant in all statistical tests utilized in this study (see table 11.1). The results of this study support the findings of previous studies on ABC implementation (Brown et al 2004; Bjornenak 1997; Clarke et al 1999; Groot 1999; and Abernethy et al 2001).

Product diversity thus appears to be an important variable to the implementation of ABC, companies which have more product diversity are more likely to adopt ABC than companies with a low number of products.

11.3.5 Competition

Types of competition have been examined to test their association with ABC implementation. The main statistical analyses focused upon price and quality which appear as the dominant highest important factors. It was expected that firms which face high levels of competition were more likely to adopt ABC than those which face less competition. The results in table 11.1 above show a significant association between both price, and quality, individually, and ABC adoption (*P*-value= .013 and .020 respectively). Results of the t-test which compared mean-values of each variable (price and quality) between the two groups indicate a significant differences in price (.000) and insignificant differences in quality (.132)). That means quality is an important factor at all companies regardless of its decision regarding ABC systems. The findings of this study support the results of previous studies which are non supportive of an association between high level of competition and ABC adoption (Bjornenak, 1997; Van Nguyen and Brooks, 1997; and Cinquini et al. 1999).

11.3.6 Cost structure (level of overheads)

Despite the conflict between the theoretical literature and the results of previous surveys relating to ABC implementation and level of overhead expenditure, this study hypothised that firms which have a greater percentage of total cost as overheads are more likely to implement ABC than other firms. The results in table 11.1 show that companies with higher overhead percentages are more likely to adopt ABC, and the association between overheads and ABC adoption statues is very significant (chi-squared 46.248, *P*-value= .000). The findings of the t-tests which compare mean-values of overhead between the two groups (adopters and non-adopters) show that, in all cases, means between the two groups are significantly different (*p*-value = .000) and show that companies which have adopted ABC or plan to adopt ABC possess significant difference in terms of overhead when compared with firms which have not adopted ABC. The ANOVA and Mann-Whitney tests indicate significant differences in overhead between the four groups of companies (P-value = .000). The results of this study therefore, support the theoretical literature (Cooper and Kaplan, 1988; Cooper, 1989b; Drury, 1989; Mitchell, 1994) which argues that growth of overhead compounds the problematic distortion inherent in traditional systems, therefore promoting

ABC as the solution to overcome these distortions. However, previous surveys report a non-association between the percentage of overhead to total costs and the implementation of ABC (Booth and Giacobbe 1989; Brown et al. 2004; Clarke et al. 1999; Van Nguyen and Brooks, 1997; Bjornenak, 1997; and Cinquini et al 1999).

11.3.7 Business unit culture

This study examined business unit culture as a contingent factor associated with the implementation of ABC by Irish companies. Business unit culture was divided into two categories, namely innovation and outcome orientation. The findings of the study (table 11.1 above) show a significant association between innovation and outcome orientation individually and the adoption of ABC systems (P-value = .018 and .000 respectively). T-tests results which compared mean-values of innovation and outcome orientation between the two groups, show that, in both cases, means between the two groups significantly different (p-value = .011 and .000 respectively). ANOVA test shows that in innovation, means between the four groups of companies are significantly different (.002), whereas insignificant differences were found in means between the four groups in outcome orientation (.180). It was expected that firms which have a culture of innovation and outcome orientation will be more likely to adopt ABC. The results of the study support this expectation. The results also support the previous study by Baird et al. (2004) which is the only other study which examines the association between business unit culture and the adoption of ABC systems.

11.4 Technical issues and ABC adoption

Having established the contingency model of ABC adoption, the research seeks to identify whether technical issues are a significant barriers to the implementation of ABC or whether other barriers, such as behavioural issues and/or systems are more significant. In order to differentiate "barriers" as a general reason for no adoption from the contingent factors, companies were first clustered on the basis of the contingent factors. A three cluster approach was adopted in order to maintain consistency with the bivariate analysis.

This resulted in the following 3 clusters:

Table 11.2: Clusters and ABC adoption status

Group/ Clusters	**Large 1**	**Medium 2**	**Small 3**	**Total**
Implemented	38 49.3 %	3 8.8 %	3 5.4%	44 26.3 %
Under consideration	11 14.3 %	4 11.8 %	4 7.1 %	19 11.4 %
Rejected	12 61.4 %	7 20.6 %	5 8.9 %	24 14.4 %
No consideration	16 20.8%	20 58.8%	44 78.6%	80 47.9%
Total	77 1100%	34 100%	56 100%	167 100%

When companies are clustered on the basis of their prime factor profiles, it was expected there will be significant differences in the ABC adoption status between clusters. Table 11.2 above indicates significant differences in the adoption of ABC. The large number of companies which have implemented ABC (38 out of 44 companies) are found in cluster one, while only 6 companies of ABC adopters found in both clusters 2 and 3. Therefore, a significant differences in the ABC status between clusters have been found, which support hypothesis 8.

Having clustered the companies and having established that there are significant differences in their ABC adoption rates, a profile of each cluster was developed. This profile represents a measure of each variable which was established in the contingency model.

Table 11.3: Descriptive statistics of the clusters

Clusters	Cluster 1			Cluster 2			Cluster 3		
Variables	**N**	**Mean**	**Std. D**	**N**	**Mean**	**Std. D**	**N**	**Mean**	**Std. D**
Employees No	77	3.467	1.252	34	2.588	1.158	56	1.732	.797
Turnover	77	4.519	1.154	34	3.764	1.046	56	2.636	.910
Product No	77	4.649	1.167	34	2.911	1.464	56	2.381	1.254
Price	77	2.558	.638	34	2.470	.563	56	2.321	.690
Quality	77	2.532	.552	34	2.382	.551	56	2.155	.658
Overhead	77	2.909	.764	34	2.558	.746	56	2.535	.712
Innovation	77	4.104	.836	34	2.970	1.086	56	3.839	.804
Orientation	77	4.325	.751	34	3.529	.861	56	4.196	.698

Table 11.3 above shows the descriptive statistics for each cluster with the eight contingent variables. The results indicate that type 1 companies (cluster 1) have a significant different profile from type 2 and type 3. Type 1 companies have the highest mean in all variables followed by type 2 companies which represent the medium companies and finally the smallest companies represented by cluster 3.

While the upholding of hypothesis 8 above allows us to say that the adoption rates between the clusters is statistically different, there is variation in each cluster, as shown in table 10.7, 10.13 and 10.18, which are represented below in a combined form.

Table 11.4: ABC adoption status among clusters

Clusters	**Cluster 1**		**Cluster 2**		**Cluster 3**	
Groups	**N**	**%**	**N**	**%**	**N**	**%**
Implemented	38	49%	3	9%	3	5%
Under consider	11	14%	4	12%	4	7%
Rejected	12	16%	7	20%	5	9%
Never considered	16	21%	20	59%	44	79%
Total	77	100%	34	100%	56	100%

Table 11.4 above reports the status of ABC adoption between the three clusters. Within each cluster, a difference in ABC adoption status was expected. Cluster one which represents the larger companies in the sample (77 companies), includes the highest percentage of those companies which implemented ABC (38 companies out of 44), clusters 2 and 3 consists a small percentage of those adopters. In fact, non-adopters represent 51% of the companies in cluster one. These non adopters were differentiated into three categories; Currently Considering ABC 14%, Have Rejected 16% and Never considered 21%. It is interesting to note that even in type 1 companies more than half have not implemented the system.

In cluster two which includes the medium profile companies (34 companies), only 9% of companies have adopted ABC, while 91% have not adopted the system. Similar results were found in cluster three (56 small profile companies) with only 5% being adopters. The results above also show that all three categories of non adopters i.e those who have rejected ABC after consideration, those who are currently considering ABC and those who have not considered ABC, are found within each cluster of companies. This supports hypothesis 9, which indicates that there will be differences in ABC adoption status within each cluster.

Hypothesis 9, established above is of particular interest to this research as it establishes that there are "non adopters" in each cluster. If the general argument of the research model is to be established there will be significant differences in the reasons for rejection between the three clusters, this is captured in hypothesis 10 which states that there will be significant differences in the reasons for rejection of ABC, between clusters. Table 11.5 below indicates the results of the comparison between those three clusters.

Table 11.5: ABC Rejecters companies

	Number of times mentioned		
Reasons for rejection	**Cluster 1 Large**	**Cluster 2 Medium**	**Cluster 3 Small**
- Difficulty in selecting cost drivers	**12 (100%)**	**7 (100%)**	1 (20%0
- Difficulty in defining activities	**12 (100%)**	**5 (71%)**	1 (20%)
- Difficulty in assigning activity's costs to cost objects	**11 (92%)**	**5 (71%)**	1 (20%)
- Data collection difficulties	**11 (92%)**	3 (43%)	1 (20%)
- High costs of ABC implementation	7 (58%)	4 (57%)	**4 (80%)**
- Difficulty in assigning resources to activities	**11 (92%)**	2 (29%)	0
- Satisfied with current system	5 (42%)	3 (43%)	**4 (80%)**
- ABC is not relevant to our business	4 (33%)	2 (29%)	**4 (80%)**
- Uncertainty of ABC benefits	2 (17%)	3 (43%)	**4 (80%)**
- Inadequate computer software	5 (42%)	1 (14%)	1 (20%)
- Internal resistance	3 (25%)	1 (14%)	2 (40%)
- Lack of top management support	3 (25%)	1 (14%)	3 (60%)
- A higher priority of other changes/projects	2 (17%)	1 (14%)	2 (40%)
- Manufacturing process is simple, easy to track costs	1 (8%)	1 (14%)	2 (40%)
- Small percentage of overhead costs	0	2 (29%)	**4 (80%)**
- The number of products/services is low	0	0	3 (60%)
- Lack of knowledge of ABC	0	0	0
Total companies	12	7	5

The results of cluster analysis show that within the 'closely aligned' cluster (cluster 1), technical difficulties were the most commonly reported reasons for (table 11.5). The cluster which is 'least aligned' (cluster 3), shows that technical difficulties were the second least mentioned reasons for rejection, and that contingent issues are the dominant reasons for such rejection. Therefore, technical issues are the most common cause for rejection of ABC within the cluster whose profile most closely matches the prime factors. Furthermore, contingent issues are the most dominant reasons for rejection of ABC within the cluster whose profile 'least aligned' the prime factors.

The above results are supportive of hypothesis ten which states that there will be significant differences in the reasons for rejection of ABC between clusters. Moreover, the results above support the hypothesis eleventh which states that technical issues will be the most common cause for rejection of ABC within the cluster whose profile most closely matches the prime factors.

The research model also embraces companies which are actively considering ABC adoption. The model suggests that the factors militating against adoption will differ between clusters. Table 11.6 below presents the results and shows that there are significant differences in the factors militating against implementation of ABC between clusters. The results show that technical issues are the most common factors militating against ABC within companies who are actively considering its adoption, within the cluster whose profile most closely matches the prime factors (clusters 1). On the other hand, technical issues are not mentioned or least frequently factors militating against ABC adoption within companies who are actively considering its adoption, within the cluster whose profile least closely matches the prime factors (cluster 3).

Table 11.6: Under consideration companies

Factors mitigating against ABC adoption	**Cluster 1 Large**	**Cluster 2 Medium**	**Cluster 3 Small**
- Difficulty in selecting cost drivers	**10 (91%)**	**3 (75%)**	1 (25%)
- Difficulty in defining activities	**8 (73%)**	**4 (100%)**	1 (25%)
- High costs of ABC implementation	**7 (64%)**	**3 (75%)**	2 (50%)
- Uncertainty of ABC benefits	6 (55%)	2 (50%)	**4 (100%)**
- Difficulty in assigning resources to activities	**8 (73%)**	**3 (75%)**	0
- Data collection difficulties	6 (55%)	**4 (100%)**	0
- Difficulty in assigning activity's costs to cost objects	**7 (64%)**	1 (25%)	0
- internal resistance	2 (18%)	2 (50%)	1 (25%)
- A higher priority of other changes/projects	3 (27%)	1 (25%)	1 (25%)
- Lack of top management support	2 (18%)	1 (25%)	1 (25%)
- Inadequate computer software	3 (27%)	1 (25%)	0
Total companies	11	4	4

The above table tests the last two hypotheses (12 and 13), and shows that there are significant differences in the factors militating against ABC adoption (within companies who are actively considering its adoption) between clusters. Furthermore, the dominance of technical issues amongst the barriers to implementation is established supporting the hypothesis which states that technical issues will be the most common factor mitigating against ABC adoption (within companies who are actively considering its adoption) within the cluster whose profile most closely matches the prime factors.

11.5 Summary and conclusion

This research has sought to answer two interrelated questions. The first research question is "Is the adoption of ABC by Irish companies associated with firm-specific characteristics, namely industry sector, firm size, nationality, product diversity, type of competition, cost structure and business unit culture?.

Based on the contingency model developed in chapter 6, seven variables and their hypothised relationship with ABC adoption have been examined in the first section of this chapter. Previous surveys are not unanimous in their support of the impact of the individual variables upon ABC adoption. While different surveys of the same variable sometimes use different operational definitions of the variable, and of ABC adoption, nonetheless there does appear to be support for a general argument that the seven identified variables potentially impact upon ABC adoption. The results of this study show a strong significant association between six of those contingent variables namely (product diversity, cost structure, firm size, types of competition, company sector and business unit culture) and the adoption of ABC. Nationality has been found to have a non significant association with ABC adoption

The research model (figure 11.1) suggests that in the adoption of ABC, likely two sets of variables are at work. The contingent variables which likely render it appropriate or useful for the company to adopt ABC, and the company's ability, or willingness to address the barriers and difficulties associated with ABC adoption. The model also suggests that the contingent variables alone may not of themselves adequately explain the actual take up of ABC systems. Moreover, the model suggests that two companies which have similar profiles with regard to the contingent variables may yet reach different decisions with regard to ABC adoption, due to their differing abilities or willingness to address the issues relating to implementation. Of the various possible barriers to implementation, this research has focused on technical issues, and has sought to answer the second research question, which is "What is the extent of the technical difficulties encountered during the implementation of ABC system?

The findings of the cluster analysis both examine the research model and answer the second research question. The model suggest that two companies which have similar profiles with regard to contingent factors (with higher overheads, more product diversity etc.) may yet reach different decision with regards to ABC adoption, due to their differing abilities or willingness to address and overcome the issues relating to ABC implementation. The results completely support this suggestion.

The results also show that technical issues are the most common factor militating against ABC adoption within companies who have rejected or are actively considering its adoption within the cluster whose profile most closely matches the prime factors.

With regard to the extent of technical issues, as barriers to implementing ABC, the results show as follows:

(i) Amongst companies which have rejected ABC, technical issues are the most frequently stated reasons for rejection, amongst those companies whose profile most closely matches the prime factors.

(ii) Amongst companies which are actively considering the adoption of ABC technical issues are the most frequently stated factors militating against ABC introduction, amongst those companies whose profile most closely matches the prime factors.

CHAPTER 12: CONCLUSIONS, CONTRIBUTIONS, AND FUTURE RESEARCH

12.1 Introduction

The conceptual model of this study based on constructs that emerged from the existing literature (Chapters 2-5) was developed in chapters 6. The research questions and hypotheses were posed in Chapter 7, and the model was tested with data from a survey of companies listed on *Business and Finance (2004) Irelands Top 1000 companies* (167 firms). The data has been examined using various statistical analysis (Univariate, Bivariate and Cluster analysis) deemed appropriate to the nature of the data and the research model.

The main argument in this study is that there are two main interacting sets of factors influencing ABC adoption, the contingency factors, and the barriers and difficulties associated with ABC implementation. Chapter 9 has established the relationship between the contingency factors and the ABC adoption status. In Chapter 10, the barriers and difficulties relating to implementation of ABC were examined using the cluster analysis.

This Chapter provides the final conclusions relating to the hypotheses, and considers the contributions of the study. The principle research question is re-addressed. The theoretical and methodological contributions of the study are then considered and suggestions for future research opportunities are also provided.

The organisation of the chapter is as follows. Section 12.2 concludes the research questions based on testing and examining the research hypotheses. Section 12.3 presents the theoretical and methodological contributions of the research. Section 12.4 identifies limitations and suggestions for future research. The last section contains the closing remarks for the study.

12.2 Concluding the research questions

The concept of contingency theory and its relationship to management accounting is well established. Fisher (1995) pointed out that contingency theory has become one of the dominant paradigms for research into management accounting design. Contingency theory suggests that there is no ideal form of management accounting. Rather, particular features or contingencies of an appropriate accounting system will depend upon the specific circumstances in which an organization finds itself (Otley, 1980).

Organisations need up-to-date information to support them in making the right decision. Costing systems should provide the accurate and necessary cost information for both informed operational and strategic decisions about resources acquisition and use (Berliner and Brimson, 1988). During the 1980s many organisations began to realize the adverse consequences of allowing their traditional costing systems to generate inaccurate costing information (Cokins, 1999). Especially during the late 1980s, traditional costing practices were widely recognized by academics to be unlikely to provide useful information for management (Kaplan, 1984; Kennedy, 2000). While many lamented that costing practices were lagging behind the contemporary manufacturing environment (Kaplan, 1984; Johnson & Kaplan, 1987; Dunk, 1989), some claimed that traditional costing systems should be eliminated (e.g. Kaplan, 1990a). As a result, Activity-Based Costing (ABC) has been developed as a remedial solution in order to eliminate the distortions of overhead cost allocation, and to present an opportunity to provide a better decision-making base for managers.

Despite strong advocacy in favour of ABC systems (Cooper 1988a, b; Cooper and Kaplan 1991, 1992 and 1998) adoption rates are not overwhelming (Innes et al. 2000). Survey evidence suggests that, over the past decade, there has been a growing awareness of ABC, but overall rates of implementation have been low (Innes and Mitchell 1995, 2000; Bjornenak1997; Nguyen and Brooks1997; Clark et al. 1999; Groot 1999; Cinquini et al.1999; Changruksut 2002; Cotton et al.2003; Pierce and Brown 2004; Manalo 2004; and Cohen et al. 2005). A suggested reason for this is that the adoption of ABC has been inhibited in many companies by the behavioural and systems factors (Anderson 1995; Shields 1995). However, the application of a contingency theory prospective would likely suggest that contextual variables also exert an influence upon ABC adoption. Behavioural and systems issues may be viewed as possible barriers to be overcome in ABC adoption, while the overall suitability of the system is influenced by the contextual or contingent factors. The barriers to ABC adoption may also include technical issues.

Anderson et al (2002, p.195) state: “an aspect of ABC implementation that researchers have neglected is the process of designing the ABC model – i.e. the resources, activities and cost drivers that are the ‘economic map’ of the organisation”. By contrast, a number of studies have considered behavioural issues (Anderson, 1995; Shields, 1995; McGowan and Klammer 1997; Anderson et al., 2002). However, there is evidence (Cobb et al 1992; Armitage and Nicholson 1993; Innes and Mitchell 1990, 1995, 2000; Clarke 1997) that there are specific technical issues which may impact upon ABC implementations. It is on such technical issues that this research has focused.

In section 7.4 the research questions were formulated and described. The research questions addressed in this study are:

1. Is the adoption of ABC by Irish companies associated with firm-specific characteristics, namely industry sector, firm size, nationality, product diversity, type of competition, cost structure and business unit culture?

2. What is the extent of the technical difficulties encountered during the implementation of ABC system?

The technical difficulties focused upon are those identified in the literature review i.e.

(i) Identifying the major activities that take place in an organisation

(ii) Assigning resources to those activities

(iii) Aggregating activities to create cost pools/ activity centres

(iv) Determining the cost drivers for each activity

(v) Assigning the cost of activities to cost objects

The study sought to establish the factors associated with ABC adoption in order to answer the research questions. When conducting empirical research, the researcher must decide whether prior expectations should dictate the design of investigation procedures. Should the study use hypotheses based on conceptual reasoning or should the hypotheses be deduced from the empirical findings (Gernon and Wallace, 1995)? The choice in this study was to specify hypotheses prior to obtaining the empirical data. Based on an extensive review of the management accounting literature, the hypotheses were specified in advance. These hypotheses determined the direction, scope, and structure of the questionnaire. Results derived from the empirical data were evaluated to determine whether the hypotheses were or were not supported.

12.3 Theoretical and Methodological contributions

The aim of this study was to examine not only the association between the adoption of ABC system and the contingent variables, but also to develop a new model of ABC adoption which seeks to incorporate contingency theory relating to a set of variables that identified from the literature as likely to be influential in ABC adoption, as well as the significant of technical issues, which may act as barrier to such implementation. Therefore, the study contributes theoretically and methodologically to the management accounting literature in several ways.

12.3.1 Dual Influences

This research has sought to examine the reasons why the take up or adoption of ABC systems remains low, given the advantages which the system offers over the more traditional approach to dealing with overhead costs. A major theoretical contribution of this study is the realisation that two distinct sets of variables influence the adoption of ABC. In this study these sets of influences are referred to, respectively, as "Contingent Variables" and "Barriers". The theoretical model developed in this research views the Contingent Variables as rendering ABC "appropriate" for use by particular companies. Thus, for example, firms with high levels of overheads (as a percentage of total cost) are more likely to find ABC appropriate to their particular information needs than firms with a low level of overheads. However, for ABC to be adopted by a firm the second set of variables, the "Barriers to Implementation" must be overcome. These implementation barriers are viewed, in this research, as potential difficulties which may inhibit the adoption of the ABC system. Thus, for example, a lack of senior management support for ABC may be a sufficient inhibitor to prevent the implementation of the ABC system. Adopting the position that there are two distinctive sets of variables which influence the adoption of ABC, this research has sought to identify and model these distinctive sets of variables. As far as the author is aware this is the first study to consider the interaction between these sets of variables.

12.3.2 Classification of the potential Barriers to ABC implementation

Based upon a review of the literature this research has classified implementation issues, or difficulties into three main types. These have been termed "Behavioural", "Technical" and "Systems" difficulties or barriers. The benefit of this classification is that it allows the results of the various studies relating to ABC adoption to be summarised in a coherent fashion. Thus, for example individually identified issues such as difficulties in identifying activity centres, difficulties in identifying cost drivers, and difficulties in assigning costs to activities have been classified under the general heading of "Technical Difficulties". Likewise, such individual issues as lack of senior management support, lack of suitable accounting staff, and internal resistance have been classified under the heading of "Behavioural Issues", while Systems Difficulties or Barriers include the individually identified difficulties such as inadequate computer software, data collection difficulties etc. Thus, while the various studies reviewed in this research have identified various common problems relating to ABC implementation, the classification adopted in this study allows us to focus in on the generic nature of the difficulties rather than deal with a (very) long list of highly specific issues.

12.3.3 Identification of Contingent Factors

Drawing upon the literature of Contingency Theory, as developed both in the general management literature and more specifically in the management accounting literature together with a consideration of the results of published research on ABC adoption, a contingency model of ABC adoption has been developed. In this model seven contingent variables were identified, each of which is justified as likely relating to the adoption of ABC. As argued under the heading "Duel Influences" the view taken in this research is that the contingent factors or variables likely render ABC appropriate for adoption. The contingent variables identified were as follows, Firm Size, Nationality, Cost structure, Industrial Sector, Type of Competition, Product Diversity and Business Unit Culture. Of these all but one, i.e. Nationality were found to be significantly associated with ABC adoption. The contingency model was therefore largely verified.

12.3.4 Use of Cluster Analysis / Profiling of Companies

As far as the author can establish this is the first study of ABC adoption which has utilised the statistical technique of Cluster Analysis to classify, or group, companies which were the basis of the study. The particular Cluster Analysis technique which was utilised was the K mean clustering method. The 167 companies were clustered into three groups based upon the values of seven variables, each of which had been established as being a significant contingent variable. The choice of three as the number of clusters to utilise was dictated by the data relating to the variables, which had previously been "collapsed" into three categories in order to facilitate Chi-square analysis. The resulting three clusters have significantly different rates of ABC adoption, as established by Chi-square tests. Some 63% of Cluster 1 companies had either adopted ABC or had adoption under active consideration, as opposed to some 20% of Cluster 2, and some 12% of Cluster 3.

Based upon the mean value of each of the variables used to form the clusters, a "profile" of the companies within each of the clusters was developed. As far as can be established this is the first time that company profiles have been developed in the study of ABC adoption.

12.3.5 Identification of Implementation Barriers.

The position adopted within this study is that there are two distinct sets of variables influencing the adoption of ABC, the Contingent Variables and the Barriers to Implementation. The Contingent Factors have been established as part of this study. The clustering of companies, which was based upon the established Contingent Variables, enables the identification of the reasons for non adaptation of ABC within each cluster. In Cluster 1, which has a profile which most closely matches the Contingent Variables, 100% of the companies which had rejected ABC indicated “Technical Issues” as a reason for the rejection, while 91% of companies within this cluster which were actively considering ABC adoption indicated “Technical Issues” as a factor militating against adoption. By contrast, in Cluster 3, which has a profile which least matches the Contingent Variables only 20% of companies which had rejected ABC indicated “Technical Issues” as a reason for rejection but 80% of these rejecting companies indicated “perceived Unsuitability” as a reason, citing such specific issues as “small percentage of overhead costs” and “ABC is not relevant to our business”. This analysis yields two major contributions. Firstly, there are indeed two set of factors interacting to contribute to low ABC adoption rates. Companies whose profile does not match the Contingent Variables reject ABC on the general ground of perceived unsuitability of the system. Companies whose profile matches the Contingency Variables cite “technical Issues” i.e. a Barrier, as the reason for rejection. Secondly the results clearly indicate that of the three types of Barriers i.e. Technical, Behavioural and Systems it is the Technical Issues which are most influential in contributing to ABC systems non adoption.

12.4 Suggestions for Future Research

Given that this research has established the significance of technical issues in ABC adoption, it is recommended that further empirical research should be conducted using a case studies approach both within companies that have already implemented ABC, and companies which have rejected its implementation. As a research tool the case study focuses on understanding the dynamics present in a real life setting. The approach can be based on either single or multiple case study designs reflecting different design situations (Yin 1994).

In-depth interviews and participant observation could be used to investigate more fully the current practice among Irish companies that have implemented ABC system.

The following possibilities and suggestions provide possible avenues for further research:

Initially, case studies should be conducted in companies that have adopted ABC, posing the following question:

How are the technical difficulties addressed? The technical difficulties being addressed are those identified in this study, as being of particular significance i.e.

(i) Identifying the major activities that take place in an organisation

(ii) Assigning resources to those activities

(iii) Aggregating activities to create cost pools/ activity centres

(iv) Determining the cost drivers for each activity

(v) Assigning the cost of activities to cost objects

The research question could be divided into a series of questions relating to each of the difficulties. In order to fully understand how the difficulties were overcome, it would be likely beneficial to address the following questions:

(i) What did they (the companies) do?

(ii) Why did they do it in that particular way?

(iii) How did they go about doing it?

(iv) Why did they choose that particular method of doing it?

In addition, given that there are likely alternative approaches to addressing and resolving the technical difficulties, it may will be beneficial to seek to capture the experience of the companies by posing a further two questions, as follows.

(v) How satisfied are they with the results of there actions?

(vi) How would they change the approach, if provided with such an opportunity?

12.5 Closing Remarks

In closing this work I shall state what at the present time it seems an important general conclusion which may be drawn. The conclusion to which I would especially invite attention is the following: in the adoption of ABC, it is likely that two sets of variables are at work - the contingency factors and the company's ability to address and overcome the barriers and difficulties associated with ABC implementation. Even though the statistical results of this study show a strong significant association between contingency factors and the adoption of ABC, the contingent factors alone do not of themselves adequately explain the actual take up of ABC systems. Moreover, the results show that two companies which have similar characteristics with regard to the contingent factors can achieve different decisions with regard to ABC adoption, due to their differing abilities or willingness to address the issues relating to implementation. The results also show that technical issues are the most common variables acting against ABC adoption, both within companies which have rejected and those which are actively considering its adoption. Therefore, it can be concluded that it is not only behavioural issues as suggested by the extant management accounting literature which influence ABC adoption, but that technical issues are highly significant. It is hoped that this result will contribute to a fruitful development of knowledge, both in terms of theory construction and practical implementation.

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Appendix A

Re: Implementation of Activity-Based Costing Systems

Dear

The area of Activity-Based Costing (ABC) appears to offer significant benefits to those companies which have adopted it. However, there is also evidence that the introduction of the system poses significant difficulties. In an attempt to investigate these issues, I am conducting a survey of the top 1,000 Irish companies and would very much appreciate if you could participate in the study by completing and returning the enclosed questionnaire.

The questionnaire seeks to establish the extent to which ABC practices have been adopted by Irish companies and the implementation problems that they have encountered or identified. The results of the survey will be used in an aggregated form only. Individual responses are anonymous and confidential. The survey forms part of my Ph.D. work which I am undertaking in the school of Accounting and Finance at the Dublin Institute of Technology. It is also hoped that aspects of the result will be published in aggregate in various professional and academic journals.

Should you have any quires regarding the research or the questionnaire please contact my supervisor Dr. Tadhg Barrett (E-mail: Tadhg.barrett@dit.ie) or myself (E-mail: Fawzi.abusalama@dit.ie or phone 086-3200514).

Your participation in this survey would be very much appreciated, and I look forward to receiving your completed questionnaire soon. Please send the completed questionnaire by post to my collection base at Room 3048, DIT, Aungier St., Dublin 2. An addressed envelope is enclosed to facilitate your response.

Thank you in anticipation of your co-operation.

____

Fawzi Abusalama

Section 1: Organisational and Environmental Characteristics

1. Please indicate, by ticking the appropriate box, the industrial sector in which your company primarily operates:

(a) Business services ☐
(b) Manufacturing ☐
(c) Transport and distribution ☐
(d) Retail trade ☐
(e) Financial services ☐
(f) Exporter ☐
(g) Importer ☐
(h) Other (please specify ________________________________)

2. Please indicate the number of employees in your company:

☐ Less than 100 ☐ 501-1,000
☐ 100-250 ☐ 1,001-2,000
☐ 251-500 ☐ More than 2,000

3. Please indicate the annual turnover of your company:

☐ Less than €5 million ☐ Between €50 to €100 million
☐ Between €5 to €25 million ☐ Between €100 to €250 million
☐ Between €25 to €50 million ☐ More than €250 million

4. Is your company a wholly Irish-owned company?

a) Yes ☐
b) No ☐

If no, please state the dominant nationality of the ownership of your company.

____

5. Please indicate if your company is public or private by ticking the appropriate box:

☐ Public ☐ Private

6. Please rank from 1 to 6 the relative importance of the following factors in the marketing strategy of your company (where 1= most important, 2= second most important, etc)

	Factors	**Ranking**
a	Price	
b	Quality	
c	Range of products/ services	
d	Customer service	
e	Product/service innovation	
f	Marketing and Promotional activities	

7. How many products/ services does your company provide?

- ☐ Single product/service
- ☐ 1-10
- ☐ 11-50
- ☐ 51-100
- ☐ 101-1000
- ☐ More than 1000 product/service

8. Please indicate which of the following accounting and management techniques are utilised within your organisation?

a) Standard costing ☐
b) Job costing ☐
c) Process costing ☐
d) Budgeting ☐
e) Target cost planning ☐
f) Payback period ☐
g) Cost-Volume-Profit analysis (CVP) ☐
h) Return On Investment (ROI) ☐
i) Activity-Based Costing (ABC) ☐
j) Activity-Based Management ABM) ☐
k) Activity Cost Analysis (ACA) ☐
l) Balance Scorecard (BCS) ☐
m) Net present value (NPV) ☐
n) Quality cost analysis (COQ) ☐
o) Other techniques utilised ____________________

____

9. Please indicate the importance of the following objectives in allocating overhead costs, by circling the appropriate number.

	Not important	of Little importance	of medium importance	Very important	Critically important
a) Product/ service cost control	1	2	3	4	5
b) Product/ service pricing	1	2	3	4	5
c) External reporting	1	2	3	4	5
d) Production/ service planning	1	2	3	4	5
e) Department evaluation	1	2	3	4	5
f) Managers' performance evaluation	1	2	3	4	5
g) Control of cost incidence	1	2	3	4	5

h) Please state any other objectives sought to be achieved by the allocation of overhead costs ____

____

10. Please indicate the approximate percentage of your total company cost accounted for by each of the following categories.

a) Direct material --------- %

b) Direct labour --------- %

c) Production/service overhead --------- %

d) Other --------- %

Total 100 %

11. Over the next five years, how do you expect the proportion of production/ service overhead costs to total costs to vary in your firm?

a) To increase substantially ☐

b) To increase slightly ☐

c) To be stable ☐

d) To decrease slightly ☐

e) To decrease substantially ☐

f) Do not know ☐

12. Below is a list of values that may be used to describe the nature of the work environment in business units. For each item please indicate the extent to which it is valued in your company.						
Response option:		Not valued at all				Valued to a very great extent
	Innovation:					
a	A willingness to experiment	1	2	3	4	5
b	Not being constrained by many rules	1	2	3	4	5
c	Being quick to take advantage of opportunities	1	2	3	4	5
d	Being innovative	1	2	3	4	5
e	Risk taking	1	2	3	4	5
	Outcome orientation:					
a	Being competitive	1	2	3	4	5
b	Being achievement oriented	1	2	3	4	5
c	Having high expectations for performance	1	2	3	4	5
d	Being results oriented	1	2	3	4	5
e	Being action oriented	1	2	3	4	5

Section 2: Activity-Based Costing (ABC)

13. Please indicate how familiar you are with Activity-Based Costing (ABC) systems?

No Knowledge	General knowledge	Good knowledge	Extensive knowledge	Expert knowledge
☐	☐	☐	☐	☐

14. Where did you first learn of ABC?

a) University ☐
b) Professional training ☐
c) Seminars or conferences ☐
d) In-house training ☐
e) Own reading (books, journals and so on) ☐
f) Other (please state) __________________________

15. What is the current level of ABC adoption within your organisation?

a) Full implementation of ABC ☐
b) Implemented ABC in selected areas ☐
c) Implemented ABC as a pilot project ☐
d) Currently under consideration ☐ (please go to question 24)
e) Rejected ABC after assessment ☐ (please go to question 25)
f) No consideration of ABC to date ☐ (please go to question 26)

16. When was ABC first introduced into your company?

a) Before 1995 ☐
b) 1995- 1999 ☐
c) 2000- 2004 ☐

17. Who initiated ABC adoption within your company?

a) Senior management ☐
b) Production managers ☐
c) Accounting/ Finance managers ☐
d) Marketing managers ☐
e) Customer service managers ☐
f) Information systems personnel ☐
g) Research & development personnel ☐
h) Other (please specify) ____________________

18. When introducing ABC, did your company initially introduce it:

a) Across the whole organisation ☐

b) In selected areas ☐

19. How much involvement had each of the following categories in the implementation of ABC? Please indicate your response by circling a number for each item.						
Response option:		Low involvement				High involvement
a	In-house accountants	1	2	3	4	5
b	Information systems personnel	1	2	3	4	5
c	External consultants	1	2	3	4	5
d	Senior executives	1	2	3	4	5
e	Production personnel	1	2	3	4	5
f	Sales/marketing personnel	1	2	3	4	5
g	Distribution personnel	1	2	3	4	5
h	Purchasing/procurement personnel	1	2	3	4	5
i	Research & development personnel	1	2	3	4	5

20. Please circle the number which best describes the importance of the following factors in the decision to adopt ABC.						
Response option:		Not important	Little important	Medium important	Very important	Critically important
a	Increasing overhead costs	1	2	3	4	5
b	Increasing range of product/service	1	2	3	4	5
c	Inability of the traditional cost systems to provide relevant cost information	1	2	3	4	5
d	Increasing competition	1	2	3	4	5
e	Increasing regulatory environment	1	2	3	4	5
f	Please state any other factors which influenced the ABC adoption	______________________				

21. Please circle a number to indicate the level of success you would attribute to the ABC system in your company, in relation to each of the following specified areas of application.						
Response options:		Success Level Low				High
a	Stock valuation	1	2	3	4	5
b	Product/service pricing	1	2	3	4	5
c	Output decisions	1	2	3	4	5
d	Cost reduction	1	2	3	4	5
e	Budgeting	1	2	3	4	5
f	New product/service design	1	2	3	4	5
g	Customer profitability analysis	1	2	3	4	5
h	Value added analysis	1	2	3	4	5
i	Cost modelling	1	2	3	4	5
j	Outsourcing decisions	1	2	3	4	5
k	Process/operating mgt.	1	2	3	4	5
l	Restructuring decisions	1	2	3	4	5
m	Forecasting	1	2	3	4	5
n	Capital investment decisions	1	2	3	4	5
o	Performance measures	1	2	3	4	5
p	Strategic planning	1	2	3	4	5
q	Quality initiative	1	2	3	4	5
r	Reward system	1	2	3	4	5
s	JIT/speed initiative	1	2	3	4	5

22. Please circle a number to indicate the degree of importance you attach to the application of ABC in the following specified areas.						
Response Options:		Importance Low				High
a	Stock valuation	1	2	3	4	5
b	Product/service pricing	1	2	3	4	5
c	Output decisions	1	2	3	4	5
d	Cost reduction/mgt	1	2	3	4	5
e	Budgeting	1	2	3	4	5
f	New product/service design	1	2	3	4	5
g	Customer profitability analysis	1	2	3	4	5
h	Value added analysis	1	2	3	4	5
i	Cost modelling	1	2	3	4	5
j	Outsourcing decisions	1	2	3	4	5
k	Process/operating management	1	2	3	4	5
l	Restructuring decisions	1	2	3	4	5
m	Forecasting	1	2	3	4	5
n	Capital investment decisions	1	2	3	4	5
o	Performance measures	1	2	3	4	5
p	Strategic planning	1	2	3	4	5
q	Quality initiative	1	2	3	4	5
r	Reward system	1	2	3	4	5
s	JIT/speed initiative	1	2	3	4	5

23. In implementing ABC, what was the extent of the difficulties encountered in the following areas?						
Response options:		Very easy	Relatively easy	Some difficult	Quite difficult	Very difficult
a	In defining activities	1	2	3	4	5
b	In assigning resources to activities	1	2	3	4	5
c	In selecting cost drivers	1	2	3	4	5
d	In assigning the cost of activities to cost objects	1	2	3	4	5
e	In designing the system	1	2	3	4	5
f	Other (please identify the other areas which were difficult in the implementation of the ABC system)	________________				

Please go to page 12.

24. **If your company is currently considering the adoption of ABC**, please indicate the factors militating against its adoption.

Please tick those factors which you are consider significantly inhibiting the adoption of ABC.

a) Difficulty in defining activities ☐
b) Difficulty in assigning resources to activities ☐
c) Difficulty in selecting cost drivers ☐
d) Difficulty in assigning cost of activities to cost objects ☐
e) Data collection difficulties ☐
f) Internal resistance ☐
g) High cots of implementing ABC ☐
h) Lack of top management support ☐
i) Uncertainty of ABC benefits ☐
j) Inadequate Computer software ☐
k) A higher priority of other changes/ projects. ☐
l) Other factors militating against ABC adoption

____

____

Please go to question 27.

25. **If your company has considered and rejected ABC adoption**, please indicate the reasons for its rejection by ticking the box corresponding to the contributing factors.

a) Satisfied with current system ☐
b) Lack of knowledge regarding ABC ☐
c) ABC is not relevant to our business ☐
d) Small percentage of overhead costs ☐
e) Manufacturing process is simple, easy to track costs ☐
f) The number of products/service is low ☐
g) Difficulty in defining activities ☐
h) Difficulty in assigning resources to activities ☐
i) Difficulty in selecting cost drivers ☐
j) Difficulty in assigning cost of activities to cost objects ☐
k) Data collection difficulties ☐
l) Internal resistance ☐
m) High costs of implementing ABC ☐
n) Lack of top management support ☐
o) Uncertainty of ABC benefits ☐
p) Inadequate Computer software ☐
q) A higher priority of other changes/ projects ☐
r) Other (please put in detail)

____

____

Please go to question 27.

26. **If your company has never considered the adoption of ABC**, please indicate the possible reasons for this by ticking the box corresponding to the contributing factors.

- a) Satisfied with current system ☐
- b) Lack of knowledge regarding ABC ☐
- c) ABC is not relevant to our business ☐
- d) Small percentage of overhead costs ☐
- e) Manufacturing/service process is simple, easy to track costs ☐
- f) The number of products/services is low ☐
- g) Other factors militating against ABC adoption

____

____

27. In your company, which of the following bases are currently used to allocate overhead costs to products/ services?

- a) Direct labour hours ☐
- b) Machine hours ☐
- c) Direct materials costs ☐
- d) Units of production/ customer service ☐
- e) Other (please specify)______________________

28. How satisfied are you with your current overhead cost allocations?

- a) Very satisfied ☐
- b) Reasonably satisfied ☐
- c) Needs improvements ☐
- d) Dissatisfied. ☐

29. Do you anticipate that your company will adopt ABC in the next five years?

- a) Yes ☐
- b) No ☐
- c) I do not know ☐

In order to follow up the various issues raised on this topic and to improve the quality of my data, I would like to interview some of the respondents to this questionnaire. If you are interested in this study and willing to be interviewed, please complete the details below.

Company name: ____

Your name: ____

Position in company: ____________________________________

Telephone number: ______________________________________

E-mail Address: ____

****

Thank you for your time and effort.
It is very much appreciated

(Reminder Letter)

Re: Implementation of Activity-Based Costing Systems

Dear,

Recently, a questionnaire was sent to you which requested information on the implementation of Activity-Based Costing Systems (ABC).

If you have already returned this questionnaire to me, please accept my sincere thanks. If not, I would be very grateful if you could do so at your earliest convenience. It is hoped that the results of the survey will give a broad view of the extent to which ABC practices have been adopted by Irish companies and the implementation problems that have been encountered.

If by some chance you did not receive the questionnaire, or it was misplaced, please do not hesitate to contact me at (E-mail: Fawzi@dit.ie or phone 086-3200514). Another questionnaire will be forwarded to you immediately.

Thank you in anticipation of your co-operation.

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Fawzi Abusalama