Developing and Testing a Model of Successful Adoption of Activity-Based Costing

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Abstract

This study aims to develop and test a model for successful adoption of activity-based costing (ABC). The model has been constructed to explore the relationship between organisational and technological factors and management evaluation of overall ABC success and suggest a pathway. Another objective of this study is the examination of the relationship between ABC and business unit performance. The study also aims to investigate why some business units have not adopted ABC and why some business units have discontinued their use of ABC.

Data for the study were collected from both adopters and non-adopters of ABC through the survey method. The data are pertinent to all types of businesses. The business unit is the unit of analysis.

Results reveal that the adoption rate of ABC is lower than that reported in literature. Testing the hypothesised model revealed that the following factors significantly influence management evaluation of ABC success: training, differentiation strategy, non-accounting ownership, ABC-based actions, activity efficiency and process cost improvement. The relationship between ABC use and operational performance is influenced by the role of ABC-based actions. The ABC system is perceived as having a high level of overall success by managers; however, it demonstrates only moderate success in terms of financial benefits and customer satisfaction. This suggests that there are other factors that also contribute to the assessment of overall success. The perceived success of ABC seems to be associated with time since introduction of ABC, but not with business size. Reasons for not adopting or discontinuing ABC appear similar to those reported in literature.

Declaration

I, Yousef Aldukhil, declare that the PhD thesis titled *Developing and Testing* a *Model of Successful Adoption of Activity-Based Costing* is no more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

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List of Abbreviations

AA	Activity analysis
ABB	Activity-based budgeting
ABC	Activity-based costing
ABCM	Activity-based cost management
ABM	Activity-based management
ACA	Activity cost analysis
AMP	Advanced manufacturing practices
CAM-I	Consortium for Advanced Management—International
CIMA	Chartered Institute of Management Accountants
CPAA	Certified Practising Accountants Australia
ERP	Enterprise resource planning
GAAP	Generally accepted accounting principles
IAS2	International Accounting Standard on Inventories
IFAC	International Federation of Accountants
IMA	Institute of Management Accountants
ISO	International Organisation for Standardisation
IT	Information technology
JIT	Just-in-time
MCS	Management control systems
MRP	Materials requirements planning
MRPII	Manufacturing resource planning
PACIA	Plastics and Chemicals Industries Association
PLS	Partial Least Squares
PCB	Printed circuit board
R&D	Research and development
ROI	Return on investment
SAP	Systems, Applications, and Products in Data Processing
SEM	Structural Equation Modelling
SPSS	Statistical Package for the Social Sciences
TQM	Total quality management
UK	United Kingdom
US	United States
WCM	World-class manufacturing practices

Chapter 1: Introduction

1.1 Background

Cost information is necessary for decision making. Managers use relevant cost information for operational and strategic decisions. For example, cost information is used in determining the selling price, for measuring product profitability and in determining product mix. As managerial decisions are concerned with future events, cost information plays an important role in planning and control functions.

Conventional cost systems have been severely criticised by experts since the late 1980s. One of the major drawbacks of these systems is that they employ inappropriate measures for assigning indirect or overhead costs, leading to distorted product costs. Critics have therefore argued for better cost systems that reflect cost information more accurately. Activity-based costing systems (hereafter called ABC) were developed to overcome the deficiencies found in conventional cost systems, which include the following:

- Failure to provide visibility of resource consumption (Miller & Vollman 1985);
- Lack of accurate measures for assessing the costs of products (Cooper 1987);
- Failure to unitise non-production overheads (Cooper & Kaplan 1988);
- Inability to modify cost behaviour patterns and provide relevant long-term variable costs for strategic decisions (Johnson & Kaplan 1987b);
- Inability to supply cost information in the pre-production stages of the product life cycle (Berliner & Brimson 1989)

ABC is defined as a costing methodology that assigns indirect costs to individual activities or process cost pools and then traces those costs to users of the activities that include products and customers (Player & Keys 1995). This study attempts to

explore the use of cost information generated by ABC in strategic and operational decision making—a concept known as activity-based management (ABM). The terms ABM and ABC have been used interchangeably in this study. Thus the use of the term ABC refers to not only the costing methodology, but the use of this methodology to conceptually enable better business decisions, and therefore achieve better outcomes.

1.2 Research Objectives

ABC systems have been developed to address organisational concerns about product costing and the need for continuous improvement. Studies on ABC have typically focused on the implementation aspects of ABC and on factors that may impact the success of ABC implementation (for example, Krumwiede 1998; Shields 1995). This study investigates the relationships between success factors and success measures of ABC taking into account alternative success measures. This study aims to contribute to existing knowledge on ABC by answering the following questions:

1. Does ABC lead to improvements in operational performance?
2. What factors influence management's assessment of ABC success?
3. How do organisational and technological factors influence ABC success?

The objectives of this thesis can be summarised as follows:

- To propose and evaluate an integrated model that suggests pathways between organisational and technological factors and an evaluation of overall ABC success
- To investigate the impact of ABC use on perceived business performance
- To investigate the reasons for the reluctance to adopt ABC as well as the problems for discontinuing the use of ABC

1.3 Contribution to Knowledge

Empirical studies on ABC have examined the implementation of ABC, describing organisational and technical factors that influence its success (Brown, Booth & Giacobbe 2004; Anderson &Young 1999). Other studies investigated the association between these success factors and the measures of ABC success (Foster & Swenson 1997; Shields 1995). Firms that have not adopted ABC have questioned the practical benefits of ABC (Innes & Mitchell 1998). This study will investigate these concerns and develop a model that charts a path for successful adoption and implementation of ABC systems. While the model will be based on existing literature, it will be refined and tested in this study.

Swenson and Foster (1997) mentioned that literature offers a problematic definition of the success of ABC. ABC studies have tackled the concept of ABC success from different perspectives. Shields (1995) and Foster and Swenson (1997) argued that organisational factors determine ABC success. These studies used alternative measures of ABC success and investigated the correlations between these measures and organisational factors. The problem here there is no explanation of how these determinants lead to successful implementation of ABC.

Studies assessing the impact of ABC on firm performance have shown mixed results. Ittner, Lanen and Larcker (2002) contend that ABC use has no significant association with return on plant assets, but found that ABC is associated with improvements in cycle time and quality. In contrast, Kennedy and Affleck-Graves (2001) claim that the introduction of ABC enhances stock returns. Frey and Gordon (1999) argue that ABC is associated with higher financial performance for business units that employ a differentiation competitive strategy. Moreover, Banker, Bardhan and Chen (2008) claim that advanced manufacturing capabilities (for example, just-in-time (JIT) and total quality management (TQM) mediate the impact of ABC on plant performance. These mixed findings suggest that further research is essential to understand the extent to which ABC influences firm performance. On the other hand, these studies have some limitations from success perspectives. First, these studies are more concerned with the characteristics of the

environment (e.g., complexity and diversity of business and competition) rather than organisational factors that have been linked with ABC success in earlier studies. Second, most of these studies did not refer to explicit measures of ABC success, although organisational performance could be assumed as a measure of success. However, this is not applicable to all cases, Cagwin and Bouwman (2002), for example, examined the association between extensive ABC use and improvements in financial performance and then ABC use was replaced with an aggregate measure of ABC success. In general, these studies focus on organisational performance rather than measures of ABC success.

Earlier studies described various measures of ABC success. Swenson (1995) measured ABC success based on management satisfaction with ABC. Foster & Swenson (1997) classified ABCM success measures into four types: (1) the use of ABCM information, (2) decision actions taken with ABCM, (3) financial improvement from ABCM, (4) Management evaluation as to the overall success of ABCM. Later studies (Banker, Bardhan & Chen 2008; Ittner, Lanen & Larcker 2002) measured ABC success as extensively using ABC and improvements in organisational performance. These alternative measures of ABC success have been linked to either organisational factors or organisational performance. In this study, these alternative measures of ABC success will be considered together and investigated how they lead to overall ABC success.

This study attempts to contribute to the existing body of literature by accomplishing the following:

- Investigating the linkage of factors that influence overall ABC success
- Exploring the role of ABC-based actions as an intermediary between ABC use and operational performance
- Coordinating the relationships between alternative measures of ABC success to lead to the overall success
- Proposing and testing a integrated model that suggests the relationships between organisational and technological factors and evaluation of ABC success

1.4 Context of the Project

The project has primary and secondary issues. The primary issues pertain to ABC users. The targeted topics are factors affect the success of ABC and measures of that success. The secondary issues pertain to non-ABC users. The targeted topics are problems and reasons for rejecting ABC.

Hicks (1999, p. 17) describes ABC as 'a powerful management concept that can be adopted and used by any organisation to gain a competitive advantage through greater understanding of product or service costs, process costs, and the organisation's overall cost behaviour'. He suggests that managers use ABC to gain competitive benefits by understanding cost drivers. Swenson (1995, p.167) describes ABC as 'an information system that assists with decision making, essentially a decision-support system'. Although the essential aim of ABC is to capture product costs more accurately, managers are currently using ABC as a means of improving processes and enhancing profitability (Plowman 2001).

The ABC system evolved to address the shortcomings that plagued conventional cost systems (Brown , Myring & Gard 1999; Gunasekaran 1999; Gupta & Galloway 2003; Hughes 2005). Conventional cost systems first emerged in manufacturing firms that produced typical products consumed similar amounts of resources and engaged in limited non-volume activities such as set-up and inspection (Johnson & Kaplan 1987a). Contemporary environments consist of a diverse array of products and numerous non-volume activities, causing conventional systems to provide distorted product costs. Although earlier references to activity costing were cited by some authors, ABC attracted widespread attention in 1990 when Harvard Business School promoted and developed ABC systems (Innes 1998).

The motivation to adopt innovative ABC systems is not always to pursue efficiency. Malmi (1999) and Nassar, Al-Khadash and Sangster (2011) show that consulting firms, which usually promote innovations, play a considerable role in influencing managers to adopt ABC systems. Apart from this, some business units

implement ABC because it is part of a mandate issued by their corporate headquarters. However, the ABC system is not applicable to all companies. It is important to consider a firm's characteristics before implementing ABC.

Information accuracy assumes priority over all other ABC objectives (Cohen, Venieris & Kaimenaki 2005; Shields 1995). However, Anderson and Young (1999) argue that accuracy of ABC information is not a sufficient condition to ensure cost reduction. Moreover, Cooper and Kaplan (1991) demonstrate that reducing resource consumption does not improve the bottom line automatically and that further actions are needed. This study aims to enhance managers' awareness of how ABC improves business processes and profitability.

Firms that have adopted ABC have had different experiences with ABC implementation. Some firms have had more success with ABC than others do (Shields 1995). Researchers have explored factors that influence ABC implementation such as top management support, linkage to competitive strategy, training and consensus and clarity regarding ABC objectives (Shields 1995). The literature on determination of successful ABC systems is still limited. Further, there have been few studies that include a comprehensive view of investigated factors. For this reason, this study will develop an integrated model to evaluate ABC success.

1.5 Conceptual Framework

The theory that forms the basis of this study is *contingency theory*. This theory explains how management accounting systems (MAS) impact the organisational performance, based on internal and external environmental factors (see Figure 1.1).

In the context of this thesis, external and internal factors are translated into a set of control variables and organisational and technological factors, MAS is translated into the ABC system and effectiveness evaluation is considered as evaluation of ABC success (see Figure 1.2). However, it is proposed that both ABC system and

evaluation of ABC success can be broken into sub-components. ABC system can be separated into ABC use and ABC actions while evaluation of ABC success can be broken into ABC benefits and overall ABC success. This gives Figure 1.3. This model has been broken into a group of relationships among factors. The nature of these relationships was hypothesised and empirically tested.

Diagram 1.3 represents a sequential process that culminates in recognition of the overall success of adoption of ABC. Where it differs from the existing contingency based model of ABC success is through incorporating features of the literature that recognise

i. That the concept of the ABC System actually has two sequential components, these being the extent of use of the ABC System and then the actions that result from that use, and
ii. That overall perception of success is a broader concept than benefits that accrue in specific dimensions, e.g., financial benefits or customer satisfaction.

There are some motivations in the literature that justify this research. The first motivation is the existing of various measures of ABC success in the literature. Accordingly, it was problematic for managers defining the success of ABC system. This motivation provides the basis for the researcher to investigate the various measures of ABC success in the literature and design a structural model (Figure 1.3). This model links the measures of ABC success to each other (i.e., ABC use, ABC actions, business performance, ABC benefits and management evaluation) and provides a general guideline for managers in respect to defining the success of ABC and exploring factors which have impact on that success. The second one is the lack of continuous and systematic link between organisational and technological factors (the first point in the model) and ABC success (the end point in the model).The third motivation is the relationship between ABC and business performance is not conclusive in the literature.

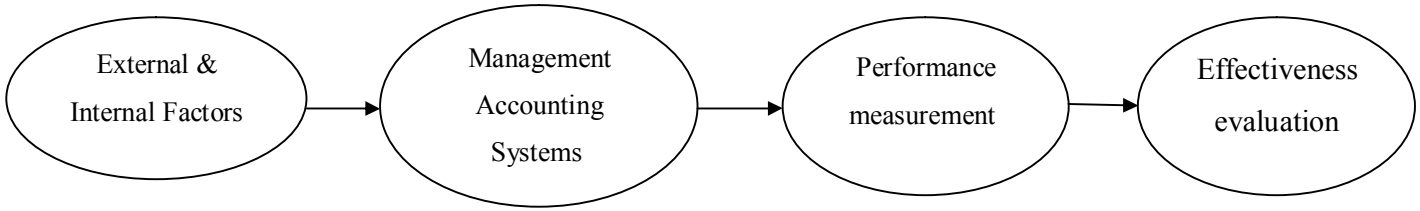

Figure 1.1: Contingency theory framework

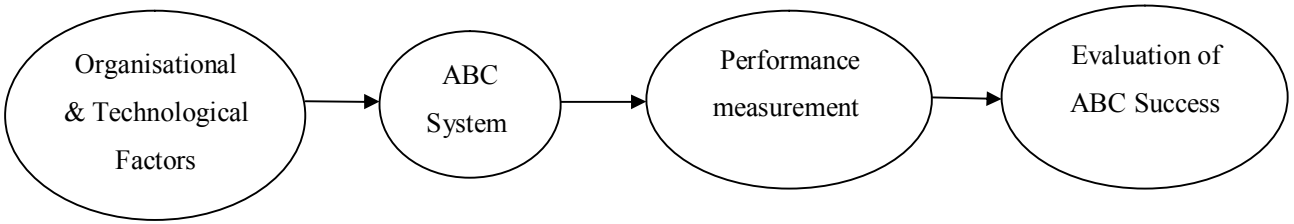

Figure 1.2: Contingency-based model of ABC success

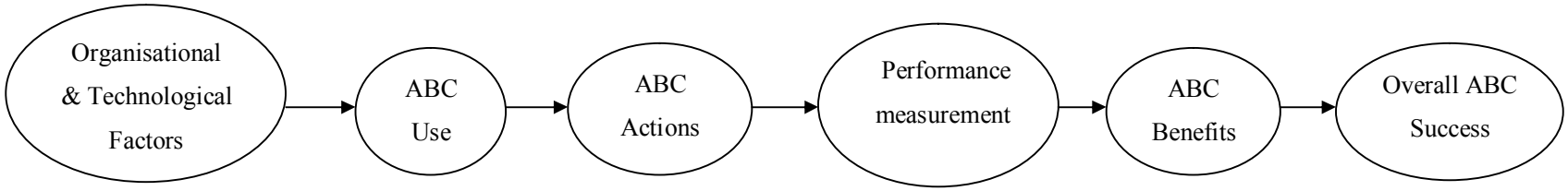

Figure 1.3: General model of ABC success

1.6 Proposed Methodology

Empirical studies on ABC often employ a cross-sectional survey method (for example, Krumwiede 1998; Banker, Bardhan and Chen 2008) whereas some use a combination of survey and interviews (Malmi 1999). Generally, the cross-sectional studies cover a wide range of firms with different or similar ABC experiences. This is an important factor to enhance the validity or the generalisability of the findings. Case studies such as the one by Anderson (1995) on General Motors have generally focused on ABC implementation rather than measuring the success of ABC. In contrast, field studies seem to cover relevant aspects of ABC success measures (McGowan & Klammer 1997).

The survey method was used in this study; the method was recommended by Young and Selto (1991) to develop and test theories related to changes in management accounting information. As the factors in this study have already been identified in literature, the use of survey research is appropriate for estimation purposes (Van der Stede, Young & Chen 2005). Survey method is the commonly adopted in business studies (Ghauri & Gronhaug 2005) and is consistent with previous ABC related studies (e.g., Foster and Swenson 1997; Ittner, Lanen and Larcker 2002). Further, the approach is cost effective and allows generalisability of the findings.

1.7 Sample Selection

Data collection consists of two sets of samples: The first set of data was selected randomly from the Kompass Australia database. Kompass Australia is a database that categorises Australian firms according to their industries. Further, it also classifies firms based on their activities into producer, importer, exporter and distributor. The database is rich in company profiles, management names and product types. The sample selected for this study includes 600 manufacturing companies in Australia with at least 50 staff. Firms with less than 50 staff members were excluded because activity management would rarely be relevant at this size (Baird, Harrison & Reeve 2004). Unfortunately, the small number of

ABC observations in the first sample required a supplementary global online survey. The second set of data was collected globally through consulting firms and targeted various sectors and industries. Mail survey was used initially in the first sample then Web-survey was used to facilitate widespread distribution of the questionnaire in the second sample.

Pre-testing was conducted by consulting academics from the relevant fields. The revised survey was then mailed to a financial controller assumed to have knowledge about firm characteristics and the ABC system.

A business unit was chosen as the unit of analysis. This is because ABC systems are usually implemented within specific business units. A firm may have multiple costing systems.

The questionnaire was based on Dillman's guidelines in the book *Mail and Internet Surveys: The Tailored Design Method* (2007). As for the distribution of the questionnaire in the first sample, the following procedures were followed:

1. An initial mail was sent out with numbers on the survey booklets in order to facilitate the identification of non-respondents for follow-up.
2. A reminder letter was sent three weeks later.
3. A reminder call was made six weeks after the initial mailing.

It was impossible to follow the above steps with the online survey as there was no direct contact between the researcher and the respondents.

1.8 Data Analysis

Statistical Package for the Social Sciences (SPSS) has been used to analyse the data. The analysis is quantitative and employs descriptive and inferential statistics. Regression techniques have been used to test the hypotheses underlying the model.

1.9 Overview of the Thesis

Chapter 2 reviews the relevant existing literature on ABC. It includes a discussion on the organisational and technological factors that may influence ABC success as well as the various measures of ABC success. These topics influence the construction of the ABC model developed in this study. Contingency theory is also reviewed in the context of the proposed model and hypotheses building.

Chapter 3 discusses the research methodology, including the steps followed during data collection. This chapter also includes information on the sample frame, the structure of the survey and the measurement of variables. This chapter also discusses the characteristics of the sample business units. It explains the demographic details of the business units including the size, industry, country and type of business unit. This chapter consists of two parts: (1) total sample including ABC adopters and (2) ABC adopters. In this study, ABC adopters are analysed in greater detail.

The first part of chapter 4 presents the analysis of data on non-ABC adopters. It investigates the reasons for non-adoption of ABC and those for discontinuation of ABC (after adoption) among business units. It also includes information on activity management other than ABC, such as activity analysis (AA) and activity cost analysis (ACA). The chapter also reviews the future potential of ABC. The second part of this chapter presets the analysis of data on ABC adopters. The proposed model of ABC serves as the framework for the analysis. The model consists of variables that are linked to each other through the hypotheses. Therefore, testing of the hypotheses forms a major section of this chapter.

Chapter 5 discusses results and contribution of the study. This chapter also explains the limitations of this study and further research opportunities. The conclusion section also highlights the outcomes of this study.

Chapter 2: Literature Review

2.1 Introduction

This chapter first discusses how ABC systems have succeeded in overcoming the deficiencies of conventional cost systems. The different aspects of the ABC system are explained including its design, implementation and use. This chapter also sheds light on the issues relevant to the research objectives in this thesis by discussing the factors and measures of ABC success, and then ABC implementation hurdles. These considerations contribute to the development of the hypotheses and the model in this thesis.

2.2The Definition of Activity-based Costing

Turney (1996) defined ABC as a method of measuring the cost and performance of activities and cost objects. It assigns cost to activities based on their use of resources and assigns cost-to-cost objects based on their use of activities. Based on this definition, ABC is more than product costing; it provides a means to measure activity performance in order to determine how well work is done in that activity.

He also defined ABM as a discipline that focuses on the management of activities as the means to continuously improve the value received by customers and the profit earned by providing this value. This discipline includes cost driver analysis, activity analysis and performance analysis. ABM draws on ABC as a major source of information. Thus, the goal of ABM is to improve customer value, which eventually improves the profit.

Customer value is the difference between what a customer receives (customer realisation) and what the customer gives in return (customer sacrifice). A customer receives a complete range of tangible and intangible benefits from a purchased product. These benefits include product features, quality, service,

reputation and brand name. Customer sacrifice includes the cost of purchasing the product, the time and effort spent acquiring and learning to use the product and the costs of using, maintaining and disposing of the product (Hansen , Mowen & Shank 2006).

Swenson (1995) defined ABC as an information system that assists with decision making—essentially a decision-support system. While he defined ABC broadly to include ABM, he claimed that some researchers prefer to use the term ABM when ABC information is used to support operating decisions.

Roberts and Silvester (1996) point out that ABC and ABM are sometimes used interchangeably by researchers. They referred to ABC as the actual technique for determining the costs of activities and the outputs that those activities produce. They referred to ABM as the fundamental management philosophy that focuses on the planning, execution and measurement of activities as the key to competitive advantage. In turn, Hicks (1999) described ABC as a powerful management concept that can be adopted and used by any organisation to gain a competitive advantage through greater understanding of product or service costs, process costs and the organisation's overall cost behaviour. These definitions commonly describe ABC/ABM as a method that can be used to gain competitive advantage. Competitive advantage is creating better customer value for the same or lower cost than the best offer of the competitors or creating equivalent value for lower cost than that offered by competitors (Hansen , Mowen & Shank 2006).

Plowman (2001) described ABC as a means of establishing product costs more accurately. He described ABM as a means of enhancing profitability by focusing on a process view of the business and a deeper understanding of product, channel and customer profitability.

Generally speaking, ABC systems refer to the method used to determine the cost of activity and cost objects. In contrast, ABM systems refer to the use of ABC information in making strategic and operational decisions. Hence, the researcher intends to use the terms ABC and ABM interchangeably to describe a

management information system that can be used by managers to support strategic and operational decisions.

The goal of ABC is to improve the accuracy of product costs and provide a means for the improved management of process and support activities. It is part of a process of continuous improvement aimed at improving the value received by the customer and enhancing profitability by providing this value. It is worth noting that manufacturing a product or serving a customer is constrained by the desirable level of profits. A firm would discontinue manufacturing unprofitable products or serving unprofitable customers. In this regard, management should focus on the manufacturing costs in making their product decisions. Customer service costs can burden product costs, causing the product to be unprofitable. ABC systems separate product-driven costs from customer-driven costs. Product-driven costs are the costs required to manufacture a product. These costs include design, procurement, quality control and engineering; in contrast, customer-driven costs are the costs of delivering, serving and supporting customers and markets. These costs include distribution, research and development (R&D) and customer orders. Thus, ABC helps managers to determine the loading between product-driven and customer-driven costs. This analysis will allow management to discontinue supporting unprofitable products, customers or markets (O'Guin 1991).

2.3 The Evolution of Activity-based Costing

The core component of ABC approach is activities. Brimson (1991) define an activity as “a combination of people, technology, raw materials, methods and environment that produces a given product or service”. He describes activity analysis (AA) as a process to analyse resources used and time consumed to determine activities’ cost and evaluate performance.

The notion of AA is interdisciplinary. It is a common methodology in the fields of economics, management and accounting. As early as 1955, Peter Drucker described the advantage of AA over the traditional theory (1999, p. 190):

> To find out what activities are needed to attain the objectives of the business is such an obvious thing to do that it would hardly seem to deserve special mention. But analysing the activities is as good as unknown to traditional theory. Most traditional authorities assume that a business has a set of typical functions which can be applied everywhere and to everything without prior analysis.

In 1972, Staubus proposed an ABM system. However, this endeavour did not receive enough attention from businesses because there was no motivation to change their existing cost systems and the proposal lacked adequate software to support the ABC model. In 1983, Kaplan issued a challenge to 'devise new internal accounting systems that will be supportive of the firm's new manufacturing strategy' (Innes & Mitchell 1998, p. 1). In 1984, Kaplan and Johnson exposed the shortcomings of conventional accounting systems. Concurrently, Cooper developed an activity-based cost system for Schrader Bellows. Shortly thereafter, Kaplan reported on an activity-based cost system developed by John Deere Component Works. These works led to the spread and adoption of ABC systems. US firms at that time began to run ABC as stand-alone systems, and a few firms (for example, Hewlett-Packard) developed online integrated ABC systems (O'Guin 1991).

In 1996, the Consortium for Advanced Management—International (CAM-I) established the Cost Management Systems Program. This program is an international coalition of leading researchers from industry, government and academia who discuss and develop new management methods. The program has raised the awareness of ABC worldwide (Plowman 2001).

2.4 Deficiencies of Conventional Cost Systems

Activity-based cost systems emerged as a result of the deficiencies in conventional cost systems (Cooper 1988). Turney (1996) and Gunasekaran (1999) highlight the following limitations of conventional cost systems:

- Focus on financial information
- Inaccurate costing
- Failure to encourage improvement

- **Conventional Cost Systems Focus on Financial Information**

The conventional cost systems provide financial information that governs performance evaluation. Financially orientated information such as return on investment (ROI) and divisional profit is important for internal managers as well as external constituencies. There is limited non-financial information that can be derived by conventional systems at macroeconomic levels of the organisation, for example, through-put time and number of production runs for specific products in the production function and inventory turnover in the inventory control function (Cokins , Stratton & Helbling 1993).

Significant non-financial information (for example, defect rate, cycle time and activity efficiency) is beyond the scope of conventional systems. Traditional financial information is an indirect measure of quality and time and is more difficult to interpret than non-financial information. For example, rework rate is easier to interpret than cost variance. Financial information in such systems is reported by the functions or departments (for example, purchasing and marketing) not by activities (for example, inspecting and material handling). This implies that traditional cost information measures the resources that are actually spent rather than the way in which they are spent (Cokins , Stratton & Helbling 1993).

The cost level in the conventional systems is too aggregated to permit value analysis of any activity because product costs are not broken down by activities. Thus, the objectives of conventional cost systems are inventory valuation and financial reporting (Kaplan 1988).

Financial information is prepared on a monthly basis because it measures the actual use of resources. However, out-of-date information hinders the ability of managers to carry out improvement actions. Further, conventional cost systems determine product costs considering only manufacturing costs and not taking into account the corporate costs (for example, selling, marketing, distribution and general administration).This reinforces the traditional assumption that a product consumes resources (costs). Accordingly, product costs do not enable managers to have a picture of the real profitability of a customer or a market channel (Hansen , Mowen & Shank 2006).

- **Inaccurate Costing**

When conventional cost systems were developed, the level of competition was moderate, and cost structures were dominated by direct material and direct labour. Further, there was similarity among products in the consumption pattern (labour consumption intensity). Typically, support overhead costs were allocated to the products based on direct labour hours. Direct labour hours represent a basis that changes in proportion to the change in production volume. This basis was warranted because the overhead costs level was as low as five to fifteen per cent of the total product costs. However, since the early 1980s, the competition level has increased and technology has changed rapidly. This situation forced managers to change the way their firms operate. Labour was a costly resource and reasonably-priced technology was available to reduce labour requirements. In 1991, it was estimated that direct labour had decreased to fifteen per cent in automated industries and five per cent in high-tech industries (Brown , Myring & Gard 1999).

The new cost structure causes distorted product costs. Conventional cost systems allocate overhead to products equally, regardless of the batch size or the complexity of the products. This method contributes to over-costing large batches and less complex products and under-costing small batches and more complex products. It is not necessarily true that high-volume products consume more overhead resources than low-volume products. For example, set-up costs do not change in proportion to the batch size (Albright & Lam 2006).

The problem here is that conventional systems do not recognise the fact that activities are performed on different levels. Cooper (1990) and Kaplan and Cooper (1998) classified activities into four general categories:

1. Unit-level
2. Batch-level
3. Product and customer-level
4. Facility-level

Unit-level activities are those that are performed each time a unit is produced such as machining and assembly. Batch-level activities refer to those that are performed each time a batch is produced such as set-up and inspection. Product-level activities are performed to enable a product to be produced such as engineering change and introduction of new products. Customer-level activities are those that are performed to serve a customer such as delivery and complaint management. Facility-level activities sustain general manufacturing processes and include plant security and utilities. This description implies that a volume-related allocation base (for example, direct labour) produces distorted product costs because it does not reflect the resources consumed by non-volume-related activities.

Another source of cost distortion is production capacity. Conventional cost systems calculate the overhead rate based on budgeted production volume. This volume causes the rate to fluctuate according to the expected demand. For example, if the anticipated demand is low, the overhead rate will be high, causing the product costs to increase. A volume-related allocation base is used to assign factory costs to products. This means that high-volume products account for most of the costs. Consequently, management decisions related to pricing and product

mix can be affected dramatically. In contrast, ABC uses practical capacity or the actual resources supplied to calculate activity cost drivers. This leads to consistency in such drivers and product costing as well as improvement in decision making (Cooper & Kaplan 1992, 1998).

- **Failure of Conventional Cost Systems to Encourage Improvement**

Conventional cost systems do not provide managers with insights on how to improve business processes. Direct labour and machine hours represent significant cost drivers in the traditional environment. Managers focus their attention on cutting down these resources. Although using multiple cost drivers (direct labour and machine hours) may improve the accuracy of product costs, these drivers lag on capturing the work of non-unit based activities. The common characteristic among these drivers is that they are volume-related bases (Turney 1990).

The conventional organisational structure along hierarchical lines impedes effective communication between departments and other areas of the organisation. This structure encourages departmental managers to take actions at the department level. One department may take action at the expense of other departments. For example, the production department may reduce direct labour or machine hours by redesigning a product but, in turn, cause quality problems in the quality control department or even increase overhead costs in the production department (Roberts & Silvester 1996).

Further, if management eliminates an activity (for example, inspection), conventional cost systems do not reveal the source of cost reduction because the savings are buried in a large overhead pool. In addition, products with the greatest machine hours or direct labour content are assigned the greatest benefits from the cost savings (Turney 1991). In general, conventional cost systems do not help managers identify opportunities for improvement or assess the consequences of improvement efforts.

2.5 ABC Systems as an Alternative for Conventional Costing Systems

When ABC was introduced, it was viewed as a methodology that could serve as a substitute for conventional cost systems (Gupta & Galloway 2003). Viewing ABC as an accounting system has helped managers upgrade their existing systems. However, this view ignores the true value of ABC as a cost planning system that focuses on activities to provide timely and relevant information for managers (O'Guin 1991). First, ABC records forecasted information about activity levels and cost drivers. On completion of this stage, ABC updates this information to reflect the actual costs. This is consistent with the goal of ABC, which is to support the process of continuous improvement.

A survey of United Kingdom (Chongruksut & Brooks) firms found that 55 per cent of the respondents indicated that ABC was introduced to replace the conventional costing system (Cobb, Innes & Mitchell 1992). Innes, Mitchell and Sinclair (2000) surveyed the UK's largest companies in 1999 and found that 43 per cent of ABC adopters use ABC as their sole costing system, 33 per cent of them use ABC in parallel with their previous costing system and 23 per cent of them use ABC in pilot testing only. Cohen, Venieris and Kaimenaki (2005) found that 73.3 per cent of Greek companies have fully replaced their former costing systems with ABC. In contrast, the majority of Canadian firms (76 per cent) have implemented ABC to complement their current costing systems (Armitage & Nicholson 1993). Booth and Giacobbe (1997a) found that 32 per cent of Australian manufacturing firms introduced the ABC system as a replacement for the conventional costing system and 24 per cent of firms use ABC in parallel with their current system. This indicates that many firms run ABC in parallel with conventional costing systems.

Depending on the purpose of the implementation, a firm may implement ABC as a stand-alone system that is not integrated with the financial system. This form of implementation reduces the maximum potential of the new system. Malmi (1997) confirmed a case study that selects this form to monitor the degree of accuracy of

the information provided by the conventional costing system. A study of eight sites in the United States indicated that not one of these sites considered the ABC system to be a replacement for the financial system. They dealt with ABC as a management information system, but not as a component of the accounting system (Cooper et al. 1992). Seventy-three per cent of respondents to the UK survey indicated that ABC was implemented as a stand-alone system (Cobb, Innes & Mitchell 1992). Similarity, 61 per cent of Canadian respondents indicated that ABC was implemented as a stand-alone system (Armitage & Nicholson 1993). Cagwin and Bouwman (2002) found that 61.7 per cent of the US companies use ABC as non-routine (authors called off-line) analytical tool. Booth and Giacobbe (1997a) found that the non-routine (authors called one-off) ABC system was used as necessary by 20 per cent of Australian manufacturing firms and that this system was used to evaluate costs by twelve per cent of these firms. In corporate India, Anand, Sahay and Saha (2005) found that 20.75 per cent of respondents using ABC as a supplementary system and 28.3 per cent of all respondents have fully integrated the ABC and financial reporting systems with the enterprise resource planning (ERP) system.

The previous discussion points out the different forms of implementing ABC. Considering ABC as an information management system, most of the firms continue using their conventional accounting systems and implement ABC as a separate system. Considering ABC as an accounting system, firms would replace their existing systems with ABC. The other point is how frequently managers use ABC information. In practice, it is difficult to use ABC system on routine basis without integration with other information systems in the organisation.

2.6 Adoption Rate of Activity-based Costing

Rogers (2003) used the normal distribution curve to describe five adoption categories. These categories are positioned on the continuum line from left to right as follows: (1) Innovators (2.5%); (2) Early Adopters (13.5%); (3) Early Majority (34%); (4) Late Majority (34%); and (5) Laggards (16%) (see Figure 2.1). However, this classification is not symmetrical in terms of the number of

categories lying to the left and right of the average adopter. This classification is characterised as exhaustive, mutually exclusive, and derived from one classification principle (innovativeness). Innovators require the shortest innovation-decision period, while laggards require the longest innovation-decision period. Status motivations consider more important for innovators, early adopters, and early majority and less important for late majority and laggards.

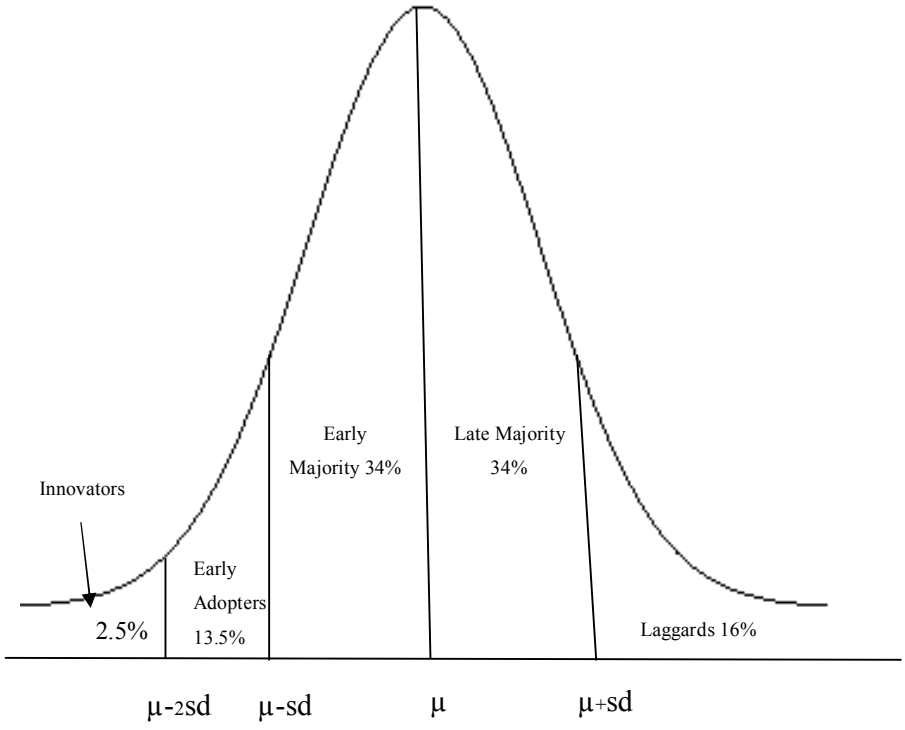

Figure 2.1: Adopter Categorisation on the Basic of Innovativeness
Source: Adapted from (Rogers 2003, p. 281)

Regarding the adoption rate of ABC in Australia, Nguyen and Brooks (1997) studied 120 manufacturing companies located in the State of Victoria with more than 50 employees and they found that 12.5 per cent (15 out of 120) had adopted and used ABC in some form. Zaman (1997) found that twelve per cent of the top 500 manufacturing firms adopted ABC. Booth and Giacobbe (1999) surveyed 213 manufacturing firms and reported a twelve per cent rate of ABC adoption. Brown (2000) received responses from 160 manufacturing and non-manufacturing

companies. Those who adopted ABC accounted for 20 per cent. Askarany and Smith (2008) conducted a longitudinal survey administered to 200 manufacturing firms registered with the Plastics and Chemicals Industries Association (PACIA). They found that only fourteen per cent of firms adopted ABC by the time of the first survey (1997) and 22 per cent by the time of the second survey (2001). Chenhall and Langfield-Smith (1998a) selected 140 of the largest manufacturing firms from the Business Review Weekly and reported that 56 per cent adopted ABC. Baird, Harrison and Reeve (2004, 2007) surveyed 246 Australian business units with a minimum of 50 employees and found that 78.1 per cent use ABC.

Regarding the global adoption rate of ABC, studies show varied results between as well as within countries. In the UK, Innes, Mitchell and Sinclair (2000) reported that 17.5 per cent of firms actually implemented ABC, while Tayles and Drury (2001) reported a 23 per cent diffusion rate. In the US, Shim and Sudit (1995) reported a 25 per cent adoption rate, while Hrisak (1996) found that 53 per cent of respondents were using ABC. In 2003, Kiani and Sangeladji surveyed the largest 500 US industrial companies and found that 52 per cent of respondents were implementing ABC. Researchers in South Africa (Sartorius, Eitzen & Kamala 2007) and India (Joshi 2001) reported adoption rates of twelve per cent and 20 per cent, respectively. Other research found that ABC diffusion in mainland Europe is less than 20 per cent. Bhimani et al. (2007) conducted a cross-national survey in seven countries and found that the proportion of respondents using ABC across business units is as follows: Canada (39.1 per cent); France (21.6 per cent); Germany (50 per cent); Italy (26.3 per cent); UK (55.8 per cent); US (54.4 per cent); Japan (6.1 per cent). Nassar et al. (2009) report 55.7 per cent of Jordanian industrial companies adopt ABC (16.4 per cent are using ABC, while 39.3 per cent are in the process of implementing ABC).

There are explanations for the difference in reported adoption rates of ABC. The difference in results may be attributed to the difference in survey questions. Some researchers may include in the adoption rate firms who intend to implement ABC in the future or firms who have already discontinued it. Further, some researchers may investigate the extent of ABC adoption rather than a dichotomous indication of ABC adoption. Also, some researchers do not differentiate between ABC and

ABM (Swenson 1995) while others do (Askarany, Smith & Yazdifar 2007). Some participants may have thought they were using ABC because of the misunderstanding of the concept or because of the lack of definition of ABC (Drury & Tayles 2005). Problems with previous studies lay in their lack of ABC definition or use of weak definitions. Dugdale and Jones (1997) criticised Innes and Mitchell's (1995) study because some of the companies classified as ABC users traced costs from conventional cost centres to products based on traditional volume bases rather than using activity cost pools or activity cost drivers. Dugdale and Jones called this a weak form of ABC because these companies use AA to trace overhead costs to manufacturing cost centres.

Although the predominant initial use of ABC systems was in the manufacturing industry, there is no signal of this in more recent times. A survey in Canada (Armitage & Nicholson 1993) and the UK (Cobb, Innes & Mitchell 1992) revealed that there is no significant difference in ABC adoption rate between manufacturing and service sectors. A survey conducted in 1999 among the largest UK companies found that 14.3 per cent of manufacturing firms and 12.1 per cent of non-manufacturing firms are using ABC, while the highest use was found in the financial institutions (40.7 per cent) (Innes, Mitchell & Sinclair 2000). A study of Indian firms that was identified through a report for the year 1999–2000 found that 76.92 per cent of ABCM users are in the manufacturing industry and 23.08 per cent in the service sector (Anand , Sahay & Saha 2005). Cagwin and Bouwman (2002) reported a higher adoption rate in manufacturing (31.1 per cent) than non-manufacturing (14.3 per cent). In contrast, a study of Greek companies in 2003 found a higher adoption rate in the service sector than that in the manufacturing sector (65 per cent and 35.7 per cent respectively) (Cohen, Venieris & Kaimenaki 2005). A study in 2005 among Better Management members investigated the use of ABC by different industries and found the rate of those actively using ABC to be 46 per cent in financial services, 58 per cent in communications, 24 per cent in manufacturing and 29 per cent in the public sector (BetterManagement 2005). This concludes that the adoption rate of ABC has been diminished in the manufacturing industry, while there is increased adoption in the service sector especially in financial institutions.

2.7 Activity-based Costing in Service Organisations

When the initial study in manufacturing industry just generated very low responses from ABC adopters, it was the decision to extend the study to include service organisations. Non-manufacturing clients represent the large customers for consulting firms who distributed the on-line survey in the second stage.

ABC systems can be developed in different types of organisations. 'Initially, most cases were based on private sector manufacturing companies and later this was extended to services and the public sector' (Bjørnenak & Mitchell 2002, p. 499). In an interview, Kaplan and Copper announced that service firms can benefit from ABC as they have the same problems as manufacturing (King 1991). Drury (2008) pointed out that overhead costs are the major element of expenditure in service organisations and these costs are non-volume related. He suggested that ABC is an appropriate system to trace such costs to different business segments. A survey in the UK reported that 51 per cent of financial and service organisations have adopted ABC compared with fifteen per cent of manufacturing organisations (Drury & Tayles 2005).

Brignall et al. (1991) studied five service organisations and found that cost systems were not of higher priority in these organisations due to the lack of stock valuation. They found that service organisations use cost information for planning and control and suggested that ABC is useful for such organisations, particularly service shops and mass services, which have the highest level of fixed costs. Service shops and mass services need accurate indirect costing because they face diversity, complexity and a high degree of competitive pressure. Whitt and Whitt (1988) explained the motivation for professional service firms to have interest in management accounting systems, focusing on two reasons: first, the increased competition made managers more conscious of the need for management accounting systems for planning, control and decision making. Second, professional service firms have grown in size and organisational complexity and therefore require efficient cost systems.

Service firms are different from manufacturing in the context of fixed costs. These costs are more common in service organisations than in manufacturing organisations (Bert & Kock 1995). Brignall et al. (1991) highlight five key differences between manufacturing and service sectors:

1. The common attendance of a customer in the time of service rendering
2. Intangibility of many service products
3. Inconsistency of either employees' performance or customers' expectations
4. Simultaneity of service production and service consumption
5. Perishability of many service products

The above characteristics have implications for products and cost behaviour and performance. Dearden (1988) outlines the factors that limit the application of conventional costing:

1. No finished goods or inventory
2. No product costs—costs are mostly period costs
3. Inappropriate assessment of output-financial measure (for example, service fee) owing to the lag between deterioration of service quality and reflection on profit
4. Few variable costs—service firms are labour-intensive and most labour costs are fixed. When sales change, contribution changes in almost equal measures, causing extreme profit volatility

The role of ABC in service firms does not different from that in manufacturing firms. In service firms, there are resources that are consumed by activities. Activities are performed to produce outputs. Figure 2.2 illustrates the major elements of allocation paths in an academic department, which is an example of a service-based unit.

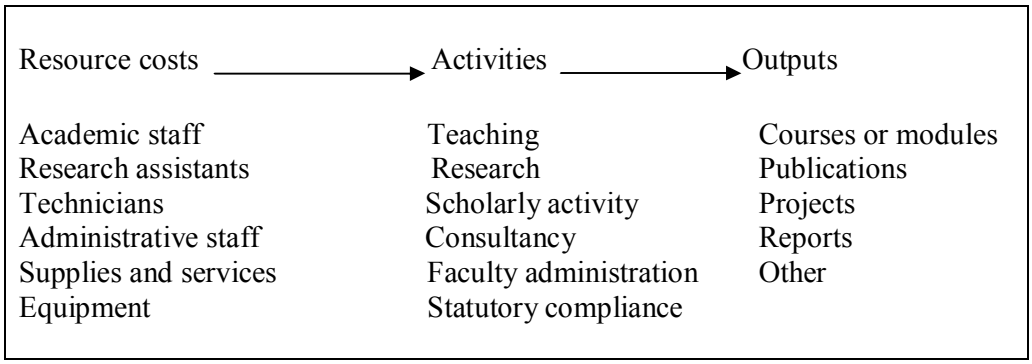

Figure 2.2: Academic department model

Source: Adapted from (Cropper & Cook 2000, p. 63)

2. 8 Activity-based Costing Implementation and Problems for Not implementing or discontinuing ABC

2.8.1 Introduction

This study is focused on using ABC information for decision making. In the context of ABC implementation stages, using ABC for decision making usually starts at routinisation and infusion stages (Cooper & Zmud 1990). Krumwiede (1998) titled these stages as "routine" and "integrated system", while Brown, Booth and Giacobbe (2004) titled them as "used somewhat" and "used extensively". This section has three objectives: first, describing the different stages of ABC implementation that a system should pass to reach the infusion stage. Within each stage, problems or issues are raised and solutions are suggested so firms can make progress towards the higher level of implementation. Second, explaining some success factors (e.g., organisational and technological factors) that affect the different stages of implementation. Third, shedding light on the reasons or problems for not implementing or discontinuing ABC, and those reasons may be attributed to the success factors such as lack of management support.

The implementation of an innovation is a conscious process. There are multi-dimensional factors that should be considered in such implementation. The factors that affect successful implementation extend beyond the adequacy of resources supplied for implementation. Shields (1995) found that successful implementation

of ABC is associated with behavioural and organisational factors. These factors are top management support, linkage to competitive strategies, linkage to performance evaluation and compensation, training in implementing ABC, non-accounting ownership and adequate resources. Anderson and Young (1999) found that ABC success is influenced by a wider array of contextual and process variables, including top management and union support of the ABC project, adequacy of resources, individual commitment to the organisation, the likelihood of lay-offs and the degree to which good performance is expected to be rewarded.

Anderson (1995) used Cooper and Zmud's model of information technology (IT) implementation to describe the implementation process at General Motors. This model consists of six stages. Anderson points out that some factors including individual, organisational, technology, task and environmental factors have different impacts among the various stages. For example, it was found that task uncertainty and worker autonomy reduce the probability of adoption while task responsibility and autonomy are important factors in promoting adaptation. Based on these findings, Krumwiede (1998) expanded the implementation model to ten stages (as detailed in section 2.18.3) and studied the association and importance between contextual and organisational factors (for example, potential for cost distortions, decision usefulness of cost information and TQM) and various implementation stages. He claimed that prior studies that combined firms at different stages may distort the level of factor significance or reject other factors that are only important for certain stages.

2.8.2 General Implementation Problems

ABC studies (Alsaeed 2005; Cohen, Venieris & Kaimenaki 2005; Cropper & Cook 2000; Innes, Mitchell & Sinclair 2000) have investigated the ABC adoption rate, either in a specific country or a specific sector, focusing on the problems or benefits associated with ABC implementation and the reason some firms do not consider ABC adoption. Researchers have found that resistance from managers and employees and lack of adequate resources (skilled staff and time) are the most common problems associated with ABC implementation (Sohal & Chung 1998).

In contrast, non-ABC adopters appear satisfied with their existing systems (Alsaeed 2005; Cohen, Venieris & Kaimenaki 2005).

In 1990, a survey of UK firms conducted by the Chartered Institute of Management Accountants (CIMA) pointed out problems facing firms considering ABC implementation and firms undertaking ABC implementation. For those who were considering ABC, the perceived problems were the amount of work involved in applying the new system, other urgent priorities such as the survival of the firm and changing manufacturing systems, lack of staff time, scarce computer resources and difficulty in identifying cost drivers. For those that were actually implementing ABC, the experienced problems were the lack of staff time; scarce computer resources and educating the managers in how to use ABC information (Innes & Mitchell 1998).

A survey report for the year 1999–2000 discussed the major problems faced by ABC firms in corporate India: developing an activity dictionary (i.e., definition of activities) (34.6 per cent), inability of conventional cost systems to capture the information required for ABC (42.3 per cent) and lack of review (guide) of ABC implementation (30.8 per cent). Surprisingly, lack of adequate resources (management time and funds) was a minor problem (7.7 per cent) (Anand , Sahay & Saha 2005).

Cohen, Venieris and Kaimenaki (2005) found that Greek companies encountered ABC implementation difficulties in certain areas, namely software selection, data collection, adequacy of resources and resistance of staff to ABC. The study also determined that the adequacy of resources is positively correlated with other variables such as personnel resistance, prolongation of ABC timetable and lack of top management support. In other words, lack of adequate resources may cause other problems.

Sartorius, Eitzen and Kamala (2007) interviewed ten consultants, five ABC companies and five non-ABC companies in South Africa. The problems or reasons for not implementing ABC were lack of management support, difficulty with data gathering, too expensive to implement, lack of skills, misconceptions

about ABC (for example, ABC believed to be suited to manufacturing only), a lack of adequate IT systems, reliance on financial data and, finally, a preoccupation with other innovations like TQM or JIT initiatives.

The next section will include details of ABC implementation stages; factors influencing the various stages; potential problems within each stage and suggested solutions.

2.8.3 Implementation Stages

The implementation of ABC systems refers to the process of carrying out the decision to adopt the system. The terms 'Implementation' and 'Adoption' are used in the literature interchangeably with the exception of their use in the context of stages. Cooper and Zmud (1990) developed a model of IT implementation consisting of six stages: initiation, adoption, adaptation, acceptance, routinisation and infusion. Krumwiede (1998) expanded this model to ten stages: (A) Not considered, (B) Considering, (C) Considered then Rejected, (D) Approved for Implementation, (E) Analysis, (F) Getting Acceptance, (G) Implemented then Abandoned, (H) Acceptance, (I) Routine System, (J) Integrated System. He first tested what he called the adoption stages (A–D) among non-ABC adopters (stages A–C) and ABC adopters (stage D). Then, he tested the implementation stages (stage E and beyond) (see Table 2.1).

Table 2.1: ABC implementation model

A. Not considered: ABC has not been seriously considered. We use either single or departmental/multiple plant-wide allocation methods only. B. Considering: ABC is being considered and implementation is possible, but implementation has not yet been approved. C. Considered then Rejected: ABC has been considered (not implemented) and was later rejected as a cost assignment method. D. Approved for Implementation: Approval has been granted to implement ABC and devote/spend the necessary resources, but analysis has not yet begun. E. Analysis: ABC implementation team is in the process of determining project scope and objectives, collecting data and/or analysing activities and cost drivers. F. Getting Acceptance: Analysis is complete and ABC model has project/implementation team support, but ABC information is not yet used outside accounting department for decision making. G. Implemented then Abandoned: ABC was implemented and analysis performed but it is not being pursued at this time. H. Acceptance: Occasionally used by non-accounting upper management or departments for decision making. General consensus among non-accounting departments is that the model provides more realistic costs. However, it is still considered a project or model only with infrequent updates. I. Routine System: Commonly used by non-accounting upper management or departments for decision making and considered a normal part of information system. J. Integrated System: ABC is used extensively and has been integrated with the primary financial system. Clear benefits can be identified, such as: non-value adding activities identified, process performance improved, products priced better and strategic/operating decisions improved.

Source: (Krumwiede 1998)

Subsequently, Brown, Booth and Giacobbe (2004) used Krumwiede's stages with different wording. They first tested initiation of interest in ABC (stage A to B and beyond), not having considered ABC (stage A) and having interest in ABC initiatives (stages B, C, D). They then tested the adoption decision stages (D and beyond), by comparing those who have adopted the innovation (stage D) with those that have rejected the innovation (stage C).

Cooper and Zmud's model is the theoretical model that explains the main stages of IT implementation. This model represents the base on which other studies (for example, Anderson 1995; Krumwiede 1998) regarding implementation stages have been built. The stages described in the model are Initiation, Adoption,

Adaptation, Acceptance, Routinisation and Infusion. The boundaries between these stages are not distinct, but there may be some characteristics that differentiate each stage.

Figure 2.3 includes a brief description of the various implementation stages and the goals that should be achieved by the end of each stage. It shows how a firm makes progress towards the highest level of implementation (ABM).The following sections provide detailed information regarding the various stages of ABC implementation.

- **Initiation**

This stage concerns a general interest in ABC innovation. This interest is usually associated with evaluating the new system. Management would not install ABC unless there was a rational need for changing the current system. Indeed, the motivation for undertaking ABC may be influenced by fads—imitating other firms—or fashions promoted by consulting firms; the effect of these motivations has, however, diminished since 1993 (Malmi 1999).

The need for change could be also explained by product cost distortion under the current allocation methods or by the need for relevant information for decision making (see Figure 2.3).

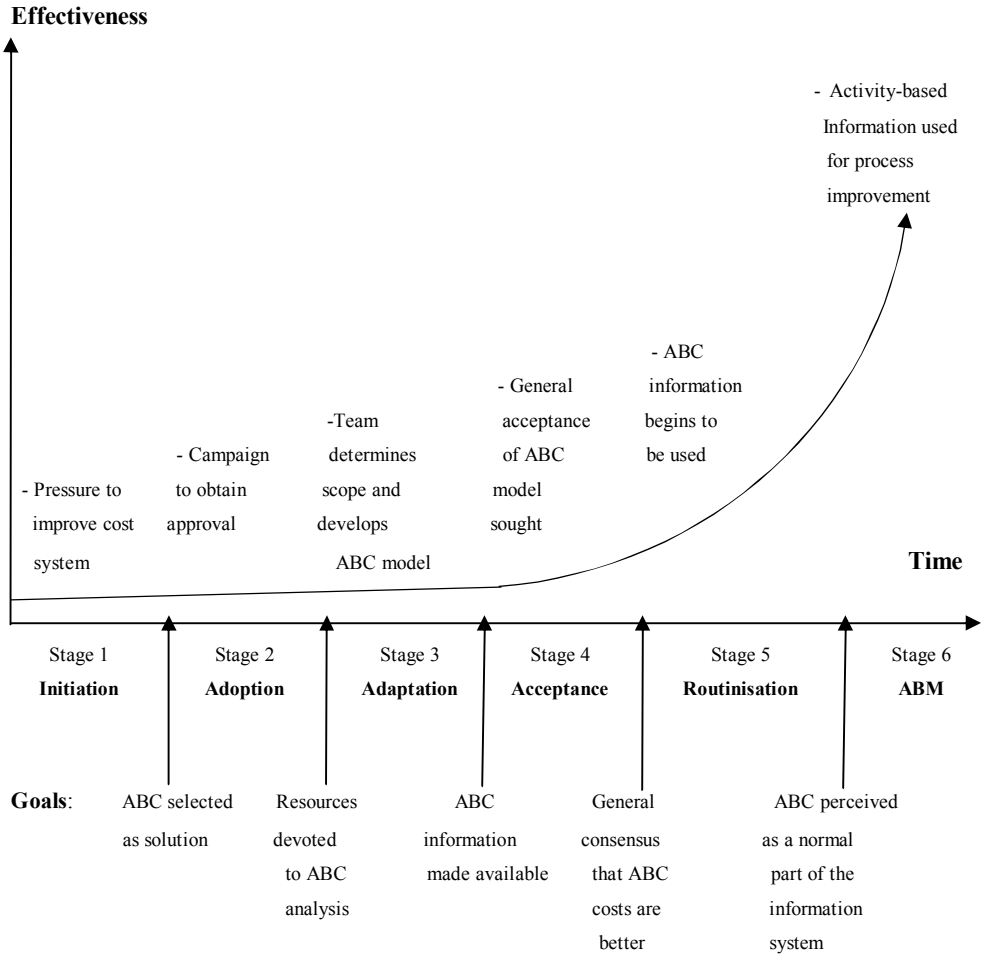

Figure 2.3: Stages of ABC implementation

Source: Adapted from (Krumwiede & Roth 1997, p. 6)

Brown, Booth and Giacobbe (2004) investigated organisational and technological factors that may be related to an interest in ABC. They found that higher levels of top management support, internal champion support and larger organisational size were associated with interest in ABC initiatives. In contrast, they found that product complexity and diversity, level of overhead and relative advantage were not significant factors at this stage.

A study of UK firms indicates that firms considering ABC implementation took more than one year before reaching a decision about ABC adoption (Innes & Mitchell 1998). Common reasons for this were as follows: accounting staff resources not yet available; other priorities before ABC; managers not yet

convinced of the benefits of ABC; and parent company had not yet reached a decision about ABC.

Krumwiede (1997) stated that firms with no significant cost distortion or no significant decision use for ABC information would not make progress towards the next stage, which is the adoption stage. He suggested that firms evaluate the current costing methodology and determine whether other methods would provide better information for decision making.

- **Adoption**

The adoption stage is one of the most important stages because management has to embark on a decision regarding ABC implementation. In this stage, management approves the decision to adopt the ABC initiative and provides adequate resources (for example, funds, time, training and staff) for implementing it.

Brown, Booth and Giacobbe (2004) found that higher levels of internal champion support were associated with firms that had adopted rather than rejected ABC. An internal champion is usually a member of high-level management with funding power. The champion plays a significant role in seeking approval for the new project (see Figure 2.3). Krumwiede (1998) found that variables such as the potential for cost distortions, job shop and size are highly significant in the decision to adopt ABC. The potential for cost distortions relates to the diversity in products, support, processes, volume and relative degree of overhead costs. The findings indicate that ABC is more likely for continuous manufacturing processes (for example, refinery plants) than for job shops (for example, assembly plants). Cooper and Zmud (1990) attributed this to the uncertainties associated with made-to-order because one major characteristic of job shops is the customisation or customer-orientated production.

Several studies (for example, Krumwiede 1998; Bjørnenak 1997; Innes, Mitchell & Sinclair 2000; Nguyen & Brooks 1997; Al-Mulhem 2002; Alsaeed 2005; Askarany & Smith 2008; Askarany, Yazdifar & Askary 2010) found that larger firms are more likely to adopt ABC. Chenhall and Langfield-Smith (1998a) and Joshi (2001) found that the adoption of advanced management accounting practices (for example, ABC) is positively related to the size of firms in Australia and India. Bjørnenak (1997) argues that larger firms have the required resources and are then more capable of adopting ABC. Clarke, Hill and Stevens (1997) claim that large firms have specific characteristics that motivate the adoption of ABC, such as complex operations, various products and large overheads. Chenhall and Langfield-Smith (1998a) justify the effect of size reflected in task complexity. Task complexity leads to differentiation of tasks and difficulties in integrating and coordinating activities. Such difficulties encourage the development of more sophisticated integrative information systems. Further, Pierce and O'Dea (1998) argue that large organisations are more exposed to the criticism of conventional accounting systems and to the awareness of benefits associated with new ideas and techniques.

In a survey of public manufacturing companies and multi-national manufacturing companies in Malaysia, Maelah and Ibrahim (2007) studied ABC adoption among these firms and investigated factors influencing the adoption of ABC. They compared ABC adopters with non-ABC adopters and found a positive relationship between organisation support (support received from management and non-accounting departments) and ABC adoption. They also found a positive relationship between decision usefulness of accounting information and ABC adoption. They argued that cost distortions are not enough to motivate companies to redesign their systems. Firms would compare the net present value of the benefits from ABC systems with the costs of implementing such systems. In practice, firms investigate certain conditions as we discussed under the headline ‘factors influencing the decision to adopt ABC’ to make decisions about ABC adoption because of the difficulties associated with measuring the benefits of ABC (Cooper 1988).

One major potential barrier at the adoption stage is the complexity of the ABC model as seen by key managers outside the accounting department (Krumwiede & Roth 1997). This may happen when the team designs a comprehensive model for the entire organisation. A suggested solution is to focus on a specific site of the organisation that has most in common with other sites (Turney 1996). This is also helpful in the case of scarce resources because minimal resources are required to implement the project. Following that, the design team should focus on a key decision for a certain product line at the pilot site. By comparing the results of ABC to traditional cost information, advocates can show the impact of ABC information on certain decisions and stimulate higher levels of management commitment and resources. It is worth noting that the existence of a powerful ABC champion is critical at the adoption stage (Krumwiede & Roth 1997).

- **Adaptation**

Adaptation is the stage during which data is collected and analysed. The project team starts collecting data on activities, activity drivers and cost objects and then enters these data into the model. The team should limit the number of activities and their drivers by using the existing data. This would reduce data collection requirements and enhance the grasp and commitment of potential users.

Before starting data collection, the ABC team should have clear objectives and be familiar with the scope of the project (Turney 1996). Due to limitations of complexity and costs, a firm may design the ABC model for specific purposes. The firm, for example, may direct the new system to serve or focus on manufacturing activities rather than non-manufacturing activities. Generally, the objectives are derived from problems or difficulties facing the firm in which ABC would be the proposed solution. In contrast, the scope of the project should be determined initially. Determination of sites, cost objects, activities and accounting period are examples of targets of project scope (Turney 1996). Management should communicate the objectives of ABC to the designers and end-users in order to develop the understanding of issues related to the design and use of the new system and to build awareness of the expected contributions of both groups.

One major barrier at this stage is the lack of non-accounting departments' support (Krumwiede & Roth 1997). These departments may become unwilling to participate in the project by providing the required data and resources. They may look at ABC as a new fashion of cost systems instead of a management system that focuses on activities across the organisation. To overcome this issue, a cross-functional implementation team should be designed (see Figure 2.3). This team may consist of members from different departments such as production, engineering, marketing, finance and information systems. Ultimately, Shields and McEwen (1996) suggested the involvement of a broad cross-section of employees in the adoption, design, implementation and use of ABC systems. The team should have a knowledgeable full-time leader and other members who are full or part-time depending on the budgeted time to complete the project. It is important that the organisation's employees perceive leadership of the project. Another possible solution to gain support from other departments is to link the objectives of ABC to other initiatives such as TQM. This link makes other people in the organisation feel that ABC may help them to improve performance (Krumwiede & Roth 1997).

External consultants play a facilitating role in ABC initiatives. They could be used as a source of knowledge as well as expertise to sell, design, implement and use ABC. Significant benefits from consultants can be realised in the designing of ABC models. They may assist the design team in different ways, including interview structure, data transfer into activity-based software, analysing and reporting and presenting the results for the project sponsor and top management (Cooper et al. 1992). In a sample of 750 manufacturing and service organisations, Swanson and Barney (2001) found that many of the respondents (104 out of 166) used outside consulting services to implement ABC. The respondents claimed that the use of consulting firms rather than internal staff reduces the potential for resistance to ABC.

- **Acceptance**

The ABC system is accepted when ABC information is perceived as better information and accountants start using this information for internal accounting purposes. However, at the acceptance stage the system has not yet been used for decision making. The feelings of some managers or employees may change after the declaration of the results (see Figure 2.3).

Managers may feel that ABC threatens their positions or budgets. This perception leads to the resistance of not using ABC information. In this case, the team manager should remind those managers and employees about the objectives of ABC. Management should mitigate any concern by confirming their readiness to retrain staff whose jobs become obsolete (Shields & Young 1989).

The education (training) program is of primary importance. Training is one of the significant factors associated with successful ABC implementation. Training can include reading, lectures, hands-on projects and on-the-job training. Training can tackle the different phases of design, implementation and use of ABC (Shields & McEwen 1996). At the acceptance stage, two important meetings can be held. The first one is the results meeting. The final design of ABC is explained to the managers, who can show the difference between the new and old systems. The second meeting is the interpretation meeting, during which managers are taken to conduct analysis of the new cost information and to explore actions that should be taken based on this information (Jong No & Kleiner 1997).

- **Routinisation**

In the routinisation stage, the ABC system becomes a normal part of the organisation's information system and non-accounting key managers routinely use the system for strategic decision making (see Figure 2.3). Therefore, acceptance of the system by those managers is important at this stage. To encourage more managers to use ABC, the firm may modify the financial reporting and budgeting process to be based on activities rather than departments or centres.

An obstacle to using the system could be managers' feelings that ABC has over-loaded information (Krumwiede & Roth 1997). One possible way to reduce the amount of information is to work with users to identify unimportant reports and performance measures and eliminate them. The extra information also increases the burden of maintaining the system. Therefore, reducing unnecessary information would leave staff more time to use ABC information.

Another issue is the change in the external environment (Krumwiede & Roth 1997). If a change happens and affects the value of the ABC system, the implementation process may not reach the routine stage. An environmental change may lead to a change in the company's strategy and this would render the ABC system unable to deliver the necessary information. In this situation, firms may go back to the analysis stage of the implementation process and change the focus of the ABC model.

Krumwiede (1998) found top management support and number of purposes (ABC applications) are significantly correlated with reaching the routine stage. With low management support, the system may be used on a limited basis. As time goes on, adopting firms expand the purposes of ABC. Shields and Young (1989) designed a model for implementing cost management systems. It consists of seven Cs, namely, culture, champion, controls, compensation, change process, commitment and continuous education. The authors found that champion, controls, compensation and education increase the level of commitment to continuous improvement. In their study, top-management support and commitment were mentioned under the factor ‘change process’, and the commitment and support of top management and employees were mentioned again under the factor ‘commitment’. Neither a clear description of top management support and commitment was given, nor was it distinguished from employees' commitment.

- **Infusion**

Infusion means that the ABC system is a normal part of the organisation's information system and non-accounting key managers use the system extensively for strategic and operational decisions. This is the stage of ABM, since the focus of ABC is expanded beyond product costing to process improvement (see Figure 2.3). Benefits from ABC are recognised through identifying non-value-added activities, improving product pricing and processes and related decisions.

One major shortcoming at this stage is if continuous improvement programs are not part of the firm's strategies (Krumwiede & Roth 1997). When cost reduction or process improvement is linked to the competitive strategies through continuous improvement programs, the firm has reached the advanced stage of ABM.

In order to encourage progress towards ABM, ABC information could be used to prioritise projects concerning products and processes. This directs managers' attention to identify opportunities for improvement. Further, displaying performance measures motivates employees to move on the improvement track (Krumwiede & Roth 1997).

Some factors were found to be important for reaching the ABM stage. These factors include non-accounting ownership, implementation training and information technology quality (Krumwiede 1998). To use ABC extensively for decision making, ABC could be integrated with other management systems. This encourages non-accounting departments to use ABC as the official system. In the ABM stage, managers need higher levels of training to cope with the advanced capabilities of the system. In addition, a higher quality of existing information systems facilitates ABC implementation by providing the operational data needed for resources and AA.

2.9 Contingency Theory

The conceptual framework underlying the present study will be based on contingency theory. Barrow (1977) developed contingency theory to explain successful leadership. 'Contingency Theory states that there is no single organisational structure that is highly effective for all organisations' (Clegg & Hardy 1999, p. 51). The optimal organisational structure varies according to contingency factors such as organisational strategy and size.

Contingency theory 'must identify specific aspects of an accounting system which are associated with certain defined circumstances and demonstrate an appropriate matching' (Otley 1980, p. 414). In management control systems (MCS) research, studies are concerned about how MCS are best designed and implemented to fit the contextual factors. These contextual factors are contingencies that may have impact on the design of MCS and they are external such as environment and culture and internal such as structure, size and technology (see Figure 2.4).

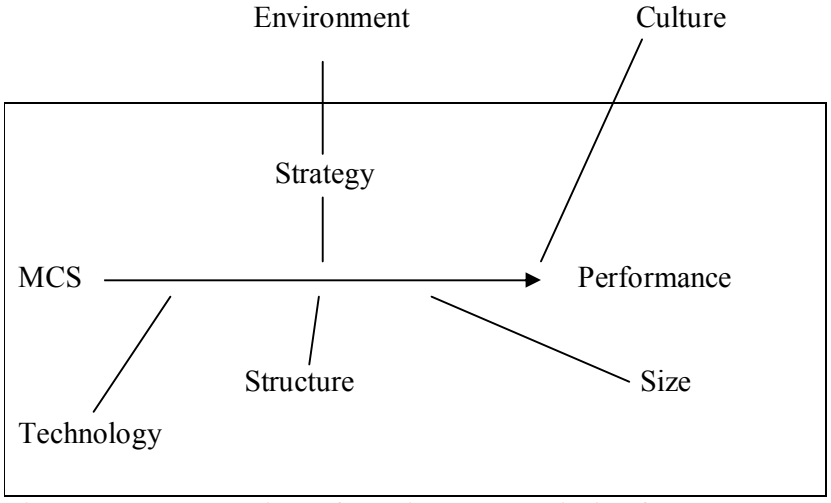

Figure 2.4: An Overview of Contingency Analysis of MCS

Source: (Hoque 2006, p. 36)

Drazin and Van de Ven (1985) identified three theoretical approaches of contingency fit. These approaches are (1) Selection fit, (2) Interaction fit, and (3) System fit. Selection studies (Abdel-Kader & Luther 2008; Gosselin 1997; Krumwiede 1998) examine the relationships between contextual factors and aspects of MCS without referring to the organisational performance. The assumption in selection fit is that firms operate in situations of equilibrium (Hoque 2006). Interaction studies (Cagwin & Bouwman 2002; Ittner, Lanen & Larcker 2002) examine whether different combinations of MCS and contextual factors have different performance outcomes. The assumption in interaction fit is that at some point of time, there are some organisations that operate out of equilibrium (Hoque 2006). Systems studies (Chenhall & Langfield-Smith 1998) consider the design of MCS as one of the contextual factors that affect performance outcome. The holistic combination of multiple contexts and performance measures provides a form of systems fit.

Although there is no exhaustive list of contingent factors, Fisher (1995, 1998) grouped these factors into five categories:

1. Uncertainty
2. Technology and interdependence
3. Competitive strategy
4. Industry, firm and unit variables
5. Observability

The first broad category, uncertainty, is defined as including unpredictability in the actions of employees, customers, suppliers, competitors, job market and government agents. Specifically, uncertainty can be attributed to tasks or to the external environment. Task uncertainty implies that achievement of the expected outcome depends upon the action taken by managers. If the manager has high knowledge of the transformation process from input to output, then the degree of uncertainty is diminished. The external environment has, however, a higher degree of uncertainty. External factors may affect the design of the management accounting systems. For example, the sophistication of the management system is influenced by the competition faced by the organisation. Researchers divided the external environment into dichotomous characteristics including certain *versus*

uncertain, static *versus* dynamic, simple *versus* complex and turbulent *versus* calm (Fisher 1998).

The second category is firm technology and interdependence. Firm technology may refer to the production method that describes the process of transforming raw materials into finished products. Woodward (1965) classifies technology into small batch, large batch, process (continuous) technology and mass production. In contrast, Perrow (1967) defines technology as the number of exceptions (failures) in the production process and the nature of the search process (knowledge) to solve such problems. Thompson (1967) argues that one of the key elements of firm technology is the interdependence between business sub-units or departments. Fisher (1995) classifies interdependence into pooled, sequential and reciprocal interdependencies. This study employs information technology as a contingent factor that affects the data process from entry to outcomes and reflects the level of integration among the various information systems in the firm.

The third category of contingent variables is competitive strategy. Porter's (1980) classification of competitive strategy includes low cost, differentiation and focus. Miles and Snow (1978) classified strategy elements as defenders, prospectors and analysers. Govindarajan and Gupta (1985) introduced a further strategic typology, which is known as the product life cycle classification. It consists of build, hold, harvest and divest strategy. Businesses that embrace the build mission have the goal to increase market share and production. They invest heavily in the industry to gain a competitive position. The hold mission is aimed at the protection of the business unit's competitive strategy. The cash outflows for a business unit following this strategy would usually be equal to the cash inflows. This mission is followed by businesses that have a high market share in high growth industries. Harvest mission has the goal of maximising short-term cash flow and earnings, even at the expense of market share. Businesses following harvest mission generate a larger surplus of cash flow than is required for further investment. High market share and low growth are dominant in these businesses. The divest mission indicates a decision to withdraw from the business, either through a process of slow liquidation or outright sale. Objectives and mission of the firm are codified in competitive strategy that, in turn, affects the design of planning and control

systems. To attain these objectives, the control system should be able to address them (Ashton, Hopper & Scapens 1995; Fisher 1995). This study investigates the effect of differentiation strategy on the design of ABC as planning and control systems.

The fourth category consists of contingent variables related to the organisation, and examples include industry, firm size, diversification and organisational structure. Diversification refers to the level of diversity in the product line (product mix). Organisational structure has been classified into functional organisational structure and divisionalised organisational structure. A functional structure is one in which all similar activities are placed under the control of the appropriate department; a divisionalised structure is one which is split up into divisions in accordance with the products which are made (Drury 2008). Other organisational factors that fall into this category and are expected to influence ABC use are top management support, training, objectives clarity and ultimate access to ABC information (non-accounting ownership).

The fifth category consists of factors related to observability. Managers can observe actions (for example, worker behaviour) or action outcomes that need to be measured, evaluated and rewarded. Observability implies that controls should be placed on factors partially or fully observable by managers.

Rogers (2003) defines an innovation as an idea, practice, or object perceived as new by an individual or other unit of adoption. He identifies five main attributes of innovations as follows:

1. Relative advantage
2. Compatibility
3. Complexity
4. Trialability
5. Observability

Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes. Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences,

and needs of potential adopters. Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use. Trialability is the degree to which an innovation may be experimented with on a limited basis. Observability is the degree to whitch the results of an innovation are visible to others. Although studies could identify other characteristics of innovations, Rogers (2003) argues that the five attributes are the common ones.

Askarany, Smith and Yazdifar (2007a) studied the influence of the above attributes of innovation on the diffusion of ABM. They employed fourteen items to measure these attributes and they found only four items ,namely, compatibility of the technique; quality of the technique; effectiveness of the technique and implication of the technique are significantly associated with the diffusion of ABM. Also, Askarany and Yazdifar (2007) studied the influence of the above attributes of innovation on the decision to implement (or not) ABC. They did not find strong relationships between most of these fourteen items and the diffusion of ABC. This finding led to an implication that decision makers are still unconvinced of the superiority of ABC over conventional costing techniques. In other words, ABC may have insufficient advantages/benefits over conventional systems. Considering relative advantage as one of the strongest factor in predicting the rate of innovation's diffusion, Brown, Booth and Giacobbe (2004) did not find a significant association between relative advantage and the decision to implement ABC. Dikolli and Smith (1996) attributed the unfavourable cost –benefits of ABC to four factors: (1) deficient technical support; (2) problematic data collection; (3) uncertain model definitions; and (4) misconceptions of methodology.

International Federation of Accountants (IFAC) (1998) provides a framework explaining four stages of management accounting development. The first stage was prior to 1950s, where the primary focus of management accounting was cost determination and financial control. In the second stage, in the 1960s and 1970s, the focus shifted toward the provision of information for planning and control purposes. In the third stage, in the 1980s, the focus changed to reduction of waste in business resources. In the 1990s, it is the fourth stage and the focus shifted to creation of value through effective use of resource. Abdel-Kader and Luther (2008) adopted these stages to describe four levels of sophistication. They define

sophistication as the capability of a management accounting system to provide a broad spectrum of information relevant for planning, controlling, and decision-making. The authors located ABC in the third stage (level 3). Al-Omiri and Drury (2007) classified product costing systems by their level of sophistication. Sophistication level is determined based on assigning indirect costs to cost objects. They found that ABC system is associated with higher level of sophistication.

Askarany and Smith (2004) found that the diffusion of six innovations including ABC is positively associated with employee awareness of the benefits of an innovation, employee awareness of the availability of an innovation, management commitment on implementation of an innovation, the employment of consultants to facilitate implementation of an innovation, and negatively associated with the lack of confidence in the new cost accounting technique.

Diffusion studies try to explain the motivations behind the spread of the ABC phenomenon. The motivations mentioned in these papers include efficient or normative choice, coercive choice and fashion or fads (Agbejule 2006; Malmi 1999). Efficient choice is based on evaluation of ABC technique, whereas coercive choice is based on instructions from the parent firm. In contrast, fashion is promoted by consulting firms, whereas fads are derived from imitating other firms. According to Malmi (1999), efficient choice may explain the earliest ABC adoption stage before the 1990s, while fashion setting organisations exerted considerable influence in the take-off stage between 1991 and 1992. From then on, the influence of fashion setting organisations diminished.

A review of the literature reveals that some firms may not benefit from implementing ABC systems (Innes & Mitchell 1998). This led researchers to investigate the conditions under which ABC is more beneficial to a firm. These conditions are a combination of organisational, environmental and technical factors. This study is more focussed on organisational factors (e.g., business unit size) rather than environmental and technical factors. The environmental factors may have impact on ABC through internal organisational factors as explained in the next section and the technical factors have controversial debate. Also, these

factors are related to the decision to adopt ABC, but not to the implementation process. The following are explanation of some of the environmental and technical factors:

- Product diversity
- Competition
- Deregulation
- Level of overhead

Alsaeed (2005) defined product diversity as the variety of type and/or volume of products and/or product lines that are manufactured by a firm. Product diversity is evident when products consume support functions in different proportions. This may be attributed to differences in product size, product or process complexity, set-up time and product volume (Hansen , Mowen & Shank 2006). As mentioned earlier, conventional cost systems result in high-volume products, subsidising low-volume products, and less complex products, which subsidise more complex products.

Empirical studies have reported on the relationship between product diversity and ABC adoption. Several studies, including those by Bjørnenak (1997), Krumwiede (1998), Al-Mulhem (2002) and Alsaeed (2005) found a positive association between product diversity and ABC adoption, indicating that ABC adoption is higher among firms with higher product diversity. However, Clarke, Hill and Stevens (1997) found a negative relationship between product diversity and ABC adoption. Van Nguyen and Brooks (1997) surveyed 350 Australian manufacturing firms and did not find a significant difference between ABC adopters and non-ABC adopters in terms of product diversity. Brown, Booth and Giacobbe (2004) surveyed 1,279 Certified Practising Accountants Australia (CPAA) members and did not find a significant association between product complexity and diversity and interest in ABC or the decision to adopt ABC. Booth and Giacobbe (1998) found a positive and significant association between interest in ABC initiatives and product complexity and diversity, but this association did not extend to ABC adoption. These mixed findings may be attributed to differences in the definition

of ABC implementation stages or in the measurement of product diversity (Brown, Booth & Giacobbe 2004).

The evidence seems to indicate that product diversity is an important factor in implementing ABC. Firms that produce one product or products with similar production processes may not need to implement ABC in order to be cost effective. However, product diversity may be insufficient to initiate interest in ABC unless firms incur significant costs in activities that are not at the unit-level (Turney 1990).

Firms with fierce competition are more likely to adopt ABC. Copper (1988) illustrates situations in which competitors gain a competitive advantage from cost errors incurred by their counterparts. These situations include, for example, increased competition, more focused competition, more creative competition and deregulation.

Increased competition leads to increased cost of errors. Cost of errors is incurred when managers make bad decisions about products, budgeting and investment. Firms may continue to sell products with inaccurately low profit margins. However, firms may decide to drop these products mistakenly if competitors cut prices on these products and attract customers.

More focused competition means that competitors follow a focused production strategy. Therefore, competitors focus on a smaller range of products rather than a full range of products. This strategy causes a conventional cost system to report less distorted product costs. Hereby, competitors can make better decisions than those with a full range of products and cost distortion.

More creative competition occurs when a competitor changes the way a product is sold. Firms may not be concerned about cost allocation if they sell bundling products. Bundling products is the practice of combining related products in a package that results in a customer needing to buy these products together. However, this situation may change if competitors determine the costs of bundling

products correctly and decide to sell these products individually. In this case, it is important for a firm to develop a more accurate cost system.

Another contingent is deregulation. The regulated market encourages a firm to focus on its overall efficiency but not to worry about its competitive position. Chenhall and Langfield-Smith (1998a) pointed out that reforms occurred in Australia during the 1980s, including the deregulation of financial markets, gradual dropping of industry protection policies and the freeing up of labour markets. The government may deliberately deregulate the market as a way of activating the economy, which can also generate impetus for businesses to adopt advanced management practices. Therefore, if deregulated competitors start cutting prices and selling products, this forces regulated firms to scrutinise their product costs.

As mention earlier, direct labour diminished as technology was introduced in the modern manufacturing environment. The expectation is that there will be an increase in the level of overhead in the cost structure of ABC firms. This premise needs to be proven by empirical evidence.

Several studies have examined the relationship between the level of overhead and ABC adoption. Bjørnenak (1997) found a positive relationship while Nguyen and Brooks (1997) and Alsaeed (2005) did not find any relationship. In addition, Cohen, Venieris and Kaimenaki (2005) and Askarany, Smith and Yazdifar (2007b) found that ABC adopters and non-ABC adopters do not appear to be different in terms of cost structure or change in overheads. Booth and Giacobbe (1998) found that a higher level of overhead is more likely to be associated with initiating interest in ABC, but there is no association at the evaluation and adoption stages. Brown, Booth and Giacobbe (2004) did not find a significant association between the level of overhead and interest in ABC, and found no relationship between the level of overhead and the decision to approve the implementation of ABC. These contradictory findings are attributed either to the difference in measuring this variable or to the ambiguity around the definition of adoption. This issue may need further investigation, especially the level of those overheads that are not found at the unit-level.

2.10 The General Model of This Study

The general model in this study is based on the framework of contingency theory. This theory assumes that there is a link between the use of management accounting systems and the effectiveness of performance (Haldma & Lääts, 2002). Moreover, the contingency-based approach assumes that management accounting systems are adopted to achieve organisational goals. Figure 2.5 is an extended version of the general contingency theory framework in Figure 1.1. For the purpose of this study, ABC as a cost management system is linked to business unit performance and other benefits that are expected to be achieved.

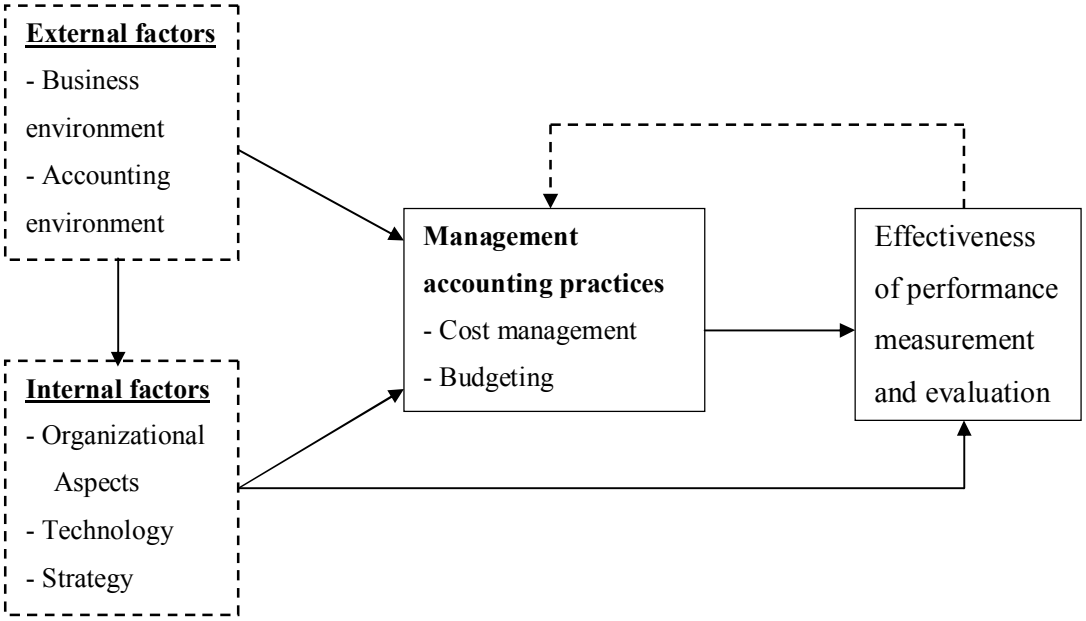

Figure 2.5: Theoretical framework of the contingency approach

Source: (Haldma & Lääts 2002, p. 384)

Contingency theory assumes that there is no universal accounting system that is applicable to all organisations; instead, the choice of an accounting system depends upon the specific circumstances of an organisation's environment (Rayburn & Rayburn 1991). These circumstances are referred to as internal and external factors that influence the design of management accounting practices (for example, cost management and budgeting). Our study is more focussed on the

internal factors, although external proxies are used (i.e., industry). Internal factors are more relevant to the context of this study, given the focus on factors influencing the success of ABC rather than factors influencing the decision to adopt ABC. However, internal factors are affected inevitably by external factors as illustrated below.

A strategy is a response to the external environment. Firms are expected to sensitise their strategies to the competitive environment. Information technology has changed rapidly and competitors respond to customer needs in innovative ways. Market and financial deregulation, market globalisation and increasing customer demand are all factors attributed to fierce competition. The nature of competition depends on the industry characteristics. Firms may compete, for example, on lower prices or innovative products or custom design or economies of scale. To attract customers, it is important for organisations to obtain a match between the external environment and the strategy. Several studies (for example, Fuschs et al. 2000; Chong & Chong 1997) found positive association between environment and strategy (Baines & Langfield-Smith 2003).

The middle block in the contingency framework described above is the design and implementation of management accounting system (e.g., ABC). Turney (1996) divided the development of ABC systems into two generations. He referred to the early ABC as the first generation. The main purpose of the system at that stage was to improve the accuracy of product costs. To do so, overhead costs were regrouped into broad cost pools. Each pool included a group of activities that had similar consumption patterns. The cost pools were assigned to cost objects based on unique cost drivers. These cost drivers could be volume-related drivers (for example, machine hours) or volume-unrelated drivers (for example, number of parts). However, the system could never be extended beyond the factory to process non-manufacturing expenses or identify specific manufacturing activities.

The goal of the first generation of ABC was to improve the accuracy of product costs, which could be part of a business unit's strategic objectives. However, the system did not attempt to identify activities individually or to reveal cost information about them; consequently, it was impossible to make a judgement on

the performance of such activities. Nonetheless, the system was beneficial because it supported strategic decisions related to pricing and product mix (see Figure 2.6).

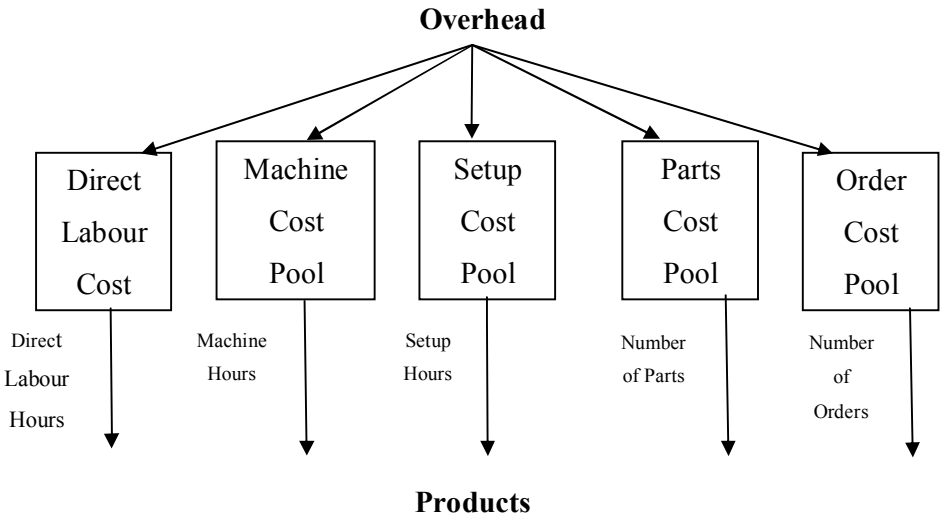

Figure 2.6: An early ABC system

Source: Adapted from (Turney 1996, p. 80)

The second generation of ABC has a framework with two main views: the cost assignment view and the process view. Both views are modelled in Figure 2.7.

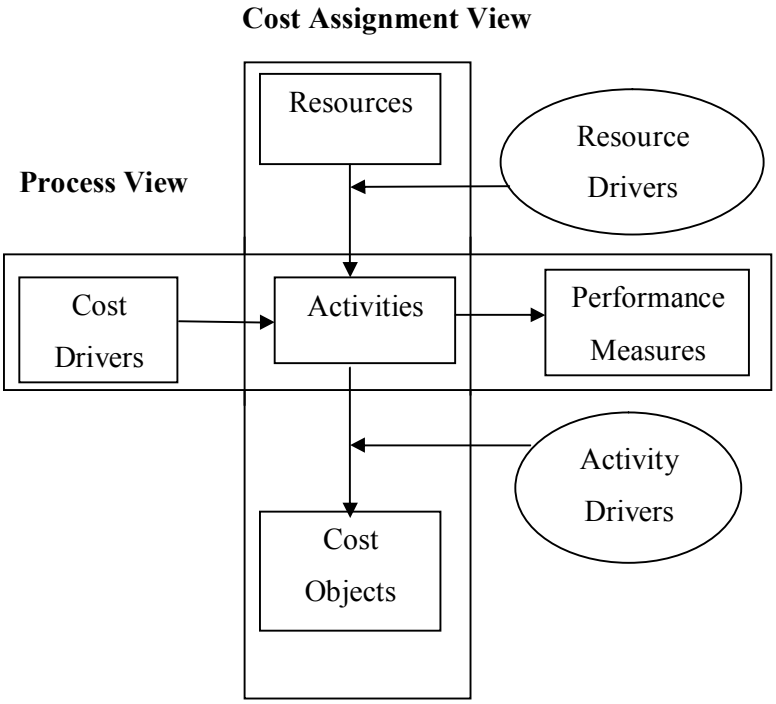

Figure 2.7: Two-dimensional ABC model

Source: Adapted from (Turney 1996, p. 96)

The cost assignment view represents the vertical part of the model. Costs are assigned to cost objects in two stages. In the first stage, resource costs (for example, salaries, depreciation and utilities) are assigned to activity cost pools directly or through the use of resource drivers. Each type of resource represents a cost element of an activity cost pool. Thus, an activity cost pool is the total cost of all resources consumed by an activity. An activity centre represents a collection of related activities that underlie a specific process, function or department. For example, the purchasing department is an activity centre that consists of related activities such as purchasing order entry, payment process, receipt of incoming material and inspection, material handling and warehousing. In the second stage, each activity cost pool is assigned to cost objects with the help of activity drivers that reflect the activity consumption patterns of cost objects. If the cost object is a

product, the product costs are the costs of the various activities assigned to that product. Figure 2.8 represents the detailed cost assignment view of ABC.

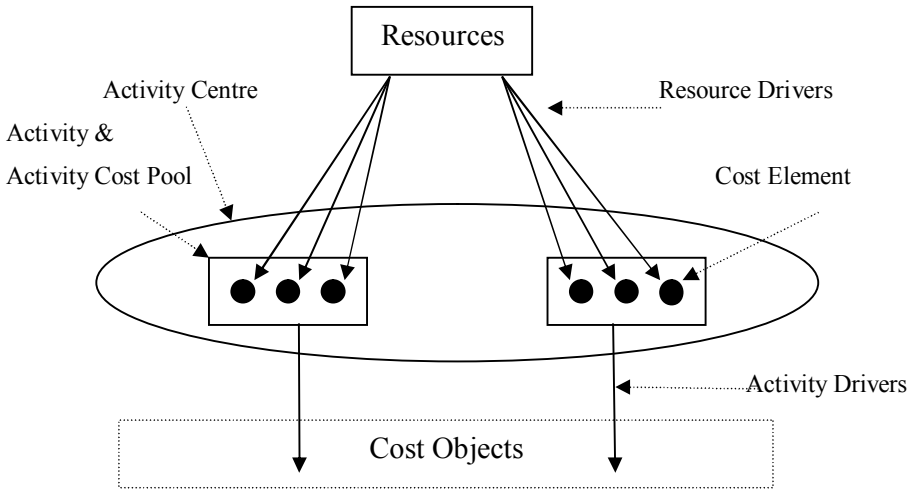

Figure 2.8: Cost assignment view of ABC

Source: (Turney 1996, p. 97)

Activity information provided for the purpose of costing usually answers activity-related questions: what activities run in an organisation, what efforts are required to perform these activities and what are their costs? The nature of this information is primarily financial. Such information can form a basis for profit evaluation that drives important decisions. These decisions include pricing strategy, product mix decisions, outsourcing decisions and cost simulations, especially in the development stage (Borjesson 1994).

The process view of ABC represents the horizontal part of the ABC model. It focuses on activity management, taking AA further and supplying information as to why an activity occurs (i.e., its cost drivers) and how the work in an activity is accomplished (i.e., its performance measures). Cost drivers and performance measures are primarily non-financial information that guides managers in the identification of opportunities for process improvement. Managers may modify the way an activity is performed or even eliminate non-value activities (Turney 1996).

An activity cost driver refers to the trigger for performing such activities. These drivers are related either to the current activity or to the prior activity. There may be multiple cost drivers associated with an activity. We can look at a process as a chain of connected activities performed together to serve the final customer. The linkage between activities offers a clear picture of activity triggers and enables process improvement by eliminating waste and non-value activities. Cost drivers act as indicators of the limitations that cause variation in activity volume, resources consumed and run time. For example, product design specifications that do not fit perfectly into the current process settings are limitations that increase the effort required for set-up activity (Borjesson 1994).

One of the major issues that affect the development of the new system is the measurement costs. Firms considering the implementation of ABC may think about the costs of collecting data regarding activities and activity drivers. Data collection is usually done through conducting interviews and questionnaires with relevant employees (O'Guin 1991; Turney 1996). The data required depends on the degree of accuracy to be reached by the system (Cooper 1989). As the degree of accuracy rises, the number of cost drivers increases, as do the costs. As a result, the system would be complex and costly to operate and maintain. Firms should keep ABC systems simple by reducing the number of activity drivers and thus reducing the costs of measurement.

Reducing the costs of measurement can be done in several ways. One way is to use transaction-based drivers instead of duration-based drivers. Transaction drivers measure the number of times an activity is performed, such as number of inspections performed and number of shipments processed. Duration drivers measure the demands in terms of the time it takes to perform an activity, such as the number of machine hours or the number of inspection hours (Hansen , Mowen & Shank 2006). Transaction drivers are easier to record than duration drivers are. Moreover, transaction drivers are already available in the existing system because a transaction is generated every time the activity is performed. For example, a purchase requisition is required every time a purchase order is processed. However, the use of transaction drivers is restricted by being an activity performed identically among products (Cooper 1989).

Another way of reducing measurement costs is bundling activities. Some activities trigger other activities. For example, a set-up activity triggers machinery activity. A firm may use one activity driver, for example the number of set-ups, to allocate the costs of set-up and machinery rather than a different cost driver for each activity. However, the potential for cost distortion would be higher if the relative cost of an activity is higher. For instance, if the machinery costs represent 70 per cent of the total costs of set-up and machinery activities, then one activity driver may not be appropriate to reflect the actual consumption of such activities (Cooper 1989).

A third way to reduce measurement costs is by using available data. Some of the data required for using cost drivers may already be available in the existing information systems. For instance, the number of production runs for each product is typically available from materials requirements planning (MRP) systems and through-put time is typically available from JIT systems. Even if these data are unavailable, it could be estimated indirectly from available data. For instance, the number of machine hours could be estimated from the number of direct labour hours combined with the average number of machines run by an operator (Cooper 1989; Turney 1990).

Performance measures are indicators of the efficiency or effectiveness of the activity. One important measure is activity efficiency, which is a rate that results from dividing the cost of resources consumed by an activity by the output of that activity. This rate is then compared with internal or external standards of efficiency or even with past performance. Another measure is the elapsed time for performing the activity. The shorter the elapsed time, the lower the costs, and there is more flexibility in the system to respond to changes in customer demand. Another performance measure is quality. The percentage of defective or scrapped parts is indicative of lower quality and higher cost. Further, these results have a negative impact on the next activity (for example, delay) and the customer value. Performance measures in one activity may become the cost drivers in the next activity. For example, the number of changes in customer specifications is a performance measure in the design activity. Concurrently, it is the cost driver for the next activity: manufacturing new products (Turney 1996).

The contingency-based model (Figure 1.2) has been aligned to the theoretical framework depicted in Figure 2.3. Organisational, technological and control variables represent external and internal factors; ABC represents management accounting practices; Performance measurement and evaluation of ABC success represent effectiveness of performance measurement and evaluation. The authors define "effectiveness" as managers' satisfaction which is a measure of ABC success in the literature as explained in the next section.

In Figure 1.3, ABC system has been split into ABC use and ABC actions. The valuation of ABC success has been spilt into ABC benefits and overall ABC success. Shields (1995) evaluated ABC success based on financial benefit and overall success and then Foster and Swenson (1997) added two other measures of ABC success (i.e., ABC use and ABC actions).These studies used the organisational factors as explanatory factors; however the measures of ABC success were correlated to each other without directed relationships between the organisational factors and these measures. Therefore, it was the role of this study to organise the relationships between these measures starting from the organisational factors. The sequential nature of the relationships was derived from the literature. Foster and Swenson (1997) described the relationship between organisational factors and ABC use. Banker, Bardhan and Chen (2008) and Ittner, Lanen and Larker (2002) described the relationship between ABC use and performance measurement with debate and argument around this relationship, for which the researcher developed a new concept "ABC actions" to explain this relationship. Ittner, Lanen and Larker (2002) and Maiga and Jacobs (2007) described the relationship between performance measurement and ABC benefits. Finally, Cagwin and Bouwman (2002) and Shields (1995) described the relationship between ABC benefits and overall ABC success.

2.11 Defining ABC Success

The definition of ABC success in the literature varies in terms of different views. Some of these views are shown in the following where they consider a success of the ABC system as 'use for decision making' (Anderson & Young 1999; Innes & Mitchell 1995; Krumwiede 1998; Nassar et al. 2009); satisfaction with the costing system (McGowan & Klammer 1997; Nassar et al. 2009; Swenson 1995); and perceived financial and non-financial benefits (Krumwiede 1998; McGowan 1998; Shields 1995). Studies regarding ABC success should be clear about what constitutes such success (Anderson & Young 1999; Shields 1995).

Firms may evaluate the success of ABC based on the time taken to implement the system. Managers may evaluate ABC success based on favourable outcomes compared with conventional systems or based on projected savings as indicated by the cost-benefit test. This could happen with firms at the early stages of ABC implementation. Firms with longer experience of ABC could realise quantifiable savings in specific areas or applications such as the manufacturing/production area or product/customer profitability (Swenson & Barney 2001).

Swenson (1995) measured ABC success based on satisfaction with cost management system and frequency of use to support decision making. Satisfaction was measured under three dimensions: (1) satisfaction for product costing; (2) satisfaction for cost control and (3) satisfaction for performance measurement. The average change in satisfaction was compared prior to and after implementing ABC. Moreover, satisfaction was correlated with the extent to which ABC information was used.

Foster and Swenson (1997) reviewed the literature and derived four measures of ABC success:

- The use of ABCM information in decision making
- Decision actions taken with ABCM information
- Dollar improvements resulting from ABCM
- Management evaluation

The above study improves the measure of ABC success by incorporating the extent to which ABC information is used and what changes have been made in a decision or a function. These factors support the perceptual measures and direct the attention of respondents. However, the survey asked for qualitative responses on the dollar improvement rather than quantitative responses (a ratio scale variable).

Cagwin and Bouwman (2002) replaced ABC use in their model by ABC success. ABC success was measured as an additive construct consisting of three measures of success: overall success; satisfaction with the cost system and perceived financial benefits obtained from ABC. The study then investigated the relationship between ABC success and improvement in financial performance. ABC success has been used as a predictor of improvement in financial performance. In contrary to this view, this research used organisational performance to predict the different dimensions of ABC success.

Table 2.2 summarises the alternative definitions of ABC success in the literature and classifies them based on the general model in this study (Figure1.3). Previous studies adopted different definitions of ABC success and sometimes different names for one measure (e.g., management evaluation, management perception, overall success).

Table 2.2 Definition of ABC success

Study	ABC Use	ABC Actions	Performance measurement	ABC Benefits	Overall ABC Success
Shields (1995)				Financial Benefit	Overall ABC Success
Swenson (1995)	Frequency of Use		Management satisfaction		
Foster & Swenson (1997)	Decision Use	Decision Actions		Dollar Improvements	Management Evaluation
McGowan & Klammer (1997)					Employees' Satisfaction
Krumwiede (1998)					Overall ABC Success
McGowan (1998)		Organisational Validity	Perceived Usefulness		Individual Attitudes
Anderson & Young (1999)	Perceived Use of ABC Data				Overall Value of ABC
Innes, Mitchell & Sinclair (2000)	ABC Applications				Overall ABC Success
Swenson & Barney (2001)				Financial Improvements	Management Perceptions
Kennedy & Affleck-Graves (2001)					Overall ABC Success
Ittner, Lanen & Larcker (2002)	Extensive Use		Improvements in Operational Performance		
Cagwin & Bouwman (2002)				Financial Benefit & Satisfaction	Overall Success
Baird, Harrison & Reeve (2007)	Success of Activity Management (AA, ACA and ABC) in Decision and Operational Areas				
Nassar et al. (2009)	Frequency of Use			Satisfaction	Overall ABC Success
Zaman (2009)			Increased Efficiency; Increased Effectiveness		

According to their definition of ABC success in table 2.2, previous studies investigated ABC success measures differently. Shields (1995), for example, investigated the relationships between organisational and technological factors and two measures of ABC success (i.e., financial benefit and ABC success). Foster and Swanson (1997) investigated the relationships between organisational factors and four measures of ABC success (i.e., use actions, financial improvements and management evaluation). Importantly, these studies did not describe sequential relationships between organisational factors and success measures.

Another category of studies investigated the association between ABC use and organisational performance. Ittner, Lanen & Larcker (2002), for instance, investigated the direct association between ABC use and operational and financial performance. Cagwin & Bouwman (2002) investigated the association between ABC use /ABC success and financial performance taking into account mediating factors. These studies deal with a limited part of the general model in this study (Figure 1.3).

ABC success could be measured in a perceptual manner. Perceptual measures use broad concepts that do not refer to specific context. Shields (1995), for example, measured ABC success by asking whether financial benefits had been received from ABC. McGowan and Klammer (1997) used employee satisfaction as an indicator of the success of ABCM implementation. Cagwin and Bouwman (2001) measured ABC success based on perceived success of the ABC implementation, satisfaction with the cost system and expressed belief that ABC had been worth implementing. Perceptual measures of ABC success lead to considerable variation among respondents in rating the degree of ABC success. Therefore, it is better to use objective and multiple-item measures that reduce the potential effect of perceptual measures (McGowan & Klammer 1997; Shields 1995).

In the context of implementation stages, there are no specific success measures for each stage. The progression through stages is the implicit indicator of success. Studies of implementation stages are more concerned with factors influencing the

success of stages. It is found that higher stages of ABC implementation are associated with higher levels of success (Krumwiede 1998; Nassar et al. 2009).

In this study ABC Success is defined solely as "Overall Perceived Success" and all other definitions of "ABC Success" as defined in the literature are used as steps that lead to "Overall Success".

2.12 Organisational and Technological Factors Influencing ABC Success

Organisational and technological factors influence the success of ABC implementation. These factors are either individual (for example, disposition to change); organisational (for example, top management support); technological (for example, information technology quality); task related (for example, task uncertainty); or environmental (for example, competition).

Shields (1995) surveyed 143 firms in the US. He developed a comprehensive model consisting of seventeen organisational and technical variables that may affect two alternative measures of ABC success (i.e., perceived financial benefits and overall success). He found that ABC success is significantly correlated with five variables, namely, top management support, implementation training, link to performance evaluation and compensation, link to quality initiatives and adequacy of resources. However, these relationships between organisational factors and ABC success describe links between two sets of anchors and do not provide constructive steps of how they may link to each other.

Foster and Swenson (1997) tested the findings of Shields's study and added two variables that were not included in prior studies: number of applications and time-in-use of application in relation to ABC success. They found support for the five variables in Shields's study. They also found that more applications and more time-in-use ABCM lead to larger amounts of benefits. They claimed that benefits start emerging after a short time of using ABC. The study investigated the relationships between organisational factors and four measures of ABC success (i.e., information use, decision actions, financial improvements and management

evaluation). However, the study did not investigate to find the relationships among these alternative success measures.

Anderson and Young (1999) studied the influence of contextual and process factors on ABC evaluation. ABC implementation process factors used in the study are top management and union support of the ABC project, local management involvement and adequacy of resources. Contextual factors include individual feeling of the need for change, individual commitment to the organisation, individual sharing of organisational values, competitive environment, quality of information systems, environmental turbulence, impediments to plant growth, quality of labour relations, importance of the plant to the company, importance of cost reduction to the plant, the likelihood of lay-offs and the expectation of performance rewards. Two criteria are used to evaluate the effectiveness of ABC system: (1) use of ABC data for process improvement and (2) improved product cost accuracy. They found that adequacy of resources is the common variable related to these criteria. However, the study did not operationalise these theoretical criteria to show how the contextual and process factors achieve these objectives.

Baird, Harrison and Reeve (2007) investigated the association between organisational and cultural factors and the success of activity management practices. Organisational factors are top management support, training, link to performance evaluation and link to quality. Cultural factors are outcome orientation, team orientation, attention to detail and innovation. At the ABC level, top management support, training and link to quality were associated with the success of ABC, as were outcome orientation and attention to detail. ABC success was measured as the sum of multiple items related to activity and product management and decisions with no reference to the organisational performance. the study did not refer to the term 'Activity-based Costing' in surveying participants. The benefit of not using the term ABC is getting a large number of respondents who may title ABC differently. Gosselin (1997) identified three levels of activity management. The lowest level is (AA) which identifies the activities performed to produce the final products and services. The middle level is (ACA) which identifies cost drivers and allocates activity costs to cost pools.

The highest level is (ABC) which allocates the costs of activities to final products and services. Given that these levels are interrelated, it is possible that ABC adopters select one of these terms to refer to ABC. Indeed, these levels are considered as levels of adoption of ABC (Askarany, Yazdifar & Askary 2010). Nassar et al. (2009) used the term ABC to refer to all levels of activity management. Importantly, this study associates (AA) and (ACA) with only non-ABC adopters.

Some managers may be reluctant to use the term ABC because they perceive it as an undesirable badge of cost cutting as well as a myopic and unrealistic focus (Askarany & Smith 2008). The major shortcoming of not using the term ABC is the probability of getting non-ABC responses. The term ABC is usually well known across the world and if not used it may lead to misunderstanding among participants. For example, in the previous study, ABC was described as follows: 'our business unit identifies and calculates the costs of the various activities involved with providing services or producing goods for the purpose of enabling a more accurate assessment of product costs'(Baird, Harrison & Reeve 2007, p. 65). This definition looks insufficient to reflect the ABC model, specifically the lack of allocation base or activity cost drivers. Accordingly, the statement is vulnerable to non-ABC responses.

Maiga and Jacobs (2007) linked the organisational factors (i.e., Management support, training, non-accounting ownership and clarity of objectives) to the operational and financial performance (see Figure 2.9). Although improvements in performance may consider as a measure of success, the model does not include a direct measure of ABC success.

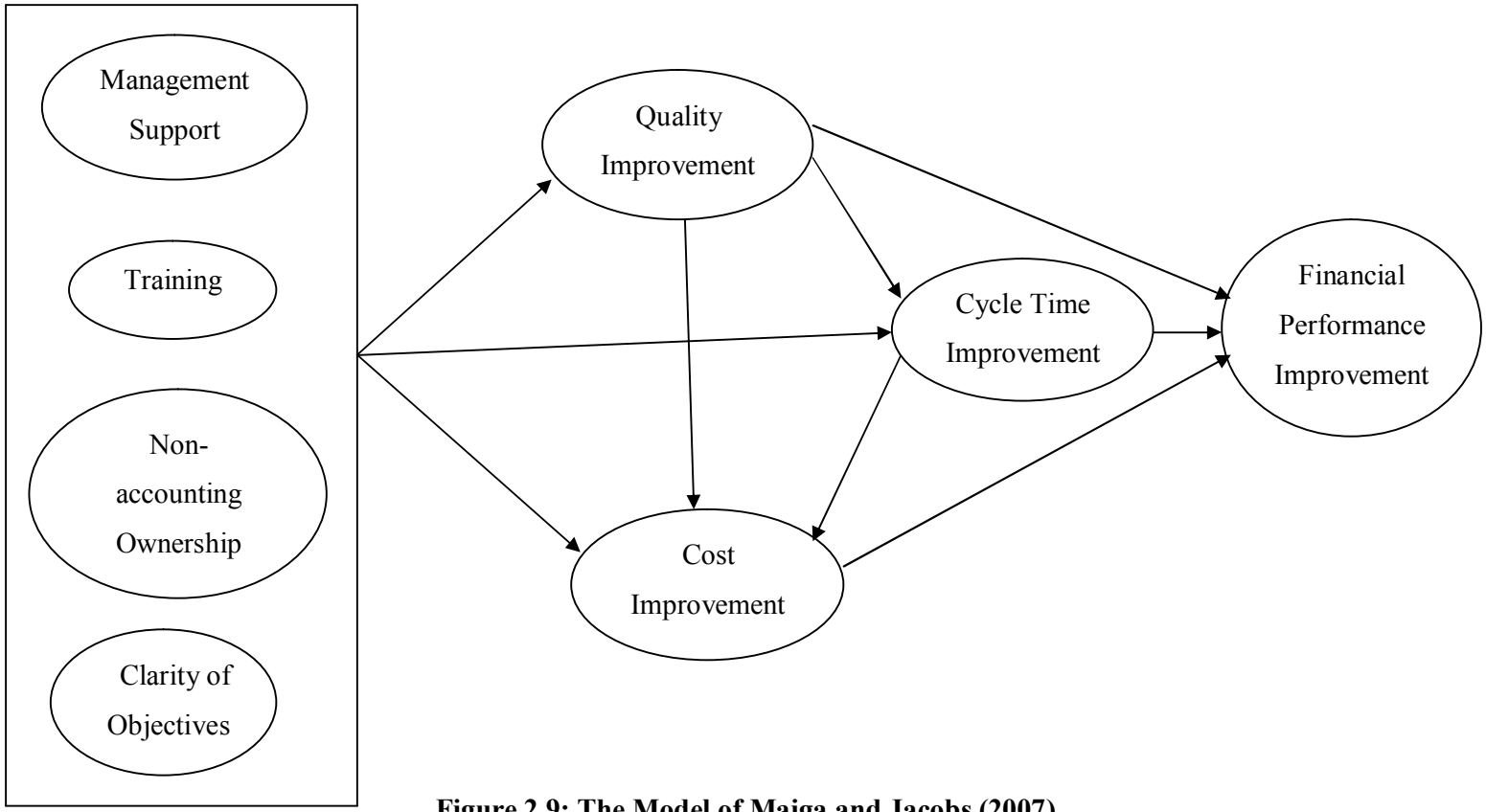

Figure 2.9: The Model of Maiga and Jacobs (2007)

2.13 The Relationship between Organisational and Technological Factors and ABC Use

Some studies including Innes and Mitchell (1997); Innes, Mitchell and Sinclair (2000) and Anand, Sahay and Saha (2005) rated the success of different applications of ABC. Ittner, Lanen and Larcker (2002) correlated extensive ABC use and improvements in operational performance to describe ABC success. Neither organisational factors had been investigated as part of this success nor had explicit measures of ABC success.

Previous studies (e.g., Foster & Swenson 1998; Cagwin & Bouwman 2002) chose to deal with ABC use as one construct. This decision is usually based on the discriminant validity. These studies employed more than two scales to measures ABC use. Beside applications and functions, Foster and Swenson (1997) used frequency of use by manager groups. Cagwin and Bouwman (2002) used ABC in their model as a composite construct consisting of four components: (1) functions using ABC, (2) applications for which ABC is used, (3) integration in evaluation systems and (4) time since implementation. Performance evaluation has been considered as an application in this study, while the time since implementation could be used as a control variable. The researcher opts to focus the content of ABC use, so impact differences could arise between applications and functions. It is an endeavour to distinguish the components of ABC use.

ABC use in this study was segmented into two dimensions: (1) ABC applications and (2) ABC functions. In ABC systems, applications refer to decision areas such as product costing, process improvements, pricing strategy and customer profitability. Functions are departments that use ABC information such as purchasing, production and marketing. The assumption in the literature is that the more extensive ABC use, the more successful its implementation (Foster & Swenson 1997; Krumwiede 1998; Nassar et al. 2009).

2.13.1 ABC Applications

ABC information is an invaluable source that underpins strategic and operational decisions including, for example, the following:

- Pricing
- Product mix
- Continuous improvement of products and processes
- Customer profitability
- Sourcing
- Performance measurement and compensation
- Capacity utilisation

❖ *Pricing*

Pricing is one of the strategic decisions that management needs to deal with carefully. The different costs between conventional systems and ABC have contributed to the reform of pricing strategy. ABC provides information that is vital for pricing strategy. Cost information generated by ABC can be used to set the prices of products. Managers may find out that some products are under-priced and some are over-priced. The anticipated action here depends on whether the prices are set by the market or not. If the firm cannot control the prices, it may be better to focus more on the over-priced products and less on the under-priced products. Moreover, the firm may increase the prices of the latter ones, but customers may not be willing to pay the higher price; they may be lost to competitors. Generally, ABC information guides managers about the desirability to sell at the market price (Turney 1996).

ABC information plays a significant role in pricing the customised products. Unique products have no prices at the market since they are designed according to customer specifications or requirements. In this situation, customers usually obtain quotations from different producers; accordingly, they select the producer with the lowest price, assuming equality among other factors. It is important for a firm to reduce the product costs, so that a competitive advantage can be achieved (Hicks 1999).

Swenson (1995) found that 72 per cent of the sampled firms use ABC to support pricing decisions. Innes, Mitchell and Sinclair (2000) found that using ABC for

the purpose of product/service pricing is significantly associated with the overall success of ABC.

❖ *Product Mix*

Product mix refers to the appropriate range of products that a firm could produce. Some firms compete on standardising products, some compete on customising products and others compete on both. Standardised products are usually produced in large volume, while customised products are usually produced in low volume. Dropping unprofitable products is not the only option open to managers.

ABC information reveals different patterns of profitability across products. Some products are produced in high volume and contribute to high profits. These products may be targeted for extra promotion such as quantity discount or extended warranty. In contrast, other products may be produced in low volume for low profits. Firms may drop these products, but even this decision is not always warranted, as in the case of representing a single source of supply. However, some products that are produced in low volume generate high profits. Apparently, these products need price cuts and advertising to elevate the volume. Contrarily, other products may be produced in high volume but generate low profits. These products should be targeted for cost reduction. Indeed, ABC is able to identify opportunities for cost reduction (Turney 1996).

Some authors combine product mix with pricing, since pricing is one of the main determinants of product mix. For instance, Swenson (1995) found that 72 per cent of manufacturing firms in the US use ABC information for product mix. In the 1999 survey, respondents associated overall ABC success significantly with product or service output decisions (Innes, Mitchell & Sinclair 2000).

❖ *Continuous Improvement of Products and Processes*

Turney (1991, p.29) defined continuous process improvement as 'the ongoing search for waste in operating activities and the elimination of this waste'. He also defined continuous products improvement as 'designing products that meet

customer requirements yet are easier and faster to manufacture'. Continuous improvement is one of the core applications of ABC. The objective of continuous improvement is the reduction of activities and products costs. It is important that cost reduction does not affect the performance (for example, quality and cycle time) or create unused capacity. It is worth noting that process improvement is not restricted to the manufacturing process, but could also be applied to other processes (for example, engineering process, purchasing process and distribution process).

ABC is a practical planning system. It uses estimated cost drivers (for example, number of set-ups) that measure the consumption of resources by activities. These drivers can be continuously improved by adopting two major sub-cycles: the continuous improvement cycle and the maintenance cycle.

Activity management is the heart of process improvement. One important issue here is the classification of activities into value-added and non-value-added activities. Defining activities as value-added is based on judgement. However, Hansen, Mowen and Shank (2006) highlighted three conditions that guide this judgement: (1) the activity produces a change of state; (2) the change of state was not achievable by preceding activities and (3) the activity enables other activities to be performed. Therefore, activities failing to meet these conditions are considered non-value-added activities. Firms attempt to eliminate unnecessary activities and increase the efficiency of necessary activities. The analysis of activities reveals possibilities for cost reduction through

1. activity reduction,
2. activity elimination,
3. activity selection and
4. activity sharing.

Activity reduction is concerned with reducing the time and effort required to perform the activity. Activity reduction not only affects activity costs, but also increases the flexibility of activity to meet a variety of customer needs. It aims primarily to increase the efficiency of value-added activities and is a way of gradually eliminating non-value-added activities. For instance, set-up time can be

reduced through redesigning products, improved training of employees, removing conflicts in employee assignments and placing tools in convenient places. Another example is customer complaints handling. This non-value-added activity could be decreased by improving the quality of products; as a result, the demand for this activity will be reduced. ABC traces cost savings to the appropriate products, showing reductions in the product costs (Turney 1991).

Activity elimination focuses on eliminating non-value-added activities such as scheduling, inspection and storage. For example, parts movement can be eliminated through changing the layout of the factory. ABC estimates the cost of the eliminated activity and no longer traces this cost to the related parts and products. Moreover, ABC identifies the source of cost reduction and assists designers and managers in following the improvement efforts.

Activity selection involves choosing the lowest cost product/process design alternative from other competing alternatives. Each design has its own set of activities and associated costs. Therefore, different activities differentiate the cost of products. For example, product designers may select either to integrate the part or attach it to a circuit board; process designers may choose to insert the part into the circuit board manually (for example, direct labour) or automatically (for example, equipment). Given that other things are equal, designers should select the lowest cost design. ABC plays the role of simulating the impact of change in the design on the cost; accordingly, ABC encourages designers to select the lowest cost alternative (Turney 1991).

Activity sharing is concerned with increasing the efficiency of activity and the economy of scale. It increases the quantity of the cost driver while the cost of the activity remains constant. Hereby, it reduces the cost allocation to products. There are different ways that lead to sharing activities. One way is to design products with common components, which increase the sharing of activities, while unique components decrease the sharing of activities. Another way is to create a work cell or a product line with a family of products. These products share the same activities within the cell. A third way is to encourage workers to be generalists rather than specialists. General workers usually have multi-skills and can perform

different tasks. Sharing resources decreases the cost of activity. ABC reports the reduction in the cost per unit of the cost driver and traces this reduction to the related products (Turney 1991).

Surveys in 1994 and 1999 indicate that cost reduction and pricing have been the most popular activity-based applications in the UK (Innes, Mitchell & Sinclair 2000). Alsaeed (2005) maintained that being able to cost products properly and reduce the overall costs are the most noticeable advantages experienced in Saudi Arabia. Swenson (1995) found that 92 per cent of the manufacturing industry in the US uses ABC information to support process improvement.

❖ *Customer Profitability*

The general goal of ABC is to improve the profitability of the value delivered to customers. A firm needs to know which customer group strengthens its financial position and which ones weaken this position. ABC enables managers to pull up a report on customer-related costs and classify customers as profitable and unprofitable. Managers may find that some customers frequently request small orders and some request less frequent large orders. In addition, some customers may incur high costs in the marketing and distribution services while they represent a small portion of the profits.

Classifying customers as profitable and unprofitable is important since both require different actions. Profitable customers deserve rewards through decreasing prices or increasing the levels of current service or creating new services or a combination of these options. In contrast, unprofitable customers need corrective actions through price increases or decreasing service costs (for example, set-up a minimum order size) or by encouraging them to leave by lowering the levels of service or a combination of these solutions (Hansen , Mowen & Shank 2006). However, management may give priority to customer satisfaction through negotiation with unprofitable customers (Smith & Dikolli 1995).

Innes, Mitchell and Sinclair (2000) indicated that ABC success was very significantly associated with customer profitability in 1999 and significantly

associated with customer profitability in 1994. Moreover, Anand, Sahay and Saha (2005) studied corporate Indian firms and pointed out that ABC has resulted in changes in various management decision areas such as focusing on profitable customers.

❖ *Sourcing*

Sourcing application focuses on the determination of supplier costs and the selection from sourcing alternatives. Firms may out-source low-volume parts or high-cost activities. Sourcing decisions need accurate and relevant information about firm and supplier costs.

The definition of supplier costs under ABC is different from the traditional definition. Traditionally, firms consider only the purchase price as a supplier cost, so purchasing managers are evaluated based on this price. In contrast, ABC systems add other costs beside purchase price, which are related to quality, reliability and delivery. ABC, for example, traces rework costs and expediting costs to the appropriate supplier because these costs are usually attributed to parts failure and late delivery. Therefore, ABC considers suppliers as cost objects (Hansen , Mowen & Shank 2006).

ABC assigns supplier costs to products. ABC reveals that unique products have higher costs than commodity products. Product designers may think about alternative designs that affect the relationship with speciality and standard suppliers. Moreover, ABC provides insight regarding the efficiency of internal activities and processes. If the firm is unable to perform a specific activity or manufacture components efficiently, it is better to out-source these. However, the decision to make or buy depends on the ability to fully eliminate the costs associated with the eliminated activity or components (Hansen , Mowen & Shank 2006; Hicks 1999).

In two case studies, Sohal and Chung (1998) found that ABC provided benefits including better decision making on outsourcing. Moreover, ABC influenced sourcing decisions (67 per cent) in corporate India (Anand , Sahay & Saha 2005).

❖ *Performance Measurement and Compensation*

In the traditional environment, performance of organisational units (for example departments) is measured in financial terms (for example, costs). However, under ABC systems, the responsibility domain is changed from the organisational unit to a process. Processes are the sources of value for customers and the key to achieving financial objectives. The process perspective has affected the nature of performance measures. Processes have non-financial attributes that need to be measured. ABC is more focused on non-financial measures than financial measures. Non-financial, process-orientated measures include efficiency, quality, cycle time and on-time deliveries. It is established that improved processes translate into better financial results (Hansen , Mowen & Shank 2006). For example, a producer used ABC to measure the performance of business initiatives such as JIT inventory practices. It found that the costs of storing and handling high levels of raw materials exceeded the cost of frequent small JIT deliveries (Swenson 1995).

Traditionally, the evaluation of the actual performance of organisational units is based on comparisons with budgetary standards. These standards are financial and static in nature, focusing on financial efficiency rather than continuous improvement. In contrast, ABC systems use dynamic standards that respond to changes in conditions, goals and performance. For instance, management may set a desired level of improvement as a standard. Once this level is achieved, the standard is changed to encourage further improvement. Performance is evaluated based on improvement over time (for example, time reductions and quality improvements) in process-orientated measures (Hansen , Mowen & Shank 2006).

ABC systems assign the responsibility to teams rather than individuals. In the continuous improvement environment, employees are empowered with more responsibilities, allowing managers to spend more time as coaches, facilitators, communicators and resources. Management proposes to mitigate risk aversion by encouraging employees to conduct experiments and make suggestions. This is the way to innovative and improve processes (Gupta & Galloway 2003; Shields & Young 1989). Process improvement is usually carried out through team efforts

and it is therefore suitable to link rewards to teams in the continuous improvement environment. According to the reward system, a team may be rewarded whenever improvements are achieved in one or more of the process-orientated measures. Rewards may include salary increases, promotions, bonuses and profit sharing (Hansen , Mowen & Shank 2006). In a study of successful implementation sponsored by CAM-I at a printed circuit board (PCB) facility, the commission for the sales force was based on profit determined by ABC (Roberts & Silvester 1996).

Shields (1995) found that performance evaluation and compensation is significantly correlated with ABC success. Foster and Swenson (1997) found that performance evaluation / compensation is significantly associated with ABC use. In addition, respondents in another study associated overall ABC success very significantly with performance measurement and improvement (Innes, Mitchell & Sinclair 2000).

❖ *Capacity Utilisation*

Firms usually use practical capacity to measure the effectiveness of resources. Practical capacity defines the number of units a machine or an employee can produce in normal circumstances. Practical capacity is less than 100 per cent when machine breakdown, maintenance and staff breaks are taken into account.

Resources are not always requested as needed. Indeed, firms commit to most of the resources before the time of usage and resource capacity can therefore remain unused in operations. An important objective for management is to minimise the difference between the expected usage and the actual usage. Cooper and Kaplan (1992) used the following equation to describe the provision of resources:

Activity Availability = Activity Usage + Unused Capacity
Or
Cost of Activity Supplied = Cost of Activity Used + Cost of Unused Activity

The ability of ABC systems to identify an opportunity for cost reduction influences production capacity. If, as a result of using ABC information, the management successfully improves operational performance, it will lead to excess capacity. Consequently, the improvement efforts would not be reflected in the bottom line. However, ABC will provide erroneous cost estimates if the management fails to correlate resources usage and the supply of these resources (Maher & Marais 1998). ABC systems provide indications about the unused capacity, so that managers could take action. Managers can take decisions regarding adjustment of the mix or volume of the outputs in the short run. They may also think of controlling the provision of resources in the long run. Figure 2.10 illustrates an example of an ABC income statement that splits capacity into used and unused resources. The statement shows the productive costs associated with used resources as well as the opportunity costs that could be invested in the future.

Example of ABC Income Statement			
Sales			20,000
Less: Expenses of Resources Supplied as Used			
Materials	7,600		
Energy	600		
Short-term labour	900		9,100
Contribution Margin			10,900
Less: Activity Expenses: Committed Resources			
	Used	Unused	
Permanent direct labour	1,400	200	
Machine run time	3,200		
Purchasing	700	100	
Receiving/Inventory	450	50	
Production runs	1,000	100	
Customer administration	700	200	
Engineering changes	800	(100)	
Parts administration	750	150	
Total Expenses of Committed Resources	9,000	700	9,700
Operating Profit			1,200

Figure 2.10: An ABC income statement

Source: (Cooper & Kaplan 1992, p. 7)

2.13.2 ABC Functions

ABC functions refer to organisational departments in which ABC information is used by managers. There are different business functional areas such as manufacturing, human resources and customer service.

ABC information is not equally used by these functions. Some departments use ABC information extensively and some use it less extensively. Foster and Swenson (1997) found that accounting / finance and manufacturing / production are the highest business functions that use ABC information while distribution and

personnel / human resources are the lowest business functions that use ABC information to make decisions. Fortin, Haffaf and Viger (2007) duplicated Foster and Swenson's study within Canadian federal government organisations and found that Accounting / Finance and programs / services delivery make the highest use of ABC information while personnel / human resources and purchasing / procurement make the lowest use of ABC information.

There are some explanations for the different use of ABC information among business functions. Some functions may not in real need for ABC information (e.g., focus markets as the main distribution channel). Another explanation may include the limited ownership of ABC information cross functions. Third explanation refers to the status of the system in the business function (i.e., routine or non-routine system).

2.13.3 Top Management Support and ABC Use

Top management support is a critical factor for the success of ABC implementation, and its significance and importance has been emphasised by several studies (Foster & Swenson 1997; Krumwiede 1998; Shields 1995). As shown in Table 2.1, one of the meanings of ABC success is frequently use of ABC information. Top management support consists of providing the necessary capital and commitment to solve potential problems and conflicts. Additionally, this support should be communicated effectively by selecting the appropriate team, deciding the type of hardware and software and making decisions on the time frame for implementing the ABC system. By requesting the progress reports on the ABC implementation process and eventually using ABC information, top managers represent the ideal example for ABC supporters. Managerial support is not exclusive to the preliminary stages of ABC implementation; rather, it is a continuous process to maintain the new system. The studies in the literature have examined top management support in relation to ABC success or in the context of ABC implementation stages. Foster and Swenson (1997) found top management support is statistically significant in predicting decision use of ABCM information -a composite of areas of decision use, business function use and a manager group use. Krumwiede (1998) found that top management support is important in using

ABC extensively. This study will specifically examine the relationship between top management support and ABC applications and functions. The expectation is a positive association between these dimensions and top management support. Accordingly, the following hypotheses will be tested:

H1a: The extent of ABC use in terms of applications is positively associated with top management support.

H2a: The extent of ABC use in terms of functions is positively associated with top management support.

2.13.4 Training and ABC Use

Training is an important factor driving ABC success. As shown in table 2.1, ABC success refers to extensive use of ABC information. Without training, problems are expected during the design, implementation and usage of ABC systems. Shields (1995) classified training into three categories: (1) design training; (2) implementation training and (3) usage training. He found that implementation training is significantly associated with a successful ABC system. Foster and Swenson (1997) found that implementation training is significantly associated with ABC use. Krumwiede (1998) found training as defined by Shields is important in reaching the highest level of ABC implementation. This level refers to the extensive use of ABC. The influence of training on ABC use (functions and applications) is expressed in the following hypotheses:

H1b: The extent of ABC use in terms of applications is positively associated with training.

H2b: The extent of ABC use in terms of functions is positively associated with training.

2.13.5 Differentiation Strategy and ABC Use

A firm's strategies highlight the objectives that management desires to achieve in the short and long term. These objectives are articulated in more detail with lower levels of management until they are operationalised on the shop floor. It is important that strategic goals be defined clearly, so that they are practical and measurable. Firms may plan to introduce new products; the strategies needed to describe the type of products and the targeted segments (for example, market or customer).

The literature describes four strategies that firms may follow. These strategies are cost leadership, differentiation, focusing and strategic positioning. Cost leadership strategy—so-called defenders—is followed when firms produce products at lower costs than competitors do. This increases the value to customers by providing the lowest prices. Firms following the low cost strategy are generally characterised by high-volume production and low product diversity (Gosselin 2005; Hansen , Mowen & Shank 2006).

The differentiation strategy—so-called prospectors—is followed when firms differentiate their processes or products or services from their competitors. This is not just the emphasis of product functionality and styling, but also includes other characteristics such as production flexibility, delivery reliability, customer service, process speed and dependability of supply. Differentiation strategy increases customer value by maximising benefits that the customer receives. Firms following this strategy are operating in high product diversity with low production volumes (Gosselin 2005; Hansen , Mowen & Shank 2006).

The focusing strategy is adopted by firms that focus on specific markets or customers. When a firm has limited capacity, it is normal to select a specific niche in which to compete. Logically, a firm selects a specific segment in accordance with its competency (Hansen , Mowen & Shank 2006).

Finally, in strategic positioning, a firm implements a combination of the above strategies instead of selecting one general strategy. It is not necessary for the

management to equalise the weights of the strategies, but they should attempt to optimise the mix. By selecting a mix of strategies, a firm may provide greater value to the customer at costs lower than its competitors (Hansen , Mowen & Shank 2006).

Gosselin (1997) found a higher adoption of ABC among prospectors than defenders. Frey and Gordon (1999) indicated that ABC use is associated with better financial performance with business units following differentiation strategy when compared to those following a cost leadership strategy. Firms following a cost leadership strategy may not gain competitive advantage because of cost proximity with competitors. Therefore, it is critical for firms to compete on differentiating their products. However, firms would not gain competitive advantage under this strategy unless the price premium exceeds the cost of differentiating the product (O'Guin 1991). Shank (1989) illustrates how differentiation strategy requires more information than cost leadership regarding new product innovations, R&D expenditures and marketing cost analysis. Thus, an ABC system enhances the knowledge about which 'value drivers' would serve product differentiation (Chenhall & Langfield-Smith 1998b). Further, there is expected to be greater variation among firms following a differentiation strategy than those following a cost leadership strategy. Waweru and Uliana (2008) found that change in management accounting systems is positively and significantly associated with high emphasis on differentiation strategies but not with high emphasis on low cost strategies.

Firms need to develop strategies that reflect the external environment. The strategies should be competitive so that competitive advantages can be gained; in other words, management is assumed to strive to maximise the value received by customers or minimise the costs paid by customers. Since competitors have increasingly responded to customer demands in sophisticated ways, firms seem to emphasise the strategy of differentiation. Baines and Langfield-Smith (2003) found that firms facing higher levels of competitive environment change towards a differentiation strategy. ABC systems focus on non-financial information more than financial information because of the nature of cost drivers. Gosselin (2005) found that defenders use non-financial measures less frequently compared to

prospectors. Shields (1995) found a significant correlation between link to quality initiative and ABC success. Swenson (1997) tested the relationship between link to quality and ABC use and found the relationship is significant. Therefore, ABC applications and/or functions are the target to achieve the objectives of differentiation strategy. For example, a customer analysis as one of ABC applications may entitle some customers for premium support. This expectation leads to the following hypotheses:

H1c: The extent of ABC use in terms of applications is associated with a differentiation strategy.

H2c: The extent of ABC use in terms of functions is positively associated with a differentiation strategy.

2.13.6 Information Technology and ABC Use

Information system technologies (for example, ERP, MRP and manufacturing resource planning (MRPII)) represent a significant portion of the capital in WCM environments. The technology drives the legitimacy of ABC implementation. Reeve (1996) suggested that ABC systems require high-level information sophistication with integration and flexible information stratification and real-time updated information. Indeed, information system technologies are the source of activity drivers' information needed by ABC. For instance, MRPII is an information system that feeds ABC with operational data such as machine and labour time, materials used and number of production runs. The quality of this data is important in assuring the effectiveness of ABC systems. Managers may be alienated from using ABC information in decision making because they believe the information is inaccurate or at least out of date. Therefore, ABC requires a reliable source of data provided by other information systems. Krumwiede (1998) found that information technology is a critical factor to using ABC extensively. Accordingly, the following hypotheses are suggested:

H1d: The extent of ABC use in terms of applications is positively associated with the quality of the information technology.

H2d: The extent of ABC use in terms of functions is positively associated with the quality of the information technology.

2.13.7 Clarity of Objectives and ABC Use

It is important for employees to know the purposes of ABC implementation. ABC drives radical changes in organisations that affect the positions and responsibilities and behaviour of employees. Management should communicate these objectives formally in order to validate the new system. Thereby, employees can understand the purposes of ABC implementation and identify the linkage between strategy and operations. Further, they realise the role expected of them in driving the change and achieving the organisational goals (Maiga & Jacobs 2007). It is important to solve potential problems causing misunderstanding of or disagreement on a matter. Employees may reject using ABC or try to sabotage the implementation process because of failure in delivering the ABC implementation objectives. Statistically, Shields (1995) studied objectives from two different dimensions: (1) clear and concise objectives; (2) consensus about objectives. He found a significant correlation between these dimensions and successful ABC implementation. McGowan and Klammer (1997) also found that the degree to which objectives are clearly stated ex ante; the degree to which objectives are shared were significantly correlated with employees' satisfaction –a measure of ABC success. Maiga and Jacobs (2007) combined the above two dimensions under one factor and found that clarity of objectives is significantly associated with quality improvement at the acceptance, routinisation and infusion stages and with cycle-time improvement only at the acceptance stage. This leads to the next hypotheses:

H1e: The extent of ABC use in terms of applications is positively associated with clarity of objectives.

H2e: The extent of ABC use in terms of functions is positively associated with clarity of objectives.

2.13.8 Non-accounting Ownership and ABC Use

Non-accounting ownership is the authority given to a variety of employees other than accountants to use ABC information. Users outside the accounting department should have convenient access to ABC information. Anderson (1995) found that specialisation (ABC ownership) had a negative impact on the ABC adoption stage. ABC ownership means that accountants retain ownership of ABC information without sharing with non-accountants. Accounting staff are more likely to slow the adoption of the new system if they feel it threatens the authority of the accounting department. Accordingly, the steering committee in General Motors Company did not assign a member from the accounting department to the ABC project team. ABC is not intended to be only an accounting system, but also a management system that crosses the boundaries of the organisation. It provides managers with accurate, relevant and timely information to assist in decision making. Therefore, ABC information can be used by different users for different purposes. There are various ways to enhance such ownership including ensuring the centrality of ABC in individual jobs, communication of ABC objectives and the commitment to ABC in the decision-making process and interaction with others (Anderson 1995; Chenhall 2004) . Swenson and Barney (2001) point out that 55 per cent of the respondents rated ABC/M as good or excellent at supporting cross-functional needs. Statistically, the correlation between non-accounting ownership and successful ABC implementation is significant (Shields 1995). However, this finding is not applicable to all implementation stages. Krumwiede (1998) found that non-accounting ownership is important for reaching the highest level of ABC implementation (extensive use). Maiga and Jacobs (2007) found that non-accounting ownership is significantly associated with quality and cost improvements at the acceptance, routinisation and infusion stages. This importance forms the basis for the following two hypotheses:

H1f: The extent of ABC use in terms of applications is positively associated with non-accounting ownership.

H2f: The extent of ABC use in terms of functions is positively associated with non-accounting ownership.

2.14 ABC Use and ABC-based Actions

AMP or advanced manufacturing technology or world-class manufacturing has no consistent definition in the literature. Definitions point to a synthesis of management techniques in a contemporary manufacturing environment covering three broad areas: people, process and quality. AMP have become the sign of simplified manufacturing methods, high quality, low cost, on-time production and new organisational structures. 'It is argued that world-class manufacturing is a set of fundamental managerial beliefs that transcend its constituent techniques' (Jazayeri & Hopper 1999, p. 264). Lind (2001) describes world-class manufacturing as broad management philosophies that focus primarily on production. There are four specific attributes that accompany AMP implementation: a new approach to quality, JIT manufacturing techniques, changes in management of the work force and more flexible approaches to meeting customer needs (Maskell 1991).

The need for a better definition of AMP has influenced the empirical studies of ABC. Ittner, Lanen and Larcker (2002) found that extensive ABC use is associated with higher quality levels and greater improvement in cycle time and quality and is associated indirectly with manufacturing cost reduction through quality and cycle time improvements. However, authors found that extensive ABC use has not been significantly associated with return on assets. Further, there is weak evidence that the association between ABC and profitability is contingent on the plant operational characteristics such as manufacturing production methods, product mix and volume, new product introductions and AMP. The previous study considered these four variables as determinants of ABC adoption or success. AMP was measured broadly by including responses to human resource practices, customer and supplier initiatives, manufacturing practices such as JIT, TQM and cellular manufacturing and information technologies such as advanced MRP II and ERP.

Cagwin and Bouwman (2002) found a positive association between ABC and improvement in ROI when ABC is used concurrently with other strategic initiatives (for example, AMP), when implemented in complex and diverse firms, when used in environments where costs are relatively important, and when there are limited numbers of intra-company transactions. The study viewed AMP as an enabler that reacts positively with ABC.

Contrary to the previous studies, Banker, Bardhan and Chen (2008) found that ABC has no significant direct impact on plant performance. The study criticised the previous studies regarding the role of AMP. The authors found that world-class manufacturing practices (WCM) completely mediate the positive impact of ABC on plant performance (see Figure 2.11).

WCM was defined as 'a broad range of manufacturing capabilities, which allow plant managers to adapt to the volatility and uncertainty associated with changes in customer demand and business cycles in agile manufacturing environments' (Banker, Bardhan & Chen 2008, p. 4).These practices include JIT, continuous process improvement, TQM, competitive benchmarking and self-directed teams. However, the authors excluded customer and supplier relationships and information technology from the content of WCM.

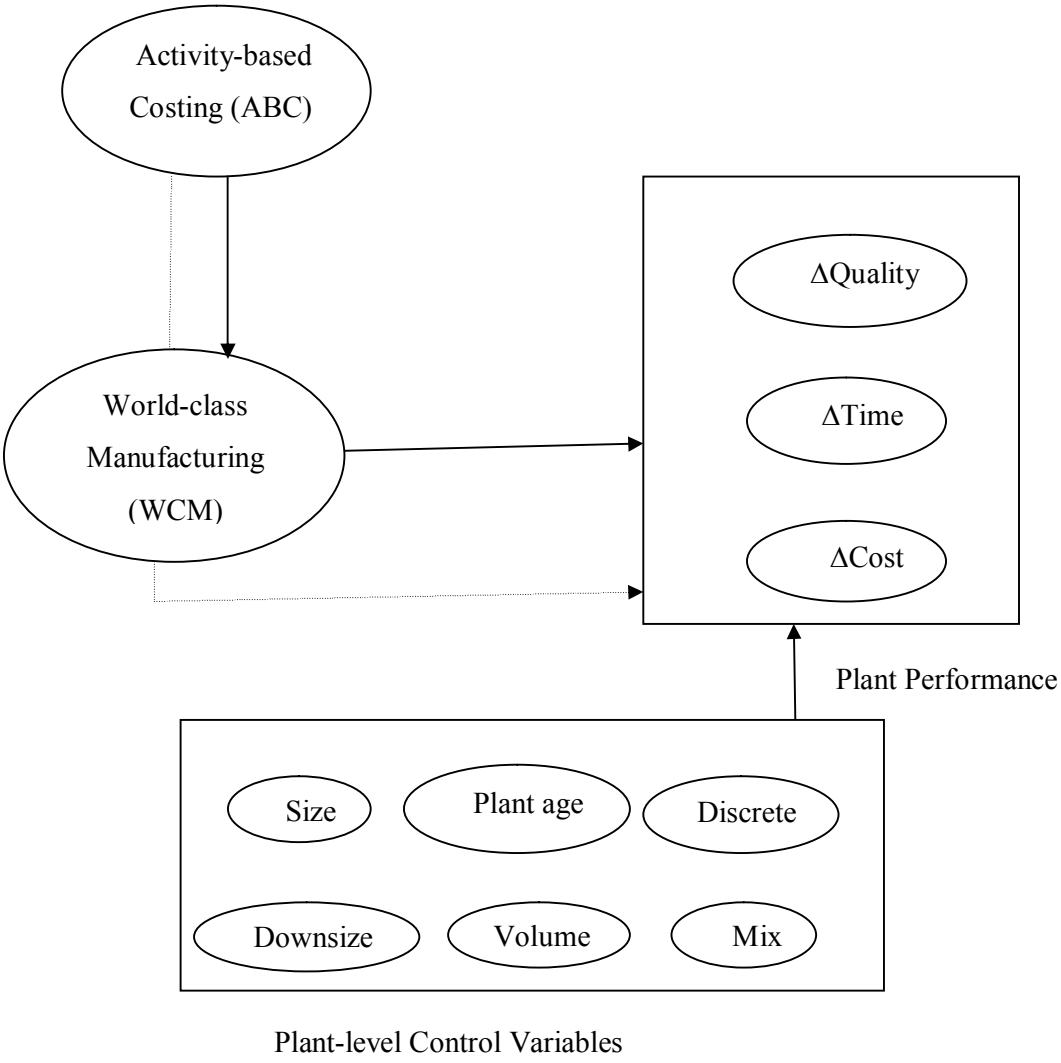

Figure 2.11: The Model of Banker et al. (2008)

It is well established that higher levels of information technology facilitate the implementation of ABC. It provides ABC with cost driver information. Therefore, many companies have integrated ABC systems into other business initiatives. A survey by the Institute of Management Accountants (IMA) indicates that 43 per cent of ABC implementers had integrated their ABC projects into their existing TQM programs (Roberts & Silvester 1996).

ABC and AMP share the same objective of continuous process improvement. ABC systems support AMP by measuring and evaluating the performance (for

example, activity costs) and identifying opportunities for improvements (for example, alternative designs). In contrast, AMP includes techniques that are controlled by ABC such as process reengineering, quality improvement, automation and team-based work. ABC and AMP are not individual innovations; rather, they are complementary systems that work together to improve performance. Askarany, Smith and Yazdifar (2007b) found that technological changes in manufacturing practices lead to increased diffusion of ABC. Also, Waweru and Uliana (2008) found that change in management accounting systems is significantly associated with higher number of technological changes. One way to improve the link between ABC and business-unit performance is to consider information technology, among other factors, as a determinant of ABC use and to create a new factor, namely, ABC-based actions, that mediates the link between ABC use and business-unit performance. Accordingly, this study investigates whether ABC use leads to actions on the shop floor and, if so, whether these actions improve performance.

One important issue here is the integration of ABC with other information systems in the organisation. A parallel system has some advantages in the preliminary stages of the project. It helps managers to explore the results of the project quickly. It also avoids making major changes in the current system for considerations of cost, compatibility and internal control (Shields & McEwen 1996). However, a stand-alone system lacks credibility and confidence because it is not the official system that managers report with or measure against. It is used by limited users for limited applications. The majority of people are risk adverse and always prefer the least risky option, in this case, using the standard system. For these reasons, firms should invest in integrated ABC systems (O'Guin 1991).

An integrated ABC system has two dimensions: first, ABC sharing one database with other information systems in the organisation. Thus, ABC can easily derive data from different sources including human resources; inventory; financial accounting; production and sales. In addition, ABC can update the data in real time. This enhances the integrity of the data and eliminates errors or inconsistencies. Second, ABC systems should be accessible from any information system terminal in the organisation. This allows non-accounting managers to use

timely and relevant data in making the related decisions. To obtain the capability of integration, firms need to invest in ERP systems. 'ERP systems integrate all the information systems of an organisation into one enterprise-wide system' (Hansen , Mowen & Shank 2006, p. 26). ERP vendors (for example, SAP) have integrated ABC into their systems.

ABC-based actions are decision actions taken based on ABC information. Decision actions, for example, include change in processes, change in products/customers mix and change in the work structure. It is well established in the literature that ABC information would be beneficial if it were used in supporting managerial decisions. Continuing use of conventional systems in decision making renders ABC irrelevant and no change is expected in the organisation. Malmi (1997) argues that ABC implementation would be successful without subsequent actions. He claims that organisations may implement ABC as a control system. The real question is as follows: does this represent sufficient benefit to implement such a complex system? In fact, using ABC information in managerial decisions is assumed to some degree to lead to actions. For example, ABC information may lead to a decision of reducing the price for some products. Krumwiede (1998) found that decision usefulness of cost information is significantly associated with extensive use of ABC. Foster and Swenson (1997) have used decision actions taken with ABC among other ABC success measures to study the association between ABCM success determinants and this measure and they found decision actions are significantly correlated with ABCM information use. This study considers ABC-based actions as important in explaining improvement in organisational performance; it also considers that ABC-based actions are indicators of ABC success. Therefore, the next hypotheses to be tested are:

H3a: ABC-based actions are positively associated with the extent of ABC applications.

H3b: ABC-based actions are positively associated with the extent of ABC functions.

2.15 ABC-based Actions and Operational Performance

Several studies (Banker, Bardhan & Chen 2008; Cagwin & Bouwman 2002; Frey & Gordon 1999; Ittner, Lanen & Larcker 2002) investigated the association between ABC use and organisational performance. The endeavour in these studies is to establish a link between ABC use and improvements in performance as a measure of ABC success. However, this study suggests the role of ABC-based actions as an intermediary between ABC use and organisational performance.

Frey and Gordon (1999) studied the impact of ABC use on business unit performance under a specific strategy. They found that ABC is associated with a higher ROI in business units following a differentiation strategy and not in those following a cost leadership strategy. The study used the dichotomous scale of ABC use or non-ABC use. They assumed a commonality among respondents regarding ABC use and they considered ABC as cost accounting systems. They defined performance as improvement in business unit profits over five years. The performance was measured by ROI as the common accounting measure.

Ittner, Lanen and Larcker (2002) investigated the association between extensive ABC use and plant performance. They used the term 'extensive use' without defining its meaning; therefore, respondents were left to decide on the extent of ABC use. Further, the study did not specify the characteristics of respondents and lacked an assessment of potential response bias. Plant performance in the study refers to the financial and operational performance as measured by return on net plant assets (ROA), product quality, manufacturing speed, changes in manufacturing costs, first-pass quality yield and manufacturing cycle time over five years.

Banker, Bardhan and Chen (2008) have also assessed the impact of ABC on manufacturing plant performance. They measured ABC use based on non-ABC implementation and extensive ABC implementation. Plant performance is related to improvement in plant-level performance as measured by changes in plant costs, quality and time-to-market over the last five years. The study by Banker, Bardhan

and Chen (2008) did not include financial measures; the difficulty in establishing a causal relationship between ABC use and financial measures may justify this exclusion. However, the data for the study was collected from a secondary data source.

Cagwin and Bouwman (2002) also investigated the association between ABC and improvement in financial performance. They determined ABC use by factors including functions using ABC, applications, integration of ABC into firm strategic and performance evaluation systems and time since implementing and using ABC. In contrast, organisation-level performance was measured financially as change in ROI relative to other companies in the industry over three (five) years.

Zaman (2009) investigated the impact of ABC in terms of strategic cost allocation method, increased efficiency and increased effectiveness on firms' performance. He found that the perception of ABC has a significant effect on overall firms' performance. The author employed the three measures of ABC benefits or success to predict the overall performance, while in this research performance was used as an intermediary to predict the overall success of ABC. Seventeen Australian companies listed by the ABC Learning Centers Ltd, were selected and eighty – two responses were received. This suggests that multiple responses were received from each company and raised concerns of response bias. Moreover, Cronbach alpha values were aligned up items rather than scales.

ABC is more concerned with process-orientated performance. The attributes of the processes usually determine the type of performance measures. These measures are often non-financial measures (for example, cycle time, quality and cost reduction). Previous studies have used cost, quality and cycle time as measures of operational performance. This study will use product quality, cycle time and activity efficiency to assess the operational performance. ABC systems assist managers in measuring and evaluating the various aspects of operational performance. Ittner, Lanen and Larcker (2002) found that ABC is associated with improvement in operational performance such as quality and cycle time. In contrast, Banker, Bardhan and Chen (2008) suggested that ABC impacts

operational performance indirectly through advanced manufacturing capabilities. However, the researcher tackles the relationship between ABC and operational performance differently by considering ABC actions as a mediatory and a key source of improvement in operational performance.

Gupta and Galloway (2003) view ABC as a means to identify value-added and non-value-added activities, and improve the process by eliminating or reducing non-value-added activities. Cooper & Kaplan (1992) suggest that resources reduction can occur by taking two types of actions. First, reducing the number of times activities are performed and second, increasing the efficiency of activities. For example, if ABC system shows a high rate of unit deficit and high costs of inspection activity. Management may decide to change the supplier relationships and have reliable parts which would increase products quality, reduce inspection costs and eventually increase process speed. Another example, using the numbers produced by ABC system to evaluate and compensate employees ensures that employees are on line with management objective to improve business unit performance. This idea can be captured in the following hypotheses:

H4: Quality improvement is positively associated with ABC-based actions.

H5: Cycle time improvement is positively associated with ABC-based actions.

H6: Activity efficiency is positively associated with ABC-based actions.

2.16 Operational Performance and ABC Benefits

The ultimate goal of ABC is to enhance the profit result from value received by the customers (Cooper & Kaplan 1991; O'Guin 1991). Financial measures are indicators of the outcomes of past performance and will not be of assistance to guide managers to areas of critical concern (Baines & Langfield-Smith 2003). Rather than linking the business unit operational performance to the financial performance, it is opted for linking the operational performance to the perceived benefits received from ABC. Following Foster and Swenson (1997), this study

does not include financial performance measures. Instead of, qualitative financial benefits are appropriate for respondents in terms of identification and tracking to ABC. Managers would recognise and realise these benefits easily. Cost savings are important indicators of financial benefits. For example, management may think of adding controls to one of the activity centres and perform an estimation of what cost savings could be gained under each activity centre. In practice, it is rare that a decision does not affect the balance of the organisation (Hicks 1999). This is would be obvious in the correlated activities. The decision, for example, to add controls to an activity centre (1) may enable the firm to increase the output, but, in turn, an activity centre (2) may not able to deal with the excess units. In this case, management may first decide to remove the bottleneck. On the other hand, it is difficult to attribute improvements in financial performance to ABC because internal and external factors have potential impact upon the bottom line (e.g., regulations, customer preferences and conflict between operations). Asking mangers to establish a link between ABC and external financial measures is elusive. Zaman (2009) found that average managers are neutral to decide on weather ABC implementation has increased the organization's profitability. Ittner and Larcker (1998) survey 27 executives of quality for US firms and 75 per cent of them felt pressure to demonstrate the financial consequences of their quality initiatives and 52 per cent of them found difficulty to identify quality improvement projects that offer the highest economic return. Only 29 per cent of the executives could directly relate their quality measures to accounting returns and just 12 per cent to stock returns. For customer satisfaction, only 28 per cent of the executives could relate customer satisfaction measures to accounting returns and 27 per cent to stock returns.

Al-Omiri and Drury (2007) suggest the use of satisfaction or usefulness of the management control system as outcome measures rather than organisational performance measures when adopting product costing systems. They justified this selection as to the difficulty in extracting the effects of adopting different systems on organisational performance from other events. Also, Cagwin and Bouwman (2002) claimed that overall ABC success, satisfaction with ABC and financial benefits obtained from ABC are good proxies for improvement in financial performance.

The purpose of this study is to coordinate between the alternative measures of ABC success that already identified in the literature such as management evaluation of ABC success. It is a broad measure which compares financial and non-financial benefits with costs of operating and maintaining the system. It is substitutes for profit measures especially the later are not relevant to the government sector in this study.

ABC benefits have been divided into four factors, (1) process cost improvement; (2) non-process cost improvement; (3) revenue improvement and (4) customer satisfaction. This category was selected based on the reliability test. Foster and Swenson (1997) and Fortin, Haffaf and Viger (2007) combined customer satisfaction with financial benefits. They found customer satisfaction does not contribute significantly to dollar improvements, which suggests that customer satisfaction is not related directly to financial benefits. Thus, this study deals with customer satisfaction from non-financial perspectives. Of course, ABC benefits in this study are not inclusive. The ending point of the model represents the sole measure of ABC success (i.e., overall ABC success). The ultimate goal is to investigate how the preceding factors affect management evaluation of ABC success.

Maiga and Jacobs (2007) point out that cycle time improvement and quality improvement have significant impacts on cost improvement. Ittner, Lanen and Larcker (2002) found that extensive ABC use has indirect impact on cost reductions through quality and cycle time improvements. In this study, ABC benefits refer to cost savings and revenue improvements as well as improvement in customer satisfaction. The assumption in the literature is that improvement in non-financial areas would improve the financial performance.

H7a: Process cost improvement is positively associated with quality improvement.
H7b: Process cost improvement positively associated with cycle time improvement.
H7c: Process cost improvement positively associated with activity efficiency.

H8a: Non-process cost improvement is positively associated with quality improvement.
H8b: Non-process cost improvement is positively associated with cycle time improvement.
H8c: Non-process cost improvement is positively associated with activity efficiency.

Revenue improvement is one of the financial benefits derived from ABC. Zaman (2009) found that perception of ABC as a measure of strategic cost allocation method, increased efficiency and increased effectiveness have positive and significant effect on perceived overall performance. Maiga and Jacobs (2007) point out that quality improvement have significant impacts on financial performance. Also, Ittner (1999) claims that higher quality of products or services increases revenue gains through customer satisfaction and loyalty. Ittner and Larcker (1998) found that 48 per cent of the senior quality executives could link their quality measures to revenue improvement. The assumption in the literature that improving non-financial performance would improve financial performance (Baines & Langfield-Smith 2003). This leads to the following hypotheses:

H9a: Revenue improvement is positively associated with quality improvement.

H9b: Revenue improvement is positively associated with cycle time improvement.

H9c: Revenue improvement is positively associated with activity efficiency.

Cooper and Kaplan (1991) demonstrated that customer-related ABC information helps firms identify unprofitable customers and decide on actions to improve their contributions. Firms may decide to focus customer base or expand it based on sales contribution for customers and unused production capacity. Moreover, serving profitable customers better, as indicated by ABC, affects their long-term acceptability. Considering customer satisfaction as paramount importance, Smith and Dikolli (1995) mentioned some negotionable aspects that could affect the behaviour of unprofitable customers without compromising the customer's level of satisfaction. One aspect, for example, is the restructure of delivery run to be infrequent and on time service.

ABC systems play an important role in supporting competitive strategies, increasing activity efficiency and identifying opportunities for cost reduction. However, ABC systems also support the different elements of customer-orientation strategy such as quality, speed, delivery and innovative products. ABC eliminates waste and streamlines the process, thus expediting the process and lowering costs. Improving in operational performance would increase the level of customer satisfaction. Accordingly, the following hypotheses are therefore developed in this direction:

H10a: Customer satisfaction is positively associated with quality improvement.

H10b:Customer satisfaction is positively associated with cycle time improvement.

H10c: Customer satisfaction is positively associated with activity efficiency.

2.17 ABC Benefits and ABC Success

ABC success in this study has been measured based on the overall success as evaluated by managers. McGowan (1998) claims that ABC use is not an appropriate proxy for success. The study focused on organisational members' attitudes (i.e., affective evaluation) toward ABCM implementation. Therefore, management evaluation is considered to be an inclusive measure of ABC success since it takes into account other success measures in the literature as well as the associated costs and benefits. Thereby, other success measures in the model can be seen as factors influencing the overall success of ABC.

Shields (1995) and Foster and Swenson (1997) and Cagwin and Bouwman (2002) found significant correlations between ABC success and financial benefits received form ABC. Management realises that lost opportunities are not just defective goods returned or compromised price granted, but current customers would not return and potential customers will choose competitors based on the unsatisfactory experience of current customers (Ittner 1999). Therefore, management look forward to satisfying customers and consider this satisfactory as a sign of success. Accordingly, it is expected that improvement in financial

benefits and customer satisfaction increase the overall level of ABC success. Therefore, the following hypotheses are developed:

H11a: The overall level of ABC success is positively associated with process cost improvement.
H11b: The overall level of ABC success is positively associated with non-process cost improvement.
H11c: The overall level of ABC success is positively associated with revenue improvement.
H11d: The overall level of ABC success is positively associated with customer satisfaction.

2.18 Summary

ABC is a methodology that traces resource costs to products through activity cost drivers. In addition to product costing, this study is concerned with other applications of cost management such as customer profitability, process improvement and performance measurement. There are different stages of ABC implementation including initiation, adoption, adaptation, routinisation and infusion. Success factors and problems have been explained in the context of these stages. This study targeted a broad section of the potential audience because ABC systems are not exclusive to manufacturing industry. Indeed, ABC is applicable to other sectors such as government, financial institutions and educational organisations.

There are different views in the literature in which ABC success is defined and measured. For examples, measures of ABC success in the literature including the following:

- Managerial perception of success
- Financial benefits derived from ABC
- Satisfaction with ABC system
- Frequency of using ABC information
- Actions taken based on ABC information
- A surrogate measure such as improved organisational performance

There are also mixed results regarding the relationship between ABC use and business performance. This study aims at coordinating the relation between alternative measures of ABC success along with the relationship between ABC use and the performance of business units and establishing hypothesised links in the form of a model. The end point of the model is the measure of ABC success in this study (i.e., overall success as perceived by managers).

Based upon previous literature as detailed in sections 2.12 to 2.17, the expanded model in this study has six sections: (1) organisational and technological factors; (2) ABC use; (3) ABC-based actions; (4) performance measurement; (5) ABC benefits and (6) ABC success. These sections have been broken down into factors (Figure 2.12) .The ultimate objective in this study is to explore the relationship between the organisational and technological factors and the overall ABC success and to explain factors that contribute to the evaluation process of overall ABC success.

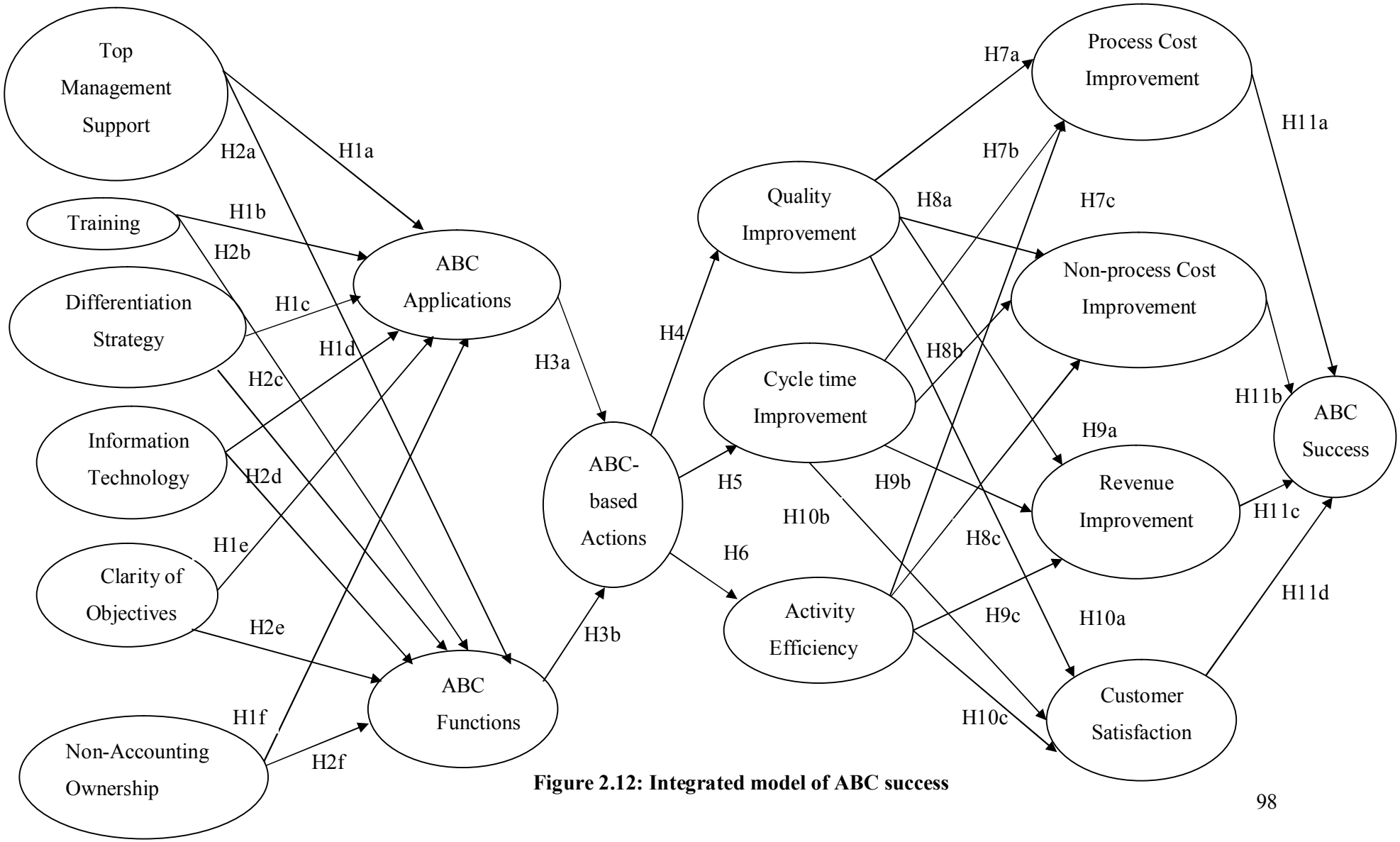

Figure 2.12: Integrated model of ABC success

Chapter 3: Research Methodology

3.1 Introduction

In the previous chapter, there was an investigation of contextual factors (organisational & technological factors) that may have an impact on ABC success in addition to investigating the association between ABC use and business unit performance. The ultimate goal of this study is to establish a proposed pathway that links organisational and technological factors to ABC success. The literature review led to the development of the model which was underpinned by contingency theory. The model can be seen in two views: first, the broad view which links contextual factors (organisational and technological variables as inputs) and ABC success; second, the narrow view which links ABC use and business unit's performance. Accordingly, this study aims to address the following research questions:

1. Does ABC lead to improvements in operational performance?
2. What factors influence management's assessment of ABC success?
3. How do organisational and technological factors influence ABC success?

A survey method was employed to collect the required data. The study has been conducted in a variety of business types around the world, although the initial stage of the study was limited to manufacturing firms in Australia.

This chapter is concerned with the characteristics of the respondent business units. These characteristics include stages of ABC implementation, country, industry and business unit size. Initially, the overall sample was described and then a description was given to business units that are using ABC.

3.2 Research Methodology

3.2.1 Survey Methods

Studies on ABC systems have used different methods to collect data. Researchers usually employ either a qualitative approach (for example, case study or field study) or a quantitative approach (for example, survey study). The qualitative approach is used to explore factors that are related to the research questions, while the quantitative approach is used to test relationships between these factors (Van der Stede, Young & Chen 2005). This study is an explanatory study which was based on theory testing. To test the hypotheses in this study, a large amount of cross-sectional data is needed. Therefore, the quantitative approach is more appropriate for this study than the qualitative approach. Survey methods (mail and on-line) have been used to collect the required data.

Surveys have been among the most popular data collection methods in business studies (Ghauri & Gronhaug 2005). Surveys refer to a method of data collection that utilises questionnaires and interview techniques with samples of the targeted populations. The survey is an effective tool for gathering opinions, attitudes and descriptions about individuals and other components of the sampled community. The sample survey has the ability to generalise the findings to the entire population based on data drawn from a portion of that population. Further, the sample survey generates data that can be standardised by analytical statistical software. For the purpose of comparison, questionnaires can be replicated in different locations or in the same locations at a later date (Ghauri & Gronhaug 2005; Rea & Parker 2005). Survey information can be collected by means of mail, internet, telephone and in-person interviews.

Mail surveys are able to reach larger samples at less cost compared with other methods such as telephone surveys and face-to-face interviews. Mail surveys are thus cost effective in the case of budget or staff scarcity and do not induce interviewer bias via voice inflection, misreading of the questions or other administrative errors. Moreover, mail surveys are less intrusive than interviews.

The respondents complete the questionnaire at their convenience without time constraints. The mail survey can be longer and more complex than telephone surveys and can also utilise graphics and symbols (De Leeuw, Hox & Dillman 2008; Nardi 2006; Rea & Parker 2005).

The online survey is a method of data collection that uses web-based technology in designing, contacting, completing and submitting the questionnaire. It is a convenient method since the respondents can have access to the questionnaire in different locations and can complete it in their preferred time. The online survey is the most cost-effective method because it requires no paper or postage and labour requirements are minimal compared to face-to-face interviews or telephone surveys. Further, it is easier to follow-up through e-mail messages. Online surveys can reach international populations and acquire completed questionnaires in a short time. Complex questions and visual materials can be used in an online survey. However, the web-based survey is limited to individuals with e-mail addresses and access to the internet. This issue may raise the potential of self-selection bias and limit the ability to generalise the findings. In addition, web-based surveys lack anonymity and decrease confidentiality due to web security problems (De Leeuw, Hox & Dillman 2008; Rea & Parker 2005).

The face-to-face interview is a method in which an interviewer collects information directly from the interviewees. One of its advantages is that it allows interviewers to use complex questions. Complexity may be necessary in question-wording, response categories or question length. The interview is flexible in that unclear questions can be explained, instructions can be provided by the interviewer, and further details can be given by the interviewees. The interviewer also ensures that the interviewees follow the instructions regarding the sequence of the questions. In some cases, the interview is the only way to collect information from the interviewees, for example, in the absence of contact information including “shoppers and casuals”. Disadvantages of this technique include the fact that an in-person interview is costly in terms of interview time, which may take more than one hour, travel costs, interviewer training to obtain the necessary skills to manage the interview and qualified staff to support the

interviewer. Further, the interviewer may influence the interviewees by expressing certain preferences rather than being neutral, and thus affecting the validity of the response. In addition, the interview lacks anonymity since the interviewer knows the interviewees. During the analysis, the interviewer faces a degree of difficulty in coding the open-ended questions. Finally, this method of data collection is limited to smaller samples (Nardi 2006; Rea & Parker 2005). This method could be also used to support the other form of surveys and increase the validity of the responses. In this study, interviews were infeasible since respondents were not accessible because they were reached through third parties as well as some of the respondents were located overseas.

The telephone survey is another method of data collection. It is the fastest method and can be done as fast as preparing mail surveys or in-person surveys. In addition, this method is less costly compared to face-to-face interviews and, in certain circumstances, mail-out surveys. However, the telephone method is suitable for less complex surveys since there are no visual materials (for example, maps, pictures, charts, and symbols) or interviewers in person. The interviewer has less control over the phone survey because the interviewee can end the call at any time. Moreover, the interviewer may take a longer time to establish credibility or confidentiality with the interviewee. As in the face-to-face interview, the phone survey lacks anonymity and is limited to smaller samples. In this study, it is difficult to conduct a telephone survey due to the unlisted numbers of the potential respondents (De Leeuw, Hox & Dillman 2008; Nardi 2006; Rea & Parker 2005).

There are two major errors that can affect responses and results: (1) non-response error and (2) response error. Non-response error occurs when respondents are unable to answer the questionnaire for various reasons, for example, because of their firm's policy or time constraints. This error affects sample representation of the population and thereby limits the generalisation of the study findings. To minimise this error, follow-up procedures would be conducted to increase the response rate (Van der Stede, Young & Chen 2005).

Response error occurs when respondents answer the questionnaire inaccurately. This error relates to the design of the questionnaire. Respondents sometimes make guesses because they do not understand the question. Researchers should pay attention to issues related to the design of the questionnaire, such as question-wording, question-ordering and response format. Pilot testing is a valid procedure to address these issues. Pilot testing is often conducted in the academic environment (Smith 2006). This pilot testing aims at generating the required responses and improving the reliability and validity of the questions and measures. This study questionnaire has been pre-tested by four academic staff. Three of them are active research in the management accounting; one of those is ABC author in Australia. The fourth one is an expert in statistics. The difficulty to identify ABC adopters impedes the involvement of the target population (ABC users) in this test. The questionnaire instrument along with feedback evaluation form were sent to the academics to comment on each of the following:

(1) Length of questionnaire
(2) Readability / difficulty of questions
(3) Were there any questions you would omit?
(4) Are there questions you would suggest should be included?
(5) Any additional comments?

According to their comments, the questionnaire was modified by changing the order of some questions, rewording some questions and adding new questions from the researcher as follows:

- Overall, training was useful in addressing concerns about the role of ABC
- Following the introduction of ABC, its initial objectives were extended
- The objectives of ABC were applicable
- Employee productivity and activity efficiency under operational performance
- Lost internal champion under reasons for discontinuing ABC

3.2.2 Questionnaire Structure

The questionnaire begins with an introduction (see Appendix A). The introduction explained the aim of the study and the importance of the respondent's participation in achieving this goal. In addition, the introduction guaranteed the confidentiality of the information obtained from the respondents. To increase the legitimacy of the questionnaire, the introduction carried the logo of Victoria University as well as the contact information. The questionnaire (see Appendix B) consisted of four sections:

1. Companies currently using ABC
2. Companies that have never adopted ABC
3. Companies that adopted ABC in the past, but have now discontinued it
4. Demographic information

Section one is divided into seven parts. The order of these parts follows the logical sequence exactly as in the model so that respondents can move from one section to the next smoothly, with obvious links between sections. The first part is titled 'Business Unit Strategy' and seeks information regarding the extent to which the business unit emphasises differentiation strategy. The second part is titled 'Information Technology' and seeks information on the quality of the information systems in the organisation. The third part, addressed as 'ABC Implementation' is concerned with the effect of ABC implementation factors. The fourth part, titled 'ABC Use' looks for information on the extent of using ABC in the form of applications and functions. The fifth part is labelled 'ABC-based Actions' and collects information on the changes that have happened as a result of using ABC information. The sixth part, titled 'Operational Performance' seeks information about the improvement in performance measures over the last three years. The seventh part, titled 'ABC Success' is concerned with the evaluation of how successful ABC has been.

Sections two and three investigate the reasons business units have never adopted ABC or have adopted it in the past, but have now discontinued it. Further, respondents are asked to decide which level of activity management they are

reaching. Gosselin (1997) divided the extent of activity management into three levels: (1) AA identifies the various activities involved in producing products, (2) ACA goes further to calculate the costs of the various activities for the purpose of identifying factors that influence costs, and (3) ABC calculates the costs of the activities for the purpose of assessing product costs. Baird, Harrison and Reeve (2004) reported that 86.2 per cent of Australian business units use AA and 82.1 per cent of them use ACA.

Section four seeks demographical information such as the industry, the size of the business unit and respondent's characteristics. It is recommended that a questionnaire begins with interesting questions that are related to the purpose stated in the cover letter (Dillman 2007).

The questionnaire was distributed through mail and web survey. The mail survey was focused on the manufacturing sector in Australia. The predominant studies on ABC were conducted in the manufacturing environment (Smith 2005).Moreover, the objective of eliminating the variation and the potential misunderstanding of the applicability of ABC introduced by different sectors (Hieu 1996). However, this intention could not be maintained. This method was unable to collect sufficient data on ABC and test the model due to a very low response rate and very few respondents using ABC. It was extremely difficult to identify ABC users and hence it was decided to contact third parties as research intermediaries. Using a third party is common in the literature and major studies, including Shields (1995), Foster and Swenson (1997), Krumwiede (1998), Brown, Booth and Giacobbe (2004) and Askarany and Smith (2008) utilised this method. By that time, the researcher contacted consulting firms who advised that manufacturing clients were not predominant to them and they agreed to distribute the survey to domestic and international clients electronically. Therefore, an online survey was designed by mid-May 2009 to reach a broad section of an international audience. The advantages of using professional entities include targeting the appropriate participants in effective time through the web survey and raising the response rate apparently. However the researcher was unable to conduct follow-up procedures or to control the region of the respondents (e.g., international participants).

With an extensive search through the internet, the researcher identified many consulting firms all over the world that are involved with ABC. The researcher, along with support from his supervisor, contacted them to solicit their assistance in circulating the survey to their clients. Commitments were received from three software and consulting firms in Australia as well as from the CAM-I in the United States. The three consulting firms design and sell ABC software packages. CAM-I is the professional body that established and spread the concept of ABC throughout the world.

3.2.3 Variables Measurement

- **Scale Development**

This study uses a Likert scale with equal intervals between response categories. The variable called differentiation strategy was measured on a seven-point scale anchored at 1 'Not Emphasised' and 7 'Highly Emphasised'. The scale has been developed by the researcher. Respondents were asked to describe the extent to which their business units emphasise each of the seven strategies. The variables information technology was measured on a seven-point scale anchored at 1 'Strongly Disagree' and 7 'Strongly Agree'. The scale was adapted from Cagwin and Bouwman (2002). Respondents were asked to indicate their level of agreement with five statements related to information systems.

Top management support was measured on a seven-point scale anchored at 1 'Strongly Disagree' and 7 'Strongly Agree'. Respondents were asked to indicate their level of agreement with four statements related to management support. Training was measured on a seven-point scale anchored at 1 'Strongly Disagree' and 7 'Strongly Agree'. Respondents were asked to indicate their level of agreement with four statements related to training. Non-accounting ownership was measured on a seven-point scale anchored at 1 'Strongly Disagree' and 7 'Strongly Agree'. Respondents were asked to indicate their level of agreement with four statements related to non-accounting ownership of ABC information. Clarity of objectives was measured on a seven-point scale anchored at 1 'Strongly Disagree' and 7 'Strongly Agree'. Respondents were asked to indicate their level

of agreement with three statements related to the clarity and consensus of ABC objectives. The scale for organisational factors (i.e., top management support, non-accounting, clarity of objectives and training) was derived from Krumwiede (1998).

The variables ABC applications and ABC functions were measured on a seven-point scale anchored at 1 'Not Used' and 7 'Extensively Used'. The scale was developed by the researcher. Respondents were asked to indicate the extent of using ABC in terms of applications and functions.

ABC-based actions was measured on a seven-point scale anchored at 1 'Strongly Disagree' and 7 'Strongly Agree'. The scale was developed by the researcher. Respondents were asked to indicate their level of agreement with nine statements related to changes made after introducing ABC.

Operational performance dimensions (i.e., product quality, cycle or lead time and activity efficiency) were measured on a seven-point scale anchored at 1 'Extremely Lower' and 7 'Extremely Higher'. The scale was adapted from Maiga and Jacobs (2007). Respondents were asked to indicate the extent to which these performance measures have improved over a period of time.

The variables process cost improvement, non-process cost improvement and revenue improvement were measured on a seven-point scale anchored at 1 'Strongly Disagree' and 7 'Strongly Agree'. The scale was developed by the research. Respondents were asked to indicate their level of agreement with six statements related to cost savings and revenue improvements. Customer satisfaction was measured on a seven-point scale anchored at 1 'Extremely Lower' and 7 'Extremely Higher'. The scale was adapted from Maiga and Jacobs (2007). Respondents were asked to indicate the extent to which customer satisfaction has been improved over a period of time.

ABC success was measured on a seven-point scale anchored at 1 'Strongly Disagree' and 7 'Strongly Agree'. The scale was developed by the research.

Respondents were asked to indicate their level of agreement with a statement of ABC being worth implementing.

The first question in the survey which related to when the business unit begins using ABC has been adapted from Cagwin and Bouwman (2002). The questions that are concerning reasons to remain with your current system or to discontinue ABC system have been derived from Hieu (1996). However, some of these questions have been added by the research. These questions are as follows:

- ABC system is not well suited to the business unit
- Higher priorities of other changes or projects
- ABC is too complex to implement and/or utilise
- Advantage conferred by ABC system is negligible
- Benefits of ABC are still not totally demonstrated in practice

The questions on activity analysis and activity cost analysis have been derived from Baird, Harrison and Reeve (2007). The question on the intention of the business unit to implement ABC in the future has been adapted from Hieu (1996). The last section in the survey -which is demographic questions - has been developed by the researcher. Table 3.1 summarises the sources of the questions in the instrument.

Table 3.1: Sources of Survey Questions

Section	Variable	Source
1	Differentiation Strategy	Baines and Langfield-Smith (2003)
	Information Technology	Krumwiede (1998); Cagwin and Bouwman (2002)
	Top Management Support	Krumwiede (1998);Grover (1993); Baird, Harrison and Reeve (2007)
	Training	Krumwiede (1998)
	Non-accounting Ownership	Krumwiede (1998); Cagwin and Bouwman (2002)
	Clarity of Objectives	Krumwiede (1998)
	ABC Use	Cagwin and Bouwman (2002); Foster and Swenson (1997)
	ABC-based Actions	Foster and Swenson (1997)
	Operational Performance	Maiga and Jacobs (2007)
	ABC Benefits	Foster and Swenson (1997);
2	ABC Success	Krumwiede (1998)
		Hieu (1996)
3		Baird, Harrison and Reeve (2007)
		Hieu (1996)
		Baird, Harrison and Reeve (2007)

- **Reliability**

Reliability is the internal consistency of several items that the researcher wants to add together to obtain a summated scale score (Morgan et al. 2007). Cronbach's alpha is the common measure of reliability. The alpha value of .70 and above is considered critical for supporting internal consistency of both new scale and established scale (Nunnally 1978). Next, it is a description for the initial Cronbach's alpha for factors as well as the deleted items.

As shown in table 3.2, reliability test suggests the deletion of some items to increase Cronbach's alpha for differentiation strategy. First, item 7 (Changes in design and introduce new products quickly) was deleted and the analysis was repeated leading to the deletion of other two items: item 8 (Rapid volume/product mix changes) and item 4 (Product and service availability (broad distribution).

Table 3.2 Cronbach's Alpha for Differentiation Strategy

Factor	Item	Cronbach's alpha for factor	Cronbach's alpha if item deleted
Differentiation Strategy		.847	
	1. High quality products		.825
	2. Dependable delivery promises		.809
	3. On-time delivery		.808
	4. Product and service availability (broad distribution)		.850
	5. Effective after-sales service and support		.801
	6. Customise products and services to customer needs		.799
	7. Changes in design and introduce new products quickly		.865
	8. Rapid volume/product mix changes		.856

Table 3.3 shows Cronbach's alpha for information technology. To increase the consistency between items, item 3 (Operating data are updated in 'real time' rather than periodically) was first deleted and then followed by item 1 (Detailed sales and operating data are available in the information systems for the past year).

Table 3.3 Cronbach's Alpha for Information Technology

Factor	Item	Cronbach's alpha for factor	Cronbach's alpha if item deleted
Information Technology		.796	
	1. Detailed sales and operating data are available in the information systems for the past year.		.789
	2. The business unit's information systems are integrated with each other.		.761
	3. Operating data are updated in 'real time' rather than periodically.		.816
	4. Different aspects of cost and performance data are available in the information systems.		738
	5. The quality of the operating data is excellent.		.694
	6. The information systems offer user-friendly query capability.		.770

Table 3.4 shows Cronbach's alpha for top management support. Reliability analysis suggests the deletion of item 5 (ABC has been closely tied to the competitive strategies of the business unit).

Table 3.4 Cronbach's Alpha for Top Management Support

Factor	Item	Cronbach's alpha for factor	Cronbach's alpha if item deleted
Top Management Support		.919	
	1. ABC received active support from top management.		.892
	2. Top management provided adequate resources to the ABC implementation effort.		.891
	3. Top management exercised its authority in support of ABC implementation.		.884
	4. Top management effectively communicated its support for implementing ABC.		.887
	5. ABC has been closely tied to the competitive strategies of the business unit.		.948

Table 3.5 shows reliability test for training. The analysis indicates good support for internal consistency of items.

Table 3.5 Cronbach's Alpha for Training

Factor	Item	Cronbach's alpha for factor	Cronbach's alpha if item deleted
Training		.934	
	1. Adequate training was provided for designing ABC.		.936
	2. Adequate training was provided for implementing ABC.		.895
	3. Adequate training was provided for using ABC.		.908
	4. Overall, training was useful in addressing concerns about the role of ABC.		.916

Table 3.6 shows Cronbach's alpha for non-accounting ownership. The analysis does not suggest the dropping of any item.

Table 3.6 Cronbach's Alpha for Non-accounting Ownership

Factor	Item	Cronbach's alpha for factor	Cronbach's alpha if item deleted
Non-accounting Ownership		.843	
	1. The ABC implementation team was truly cross-functional.		.792
	2. Departments other than accounting have shown personal ownership for ABC information.		.839
	3. ABC has been linked to performance evaluation of non-accounting personnel.		.751
	4. ABC has been linked to compensation of non-accounting personnel.		.808

Table 3.7 shows reliability analysis for clarity of objectives. Item 4 (Following the introduction of ABC, its initial objectives were extended) was deleted to increase the value of Cronbach's alpha.

Table 3.7 Cronbach's Alpha for Clarity of Objectives

Factor	Item	Cronbach's alpha for factor	Cronbach's alpha if item deleted
Clarity of Objectives		.813	
	1. The objectives of ABC were applicable.		.702
	2. When the ABC initiative began, its purpose was clear and concise.		.794
	3. When the ABC initiative began, there was consensus about its specific objectives.		.718
	4. Following the introduction of ABC, its initial objectives were extended.		.843

Table 3.8 reveals the results of reliability analysis for ABC applications. The analysis shows good support for internal consistency of items.

Table 3.8 Cronbach's Alpha for Applications

Factor	Item	Cronbach's alpha for factor	Cronbach's alpha if item deleted
Applications		.882	
	1. Product/service costing		.871
	2. Pricing decisions		.874
	3. Performance measurement		.872
	4. Budgeting and planning		.876
	5. Process improvement		.885
	6. Customer profitability analysis		.872
	7. Product-mix decisions		.862
	8. Outsourcing decisions		.860
	9. Product design		.866
	10. Compensation system		.871
	11. Stock valuation		.883

Table 3.9 reveals reliability results for ABC functions. Based on the analysis, item 1 (Accounting/ Finance) was dropped.

Table 3.9 Cronbach's Alpha for Functions

Factor	Item	Cronbach's alpha for factor	Cronbach's alpha if item deleted
Functions		.890	
	1. Accounting/Finance		.921
	2.Manufacturing/Production		.865
	3. Customer Service		.880
	4. Quality Control		.864
	5. Distribution		.867
	6. Sales and Marketing		.874
	7. Engineering		.864
	8. Purchasing		.869
	9. Research and Development		.885

Table 3.10 points out reliability analysis for ABC-based actions. The results show good support for internal consistency of items.

Table 3.10 Cronbach's Alpha for ABC-based actions

Factor	Item	Cronbach's alpha for factor	Cronbach's alpha if item deleted
ABC-based actions		.939	
	1.As a result of using ABC, changes are made in pricing strategy		.933
	2.As a result of using ABC, changes are made in operating processes		.935
	3.As a result of using ABC, changes are made in the product mix		.926
	4.As a result of using ABC, changes are made in customer segments		.927
	5.As a result of using ABC, changes are made in work force organisation		.938
	6.As a result of using ABC, changes are made in outsourcing decisions		.927
	7.As a result of using ABC, changes are made in product design		.938
	8.As a result of using ABC, changes are made in distribution channels		.929
	9.As a result of using ABC, changes are made in compensation systems		.930

Table 3.11 reveals the results of reliability analysis for non-process cost improvement. The analysis does not show consistency of item 2 (ABC has led to cost savings in product design) and other items. Accordingly, this item has been deleted.

Table 3.11 Cronbach's Alpha for Non-Process Cost Improvement

Factor	Item	Cronbach's alpha for factor	Cronbach's alpha if item deleted
Non-process cost Improvement		.939	
	1. ABC has led to cost savings in distribution.		.909
	2. ABC has led to cost savings in product design.		.952
	3. ABC has led to cost savings in purchasing.		.906
	4. ABC has led to cost savings in marketing.		.907

According to the literature review, "manufacturing/operations costs" and "process cost" are very similar measures and therefore, only process cost has been retained. They were not combined into a single measure because they were measured using different scales. Also, the correlation between employee productivity and activity efficiency is high, so the broad measure in the literature which is activity efficiency has been used in the model.

3.3 Population

3.3.1 Mail Survey

The population of the mail survey part of the study included manufacturing organisations in Australia. The term 'manufacturing' encompasses any manufacturer who converts raw materials or components into intermediate or consumer goods.

The population for the mail survey encompasses all manufacturing industries listed in the Kompass Directory except agricultural, forestry, fishing and defence because these industries have special costing issues that reduce their comparability to other industries (Brown, Booth & Giacobbe 2004). It is worth noting that Kompass classifies businesses based on four criteria: Producer, Distributor, Exporter and Importer. However, the directory categories are not reliable because the researcher, for example, found some non-manufacturing businesses listed under the manufacturing category. Moreover, many surveys have been sent back, as the database did not update from business subscribers.

The sample was distributed approximately equally among the following industries:

- Metallurgy and metal products
- Machinery and equipment
- Measuring and testing equipment and instruments
- Medical and veterinary equipment and supplies
- Safety and security equipment
- Electrical and electronic equipment
- Rubber and plastic products
- Chemicals and pharmaceuticals
- Mineral products, glass and ceramics
- Wood, furniture and wooden products
- Foods and beverages
- Paper and paper products
- Publishing
- Textiles, clothing, leather, footwear and travel goods
- Heating and air conditioning
- Tobacco products and smokers' requisites
- Office machinery and computers

The sample frame for the mail survey consisted of 600 manufacturing business units with a minimum of 50 employees that were stratified by industry and drew from the online Kompass Directory, a common directory that includes all businesses in Australia. The sample frame was considered to be sufficient to generate the required number of ABC responses. This decision was based on reported ABC adoption rate of 78% (192 out of 246 Australian business units) (Baird, Harrison & Reeve 2004, 2007).

Business units include divisions or plants or single companies. The reason for choosing the business unit as a unit of analysis is that the firm may have different systems in different locations (Baird, Harrison & Reeve 2004). Moreover, the focus on the micro-level of organisations makes it easier for respondents to complete the questionnaire rather than focus on the organisations as a whole. The reason for the minimum number of employees is that business units with less than 50 employees are less likely to adopt a high level of activity management (Baird, Harrison & Reeve 2004).

The selection of the financial controller as the respondent is justified by the knowledge he or she is more likely to have about ABC and the relationship with a broad section of the organisation; all of these reasons make the financial controller more capable of providing the necessary information required by this study (Brown, Booth & Giacobbe 2004; Krumwiede 1998). In addition, choosing the financial controller is consistent with prior research (Anderson 1995; Baird, Harrison & Reeve 2004; Brown, Booth & Giacobbe 2004; Krumwiede 1998).

3.3.2 Web Survey

The population consists of members of CAM-I and clients of consulting companies. The population here is global and covers different sectors (for example, manufacturing, services and government). As in the mail survey, the business unit is the unit of analysis and staff in finance/accounting are targets. The management of CAM-I distributed the survey to its members, but the process of

getting responses was ultimately unsuccessful because of the difficult economic conditions in the US in 2009.

3.4 Questionnaire Administration

3.4.1 Mail Survey

The questionnaire package for the mail survey included the cover letter, a booklet and the reply-paid envelope. The booklet was coded with an identification number for the purpose of follow-up (Dillman 2007). A follow-up step through a different mode of communication is expected to improve response rate. The self-administered survey was distributed according to the following procedures.

1. The complete package was mailed out to the financial controller of the business unit.
2. A reminder letter was mailed out three weeks later.
3. A reminder call was given to the ones who did not return the questionnaire within five weeks from the initial mailing.

3.4.2 Web Survey

The web survey needs a list of participants' emails, which were unavailable to the researcher, so the survey was supported and administered through third parties. Consulting companies and a professional organisation agreed to participate voluntarily and carry out the distribution of the survey. As a result, the researcher is unable to determine non-response bias or conduct follow-up procedures.

3.5 Data Analysis

The unexpectedly small size of ABC adopters has influenced the statistical techniques used in analysing the data. Accordingly, advanced techniques such as partial least squares (PLS) or even structural equation modelling (SEM) was not used in this study. Descriptive statistics and frequency distribution are used to facilitate the analysis. The standard regression technique has been used to test the hypothesised relationships in the model. Mann-Whitney is a non-parametric test

used to investigate difference in the dependant variables in terms of control variables. For non-ABC adopters, Fisher Exact Test has been used to investigate difference in dichotomous variables in terms of control variables.

3.6 Response Rate

The initial intended population consists of 600 Australian manufacturing firms drawn from the online Kompass Directory. However, there were 32 returned mailings that reduced the population size to 568 firms. The initial mail-out was sent to the financial controller by 16 February 2009. Thirty-nine responses were collected early. Three weeks later, a first reminder was mailed out to the ones who did not return the questionnaire. Fifteen more responses were collected by the end of March. Two hundred calls were conducted in April to those who had not yet responded. Two more responses were collected. Participants expressed time restrictions or company policy as reasons for not taking part in the survey. Total responses in this stage were 56 responses with a response rate of 9.9 per cent (see Table 3.12). Among these responses, four business units found using ABC with an adoption rate of seven per cent (4/56). The researcher strived to identify ABC users. One attempt was when the researcher called the participants in the first stage. Eighty firms were asked randomly whether they were using an ABC model. Two of them replied positively, although one of them limited ABC to the distribution function. After this disappointing response to the initial survey of 600 Australian manufacturing business units, the likelihood of extending the mail out survey was assessed by contacting the top 1000 Australian firms listed on "Business Who's Who". They were asked if they had adopted ABC. This approach solicited only 16 replies; none of whom had adopted ABC. At this point it was decided to adopt a different approach to collecting the sample.

Table 3.12: Response rate

	Mail Survey		Web Survey
Questionnaires mailed		600	
Less: undeliverable		32	
Net questionnaires delivered		568	100
Responses received			
First mailing	39		
Second mailing	15		
Call follow-up	2	56	52
Response rate		9.9%	52%

On the other hand, the response rate from the on-line survey was 52 per cent. The total responses were 52 responses, from which 27 were ABC users. It was impossible to conduct non-response bias since the majority of responses in the mail survey were non-metric as well as there was no follow-up actions in the on-line survey. However, the amalgamation of the two sorts of survey was tested by comparing ABC users in the mail survey with ABC users in the on-line survey. There are no significant differences between them in terms of their impact on the model.

3.7 Profile of Business Units

The profile of the respondent business units consisted of different dimensions: the status of ABC adoption, firm classification, location, industry and size. The following is a description of these dimensions.

3.7.1 Status of ABC Adoption

Respondents were asked to identify the stage of ABC in their business units from the following five options:

1. You have never used ABC.
2. You adopted ABC in the past, but have now discontinued it.
3. You are currently evaluating ABC.
4. You are currently implementing ABC.
5. You are currently using ABC.

Table 3.13: Status of ABC adoption

	Frequency	Percentage
Non-ABC Users	53	49.1
ABC Abandoners	14	13.0
Evaluators	4	3.7
Implementers	6	5.6
ABC Users	31	28.7
Total	108	100

Table 3.13 presents the five categories of respondents in the sample. The largest category consists of those who have never adopted ABC (49 per cent). The smallest category comprises those who are currently evaluating or considering ABC (3.7 per cent). Surprisingly, the number of those who have discontinued the use of ABC, after using it in the past, is nearly half of that of the current users. This study does not discuss two of the five categories listed above: evaluators and implementers since the study focuses on business units using ABC for decision making. The following chart gives a visual picture of the content of the sample (see Figure 3.1).

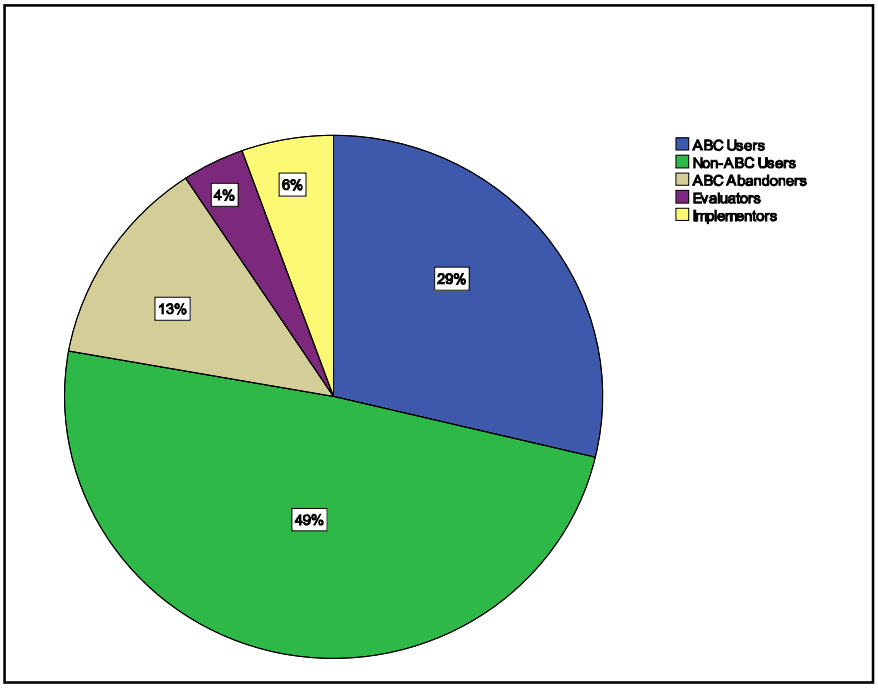

Figure 3.1: Status of ABC adoption

3.7.2 Types of Business Units

The unit of analysis in this study is the business unit. It is a self-contained subunit of a larger organisation (Frey & Gordon 1999). Based on this definition, the business unit has more than one department. Division, plant and single firm are examples of business units. This study may have more than one business unit from the same company. Table 3.14 shows the proportion of each type of business unit.

Table 3.14: Types of business units

	Frequency	Percentage
Division	29	29.6
Headquarters	17	17.3
Single Firm	31	31.6
Group of Companies	10	10.2
Plant	7	7.1
Other	4	4.1
Missing	10	
Total	108	100

Table 3.14 shows that divisions (30 per cent) and single firms (32 per cent) account for the highest percentages among all other types of business units.

3.7.3 Country Distribution

The domain of this study covered Australian and overseas business units. However, Australia has the largest stake as the first stage of the survey was run in Australia, and some of the consulting firms during the second stage are located in Australia.

Table 3.15: Distribution by country

	Frequency	Percentage
Australia	73	74.5
Worldwide*	25	25.5
Missing	10	
Total	108	100

Table 3.15 shows the distribution of the sample according to countries. As shown in the table, 74.5 per cent of respondents are based in Australia, while other countries constitute 25.5 per cent of the total.

*Worldwide represents the following countries: Saudi Arabia (7), India (3), South Africa (2), United Arab Emirates (2), United Kingdom (2), United States (2), Bahrain (1), Colombia (1), Mexico (1), Netherland (1), New Zealand (1), Spain (1) and multi-nation (1).

3.7.4 Industry Classification

This study covered a broad range of industries such as manufacturing, services and government.

Table 3.16: Industry classification

	Frequency	Percentage
Manufacturing	48	48.5
Government and Non-profit Organisations	14	14.1
Financial and Insurance Services	7	7.1
Education and Training	7	7.1
Wholesale/Retail	6	6.1
Energy and Utilities	4	4.0
Telecommunication and Media	3	3.0
Technical Services and Consultations	3	3.0
Publishing	2	2.0
Construction	2	2.0
Information Technologies	1	1.0
Transportation, Packaging, Storage	1	1.0
Health Care Services	1	1.0
Missing	9	
Total	108	100

Table 3.16 clearly shows that the manufacturing sector accounts for the highest percentage (49 per cent) of the sampled sectors. This is because the initial sample focused on manufacturing. The government sector constitutes fourteen per cent of the sample, while financial services and education services represent seven per cent. The wholesale and retail sector accounts for six per cent.

3.7.5 Size of the Business Unit

There are various criteria in the literature that could be used to define or measure the size of the business unit (in the literature, this frequently relates to a single firm). These measures, for example, include annual sales, total revenue, total assets, net worth of firms and number of employees. The monetary based measures fluctuate based on international exchange rates, and some firms also represent cost centres. Firms are most frequently classified by number of employees because this measure is more stable over time compared with other factors (Forsaith & Fuller 1995). Therefore, this study uses number of employees as an index of business unit size.

Using number of employees to categorise firms' size is problematic. There is no agreement on the number of employees that defines small, medium and large firms. Indeed, the number differs from country to country and even among industries (McMahon et al. 1993). For example, in New Zealand manufacturing firms with less than 50 employees are considered small, while this figure is 100 in Australia. Conversely, non-manufacturing firms in Australia are small when they employ less than 20 persons.

Table 3.17: Business unit size

	Frequency	Percentage
Less than 100 employees	32	33.7
100–199 employees	15	15.8
200–500 employees	18	18.9
More than 500 employees	30	31.6
Missing	13	
Total	108	100

Table 3.17 shows that 34 per cent of business units have less than 100 employees. In addition, 32 per cent of business units in the sample have a number of employees greater than 500. The strength of the remaining business units (34 per cent) falls in the range 100–500 persons.

3.8 Respondents' Characteristics

As indicated by Table 3.18 below, most of the respondents in this study are working in the financial and accounting departments. The assumption is that targeted respondents deal with financial and management systems and control performance in the business unit.

Table 3.18: Respondents' Characteristics

	Frequency	Percentage	Average number of years in position	Average number of years in business unit
Chief Financial Officer	11	12.5	5.64	6.09
Finance Manager	7	8.0	10.29	9.14
Finance Director	6	6.8	6	8.5
Financial Controller	16	18.2	8.19	7.69
General Manager-Finance	4	4.5	6.75	19
Accountant	10	11.4	7.4	7.1
Consultant	5	5.7	3	1
Financial Analyst	5	5.7	7.4	7
Other	24	27.3	6.54	9.33
Missing	20			
Total	108	100		

Table 3.18 (ignoring the category labelled 'other') shows that chief financial officers, financial controllers and accountants account for the highest percentage of respondents (12.5 per cent, 18.2 per cent and 11.4 per cent, respectively). Their professional experience within the business unit ranges from six to eight years. Therefore, they are knowledgeable and qualified to take part in this study.

3.9 ABC Users

ABC users are the essential targets in this study and the hypothesised model is related exclusively to them. It would be interesting to classify them based on some of the previous criteria such as type, country, industry and size as well as time elapsed since introducing ABC, in order to aid in decision making.

3.9.1 Type of Business Unit

The decision to adopt ABC could be applied to any type of business unit. The ABC method is not just a new way of cost allocation, but also a radical change that affects strategy, performance evaluation and resources allocation. Therefore it is recommended that an ABC model is implemented as a pilot project held on a specific scope of the organisation (Krumwiede & Roth 1997). Single firm, plant and division are examples of the preferred locations to implement ABC, but not the headquarters. The following table (see Table 3.19) shows the types of ABC business units, with divisions accounting for the highest proportion of ABC users.

Table 3.19: Types of ABC users

	Frequency	Percentage
Division	10	32.3
Headquarters	7	22.6
Single Firm	7	22.6
Group of Companies	3	9.7
Plant	1	3.2
Other	3	9.7
Total	31	100

3.9.2 Location of ABC Users

Table 3.20 shows that approximately half of ABC users are located in Australia (16 out of 31 firms). As we indicated before, this is because much of the efforts to identify ABC users took place in Australia. There was a collaborative effort between the researcher and certain software and consulting organisations in Australia, but this was not the case overseas. Due to a small number of observations for overseas countries, the variable country would not be used in the subsequent analyses in this study.

Table 3.20: Countries of ABC users

	Frequency	Percentage
Australia	16	51.6
World wide*	15	48.4
Total	31	100

3.9.3 Industry of ABC Users

Even though ABC initially flourished in the manufacturing industry, there are other sectors that exceeded the manufacturing sector, such as government organisations (see Table 3.21). Innes, Mitchell and Sinclair (2000) found an adoption rate of 40.7 per cent in the UK financial sector while Cohen, Venieris and Kaimenaki (2005) found an adoption rate of 65 per cent in the Greek service sector. This could be attributed to the high level of fixed costs associated with providing services. Baird (2007) studied 122 Australian public organisations (hospitals, universities, government business enterprises and government agencies). He found that 66.3 per cent had adopted ABC.

*Worldwide represents the following countries: Saudi Arabia (4), India (2), South Africa (2), United Arab Emirates (1), United Kingdom (1), United States (2), Mexico (1), Netherland (1) and New Zealand (1).

Table 3.21: Industries of ABC users

	Frequency	Percentage
Government and Non-profit Organisations	8	25.8
Manufacturing	7	22.6
Financial and Insurance Services	5	16.1
Education and Training	3	9.7
Energy and Utilities	2	6.5
Technical Services and Consultations	2	6.5
Telecommunication and Media	1	3.2
Information Technologies	1	3.2
Construction	1	3.2
Transportation, Packaging, Storage	1	3.2
Total	31	100

Table 3.21 sheds light on the industry classification in this study. The main industries adopting ABC are government and non-profit organisations, manufacturing and financial and insurance services (25.8 per cent, 22.6 per cent and 16.1 per cent, respectively).

3.9.4 Size of ABC Users

There is accumulated evidence in the literature that organisational size is one of the significant factors that drives the decision to adopt ABC (Booth & Giacobbe 1997b; Hieu 1996; Krumwiede 1998). Larger firms are more likely to adopt ABC because of resource availability. Similar principles could be applied to the business units.

Table 3.22: Size of ABC users

	Frequency	Percentage
Less than 100 employees	8	25.8
100 - 199 employees	3	9.7
200 - 500 employees	5	16.1
More than 500 employees	15	48.4
Total	31	100

Table 3.22 shows that 48.4 per cent of ABC users have more than 500 employees. This size is large and this finding is consistent with the literature. However, the second largest category, being less than 100 employees, is unexpected. This may be attributed to using business units rather than firms.

3.9.5 Time since Introduction of ABC

Table 3.23 shows that most ABC users in this study started using ABC to aid in decision making during the 2000s.

Table 3.23: Years since introduction of ABC

	Frequency	Percentage
Less than 5 years	7	33.3
5–10 years	9	42.9
11–15 years	3	14.3
More than 15 years	2	9.5
Missing	10	
Total	31	100

3.10 Summary

In this chapter, research questions are outlined and contingency theory is used to explain the effect of contingent factors on the design of the ABC system. Mail survey and web survey are the methods used to collect data for this study. A mail survey was run in Australia and targeted the manufacturing industry, while a web survey was run internationally and targeted various industries. Construction of the survey and measurement of the variables have been provided.

This chapter provides descriptive statistics for sample characteristics. The sample characteristics include features of the participating business units as well as the respondents. Features of the sample are analysed, including country, size, industry and type of business unit. Respondent data was presented in two parts: (1) overall sample including ABC users and (2) ABC users' sample.

SPSS version 17—recently known as PASW—is the tool used to analyse these data in the next chapter. The analysis is quantitative and employs descriptive and inferential statistics. Regression techniques will be used to test the hypotheses embedded in the model. Adjusted R-square values have been used instead of R-square to reduce the effect of the number of variables in the model.

Chapter 4: Data Analysis and Results

4.1 Introduction

Our goal in this chapter is to analyse data derived from the survey to provide summary statistics and to investigate the various hypotheses in this study. Based on survey responses, participants could be classified as either:

- Business units who have not adopted ABC
- Business units who have discontinued ABC
- Business units who are using ABC

The first part of this chapter will report on the first two groups, while the second part will look into ABC users and test the various hypothesised relationships. Further, path analysis will be suggested.

4.2 Business Units that Have Not Adopted ABC

Despite the broad publicity for ABC systems over the world, the low adoption rate of ABC has promoted researchers to investigate the reasons for such adoption. This investigation has been done by comparing firm's characteristics and business environment between ABC adopters and non-ABC adopters. One of these studies, (Hieu 1996) collected data from 102 Victorian manufacturers who did not adopt ABC. The corresponding number in this study is 53 Australian manufacturers. The following table has a comparative analysis between the two studies to illustrate whether or not the reasons have changed over time.

Table 4.1: Reasons for non-adoption of ABC by business units

Variables	Percentage of respondents	Hieu's study (%)
ABC system is not well suited to the business unit*	34	—
Current systems have already satisfied the needs of management	24.5	33.3
Higher priorities of other changes or projects*	22.6	—
Lack of awareness of ABC development	18.9	8
Problems with current costing system are not significant	17	33.3
Costly to switch to ABC	13.2	14.7
Current costing system has been modified by using more appropriate cost allocation bases	11.3	18.6
Difficulties in collecting data on the cost drivers from the existing system	11.3	10
ABC is too complex to implement and/or utilise*	11.3	—
Advantage conferred by ABC system is negligible*	11.3	—
Lack of internal resources	11.3	33.3
Benefits of ABC are still not totally demonstrated in practice*	9.4	—
Difficulties in selecting cost drivers	7.5	5.83
Top management do not support the implementation of ABC	5.7	25.5
Lack of support from employees or management other than yourself	1.9	15

*Theses questions are not in Hieu's study

Table 4.1 sets out the possible reasons for not using ABC along with the responses. Contrary to Hieu's finding, it is surprising that lack of awareness of the ABC model (18.9 per cent) represents a somewhat high percentage. ABC is a system that has received considerable publicity via software and consulting firms since the 1990s. The absence of knowledge of ABC may suggest that it is not relevant to some business units. Another important reason is that ABC is not well suited to the business unit (34 per cent). This is the general statement chosen by the highest percentage of those surveyed. Business units differ in characteristics

and this, in turn, affects the decision to adopt ABC. Hieu (1996) found that product-process complexity, size and competition are significantly different between ABC firms and other firms. Another important reason for not adopting ABC is that the current system is already satisfying the needs of management (24.5 per cent). This means that the current system provides reliable and timely information and the problems associated with it are not significant (17 per cent). The higher priority given to other changes and projects is another prominent reason (22.6 per cent), indicating that costing systems are not as important as other technological projects. In addition, three of the respondents indicated that the ABC method is not promoted or recommend by the parent company.

When compared to the data in Hieu's study, there is consistency with the reason, 'costly to switch to ABC' (13.2 per cent and 14.7 per cent, respectively). Consideration of the high costs involved in implementing ABC is low in both cases, however, some of the findings of this study differ from those in the literature. Respondents are less satisfied with their systems compared with those in Hieu's study (24.5 per cent and 33.3 per cent, respectively). In addition, lesser numbers of respondents in this study reported problems with current systems (17 per cent compared with 33.3 per cent). Moreover, lack of resources (11.3 per cent), support from top management (5.7 per cent) and other employees (1.9 per cent) do not seem to be problems in this study, but they are pertinent factors in Hieu' study (33.3 per cent, 25.5 per cent and 15 per cent, respectively).

4.2.1 The Significance of the Reasons to Not Adopt ABC

This section scrutinises the effect of business unit size on the selection of the possible reasons for not adopting ABC. The classification of size in this section is obtained by segmenting the sample into two equal groups, small and large groups (Hair et al. 2010). Every reason was coded (0, 1) which refers to (No) and (Yes), respectively. The basic test for two categorical variables for 2*2 table is Chi-square (X^2). However, for small samples, running an alternative test—Fisher's exact test (FET) —is more suitable, especially when the expected frequencies are less than 5.

The motivations to not adopting ABC have been segmented based on business unit size. A Fisher exact test is the test of significance (2-tailed) that has been used in this section. No significant difference was found between business units by size in the prospective reasons.

4.3 Business Units Who Adopted ABC but Have Discontinued It

4.3.1 Industry Categories

It is interesting to know the motivations that cause companies to discontinue an ABC system. The reasons for discontinuing ABC are more powerful than the reasons why companies do not adopt ABC in the first place, because the former display the actual experience, including problems or disadvantages associated with ABC. In this section, there are fourteen Australian business units from different industries that have discontinued ABC. There is a similar pattern in the distribution between the manufacturing and government sector. Noticeably, universities represent the highest number among these business units (see Table 4.2).

Table 4.2: Industry categories

	Frequency	Percentage
Education and Training	4	28.6
Manufacturing	3	21.4
Government and Non-profit Organisations	3	21.4
Wholesale/Retail	2	14.3
Telecommunication and Media	1	7.1
Publishing	1	7.1
Total	14	100

4.3.2 Reasons for Business Units to Discontinue ABC

Table 4.3 highlights four major reasons for business units to abandon the ABC system: high cost to operate and maintain the system (50 per cent); difficulties in processing and interpreting information generated by ABC (42.9 per cent); managers' lack of belief in and use of ABC information (50 per cent) and lack of support (resistance) from employees and other management (42.9 per cent).

Table 4.3: Reasons for business units to discontinue ABC

Reason	Frequency	Percentage
Too costly to operate (benefits did not justify implementation costs)	7	50
Managers did not believe and use the ABC information	7	50
Lack of support from employees or management other than yourself	6	42.9
Difficulties in processing and interpreting information generated by ABC	6	42.9
Information generated by ABC was not useful for decision making	3	21.4
Lost internal champion	2	14.3
Information from ABC was not significantly different from the old system	1	7.1
Modifying the old system was the better solution	1	7.1
A decision from the parent company	1	7.1

4.4 Activity Management Other Than ABC

According to our literature review, activity management could be divided into three levels: the basic level is AA, the middle level is ACA and the highest level is ABC (Gosselin 1997). Non-ABC adopters can still be assumed to have some sort of activity management (Baird, Harrison & Reeve 2007). This section investigates business units that have not adopted ABC (53 business units) and business units that discontinued ABC (14 business units). Table 4.4 provides statistics of the status of activity management in these business units.

Table 4.4: Status of activity management

	Frequency	Valid Percentage
Activity analysis (AA)	51	80.95
Activity cost analysis (ACA)	12	19.05
Missing	4	
Total	67	100

It is expected that the higher level obtains a lower percentage because some business units may not motivate to escalate to a higher level of activity management.

Another issue here is looking at the effect of size on activity management level. Analysing the difference for each level through a Fisher exact test (2-sided) contribute to no significant effect of size on activity management level (p = 1 & .781 for AA and ACA, respectively) (see Table 4.5 and Table 4.6). For industry, there is also no significant effect of industry type (manufacturing versus non-manufacturing) on activity management level (p=.515 & .233 for AA and ACA, respectively).

Table 4.5: Activity analysis * size (cross-tabulation)

			Size		
			1–149	>149	Total
Activity Analysis	No	Count	6	7	13
		% within size	21.4%	25.0%	23.2%
	Yes	Count	22	21	43
		% within size	78.6%	75.0%	76.8%
Total		Count	28	28	56
		% within size	100.0%	100.0%	100.0%

Table 4.6: Activity cost analysis* size (cross-tabulation)

			Size		
			1–149	>149	Total
Activity Cost Analysis	No	Count	9	11	20
		% within size	33.3%	39.3%	36.4%
	Yes	Count	18	17	35
		% within size	66.7%	60.7%	63.6%
Total		Count	27	28	55
		% within size	100.0%	100.0%	100.0%

4.5 Future Intention Regarding ABC

This study reveals that more than half of both the business units who have not adopted ABC and the business units who discontinued ABC (53.8 per cent) do not plan to implement ABC systems in the future (see Table 4.7). Indeed, only two business units (3.1 per cent) have incorporated ABC into their future plans. It is interesting that these two are among the business units that have adopted but discontinued ABC.

Table 4.7: Future of ABC

	Frequency	Percentage
No	35	53.8
Not Sure	28	43.1
Yes	2	3.1
Missing	2	
Total	67	100

4.6 Business Units Who Are Using ABC

This section tackles different aspects of data regarding ABC users. ABC users are the main focus of this study. This section consists of the following sections:

- Business units characteristics
- Descriptive statistics and reliability
- Hypotheses testing

4.6.1 Business Unit Characteristics

Research studies take into account the different characteristics of the sample of the study. These characteristics or control variables may have potential effects on the relationships between variables. Taking gender as an example of a control variable, the relationship between two variables may not have the same direction for both male and female. Each study has its own control variables depending on the design and the objectives of the study. The control variables considered in this study are size, time since introducing ABC and industry. These variables have been investigated in various studies (Banker, Bardhan & Chen 2008; Cagwin & Bouwman 2002; Foster & Swenson 1997; Frey & Gordon 1999; Ittner, Lanen & Larcker 2002; Maiga & Jacobs 2007).

The control variables will be used in two types of analyses. The first one is the comparison analysis. The results of this analysis along with the literature would decide which a variable can go in the subsequent analysis which is the multivariate analysis. The reason for these procedures is the small number of observations in this study.

The parametric t-test is usually used to compare the means of two groups. The t-test has assumptions that should be met to analyse the data. One of these assumptions is that the underlying population follows a normal distribution. It is recommended that non-parametric tests be employed in the case of violating t-test assumptions. The Mann-Whitney U test is the alternative non-parametric test to the t-test and has been run for the dependent variables, namely, ABC functions, ABC applications, ABC-

based actions, operational performance, ABC benefits and ABC success. These variables have been segmented based on size, time since introduction of ABC and industry.

Statistical significance level (alpha α) has been determined at ten per cent. The size of the sample is the main contribution to this decision (Hair et al. 2010). There is a direct relationship between alpha and the statistical power (which is the probability of accepting the hypothesis when it is true). Thus, reducing the significance level would result in reducing the statistical power of the tests. This must be offset against the probability of accepting the hypothesis when it is false, which decreases with higher significance levels (Cooper & Schindler 2006). While it is most common to use a significance level of five per cent, this is normally combined with an acceptable sample size that yields a suitable power of the test. With such a small sample size in this study, a higher significance level is required to balance the likelihood of making type I error (rejecting the null hypothesis when it is true) versus type II error (accepting the null hypothesis when it is false). However for comparability to the norm in such research, the results at the one per cent and five per cent levels of significance are also reported. For the sample size in this study, it is felt that a significance level of ten per cent gives the right balance between these competing issues. This is consistent with popular ABC articles in the leading journals (Anderson & Young 1999; Banker, Bardhan & Chen 2008; Cagwin & Bouwman 2002; Ittner, Lanen & Larcker 2002; Krumwiede 1998; McGowan & Klammer 1997).

- **Size of Business Unit**

The size of business unit has been measured by the number of employees in the business unit. A dichotomous variable (0,1) has been used to classify business units. The number (0) refers to business units who employ less or equal to 500 persons and the number (1) to business units with more than 500 employees. The number (500) has been used to divide the sample into two equal groups (Hair et al. 2010). Table 4.8 and Table 4.9 show that there is a significant difference in the mean ranks only for revenue improvement between smaller and larger business units,

U=54.500, P=.078. Smaller business units gain higher revenue improvement than larger business units (mean rank =16.37 *versus* 11.04, respectively).

Table 4.8: Mann-Whitney U test for business unit size

Size	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Applications	115.000	235.000	-.198	.843
Functions	90.000	195.000	-.656	.512
ABC-based actions	98.500	218.500	-.581	.561
Product quality	87.500	207.500	-.127	.899
Cycle time	65.500	131.500	-.946	.344
Activity efficiency	66.000	144.000	-.676	.499
Process cost improvement	102.500	222.500	-.112	.911
Non-process cost improvement	66.000	121.000	-.502	.616
Revenue improvement	54.500	132.500	-1.760	.078*
Customer satisfaction	62.500	140.500	-.222	.825
ABC success	93.000	213.000	-.566	.571

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (two-tailed).

Table 4.9: Descriptive statistics for business unit size

	Size	N	Mean Rank
Applications	Less than 500 employees	16	16.31
	Greater than 500 employees	15	15.67
	Total	31	
Functions	Less than 500 employees	15	16.00
	Greater than 500 employees	14	13.93
	Total	29	
ABC-based actions	Less than 500 employees	15	16.43
	Greater than 500 employees	15	14.57
	Total	30	
Product quality	Less than 500 employees	15	13.83
	Greater than 500 employees	12	14.21
	Total	27	
Cycle or lead time	Less than 500 employees	15	14.63
	Greater than 500 employees	11	11.95
	Total	26	
Activity efficiency	Less than 500 employees	12	12.00
	Greater than 500 employees	13	13.92
	Total	25	
Process cost improvement	Less than 500 employees	15	14.83
	Greater than 500 employees	14	15.18
	Total	29	
Non-process cost improvement	Less than 500 employees	15	13.60
	Greater than 500 employees	10	12.10
	Total	25	
Revenue improvement	Less than 500 employees	15	16.37
	Greater than 500 employees	12	11.04
	Total	27	
Customer satisfaction	Less than 500 employees	12	11.71
	Greater than 500 employees	11	12.32
	Total	23	
ABC success	Less than 500 employees	15	14.20
	Greater than 500 employees	14	15.86
	Total	29	

- **Time since Introduction of ABC**

The business units in this study have experienced ABC for different periods. Some have used ABC for a long time compared to others. A dichotomous variable (0,1) has been used to classify business units. The number (0) refers to business units who have used ABC to aid in decision making for less or equal to six years and the number (1) represents those with more than six years of ABC use. The selection of six years is based on the equality of observations in each group. Tables 4.10 and 4.11 show that there is a significant difference in cycle time between business units using ABC for a longer time and a shorter time, U = 21.500, P = .077. The cycle time for business units using ABC for a long time is less than that for business units using ABC for a short time. The mean rank is 11.81 versus 7.65 respectively. Moreover, business units using ABC for a longer time improve process costs significantly. There is also a significant difference in the overall ABC success for those business units, U = 20.500, p < .01. Business units who have used ABC for longer have a higher rank of overall ABC success than others (mean rank is 14.45 and 7.86 respectively).

Table 4.10: Mann-Whitney U test for time since introduction of ABC

Time	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Applications	45.000	111.000	-.704	.481
Functions	40.000	95.000	-.758	.449
ABC-based actions	44.500	110.500	-.741	.459
Product quality	26.500	81.500	-1.548	.122
Cycle time	21.500	76.500	-1.768	.077*
Activity efficiency	46.000	112.000	-.656	.512
Process cost improvement	23.000	89.000	-2.305	.021**
Non-process cost improvement	18.500	73.500	-1.619	.105
Revenue improvement	36.500	91.500	-.705	.481
Customer satisfaction	32.500	87.500	-1.056	.291
ABC success	20.500	86.500	-2.609	.009***

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (two-tailed).

Table 4.11: Descriptive statistics for time since introduction of ABC

	Time	N	Mean Rank
Applications	Less than 6 years	11	10.09
	Greater than 6 years	10	12.00
	Total	21	
Functions	Less than 6 years	10	9.50
	Greater than 6 years	10	11.50
	Total	20	
ABC-based actions	Less than 6 years	11	10.05
	Greater than 6 years	10	12.05
	Total	21	
Product quality	Less than 6 years	10	8.15
	Greater than 6 years	9	12.06
	Total	19	
Cycle or lead time	Less than 6 years	10	7.65
	Greater than 6 years	8	11.81
	Total	18	
Activity efficiency	Less than 6 years	11	10.18
	Greater than 6 years	10	11.90
	Total	21	
Process cost improvement	Less than 6 years	11	8.09
	Greater than 6 years	10	14.20
	Total	21	
Non-process cost improvement	Less than 6 years	10	7.35
	Greater than 6 years	7	11.36
	Total	17	
Revenue improvement	Less than 6 years	10	9.15
	Greater than 6 years	9	10.94
	Total	19	
Customer satisfaction	Less than 6 years	10	8.75
	Greater than 6 years	9	11.39
	Total	19	
ABC success	Less than 6 years	11	7.86
	Greater than 6 years	10	14.45
	Total	21	

- **Industry**

There are two types of comparison in relation to industry. The first one compares manufacturing industry with other industries and the second one compares the government sector with other industries. In the first type of comparison, we refer to the manufacturing industry with the number (1) and (0) to other industries. Tables 4.12 and 4.13 show only a significant difference in functions between manufacturing business units and other business units, U = 34, P = .073. Manufacturing industry has a broader range of functions that use ABC than other industries. The mean rank for manufacturing is 19.83 and the mean rank for others is 13.05.

Table 4.12: Mann-Whitney U test for manufacturing

Manufacturing	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Applications	52.500	352.500	-1.012	.312
Functions	34.000	287.000	-1.795	.073*
ABC-based actions	64.500	85.500	-.243	.808
Product quality	34.500	55.500	-1.605	.108
Cycle time	39.000	60.000	-1.238	.216
Activity efficiency	11.000	264.000	-1.192	.233
Process cost improvement	50.000	71.000	-.917	.359
Non-process cost improvement	54.000	244.000	-.192	.848
Revenue improvement	36.000	57.000	-1.486	.137
Customer satisfaction	14.000	17.000	-.704	.482
ABC success	55.000	76.000	-.666	.505

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (two-tailed).

Table 4.13: Descriptive statistics for manufacturing

	Manufacturing	N	Mean Rank
Applications	Non-manufacturing	24	14.69
	Manufacturing	6	18.75
	Total	30	
Functions	Non-manufacturing	22	13.05
	Manufacturing	6	19.83
	Total	28	
ABC-based actions	Non-manufacturing	23	15.20
	Manufacturing	6	14.25
	Total	29	
Product quality	Non-manufacturing	20	14.78
	Manufacturing	6	9.25
	Total	26	
Cycle or lead time	Non-manufacturing	19	13.95
	Manufacturing	6	10.00
	Total	25	
Activity efficiency	Non-manufacturing	22	12.00
	Manufacturing	2	18.00
	Total	24	
Process cost improvement	Non-manufacturing	22	15.23
	Manufacturing	6	11.83
	Total	28	
Non-process cost improvement	Non-manufacturing	19	12.84
	Manufacturing	6	13.50
	Total	25	
Revenue improvement	Non-manufacturing	20	14.70
	Manufacturing	6	9.50
	Total	26	
Customer satisfaction	Non-manufacturing	20	11.80
	Manufacturing	2	8.50
	Total	22	
ABC success	Non-manufacturing	22	15.00
	Manufacturing	6	12.67
	Total	28	

In the second comparison between government and other industries, we refer to the government sector with the number (1) and (0) to other industries. Tables 4.14 and 4.15 show a significant difference in applications between the government sector and other industries, U = 44.5, P = .04. Other industries use more ABC applications than the government (mean rank = 17.48 *versus* 10.06 respectively). There is also a significant difference in ABC-based actions in which other industries have taken actions based on ABC information more frequently than the government sector. Moreover, there is a significant difference in the mean rank of functions. Other industries run more ABC functions than the government sector. The mean ranks are 15.98 for other industries and 10.07 for government.

Table 4.14: Mann-Whitney U test for government

Government	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Applications	44.500	80.500	-2.041	.041**
Functions	42.500	70.500	-1.647	.099*
ABC-based actions	42.000	70.000	-1.786	.074*
Product quality	45.000	66.000	-.944	.345
Cycle time	41.000	56.000	-.661	.509
Activity efficiency	43.000	71.000	-1.087	.277
Process cost improvement	65.000	93.000	-.462	.644
Non-process cost improvement	45.000	60.000	-.341	.733
Revenue improvement	46.500	256.500	-.836	.403
Customer satisfaction	34.000	55.000	-1.060	.289
ABC success	53.000	284.000	-1.177	.239

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (two-tailed).

Table 4.15: Descriptive statistics for government

	Government	N	Mean Rank
Applications	Non-government	22	17.48
	Government	8	10.06
	Total	30	
Functions	Non-government	21	15.98
	Government	7	10.07
	Total	28	
ABC-based actions	Non-government	22	16.59
	Government	7	10.00
	Total	29	
Product quality	Non-government	20	14.25
	Government	6	11.00
	Total	26	
Cycle or lead time	Non-government	20	13.45
	Government	5	11.20
	Total	25	
Activity efficiency	Non-government	17	13.47
	Government	7	10.14
	Total	24	
Process cost improvement	Non-government	21	14.90
	Government	7	13.29
	Total	28	
Non-process cost improvement	Non-government	20	13.25
	Government	5	12.00
	Total	25	
Revenue improvement	Non-government	20	12.83
	Government	6	15.75
	Total	26	
Customer satisfaction	Non-government	16	12.38
	Government	6	9.17
	Total	22	
ABC success	Non-government	21	13.52
	Government	7	17.43
	Total	28	

The decision on the inclusion of the control variables in the multivariate analysis was based on the frequency of significance in the univariate analysis and comments from the literature. The previous analysis on business unit size reveals that size is not significant to the model of ABC success. This can be explained by size being more related to adoption than success (Krumwiede 1998). Also, manufacturing industry is not significant to the model. Cagwin and Bouwman (2002) also did not find manufacturing industry is significant to the model of ABC and success.

4.6.2 Descriptive Statistics

Descriptive statistics are a general means to explore the data collected and summarise it in the form of graphs and tables. This is usually the initial procedure undertaken in order to observe and obtain a general idea about the data. For example, it may be interesting to know the average (mean) number of each variable described in the study. Other examples also include frequency distributions. The following section presents the descriptive statistics for each variable in this study.

- **Differentiation Strategy**

Table 4.16 describes the minimum and maximum score for each item used to measure the factor and differentiation strategy, as well as the average score of the item and the standard deviation of each component. Managers on average agreed that their business units emphasise the strategies of on-time delivery, dependable delivery and high quality products. The mean scores are 4.87, 5 and 5.59, respectively. However, managers on average agreed only moderately to the strategies of effective after-sales service and customise products to customer needs. The mean scores are 4.34 and 4.28, respectively. As to reliability test, Cronbach's alpha value (.902) shows acceptable consistency of items describing differentiation strategy.

Table 4.16: Descriptive statistics of differentiation strategy

	N	Minimum		Maximum		Mean	Std. Deviation	α
		Theoretical	Actual	Theoretical	Actual			
Differentiation strategy								.902
High quality products	29	1	1	7	7	5.59	1.701	
Dependable delivery promises	29	1	1	7	7	5.00	1.927	
On-time delivery	30	1	1	7	7	4.87	1.907	
Effective after-sales service and support	29	1	1	7	7	4.34	1.987	
Customise products and services to customer needs	29	1	1	7	7	4.28	1.998	

Note: A seven-point scale (1= not emphasised and 7= highly emphasised)

- **Information Technology**

Table 5.17 shows descriptive statistics for the information technology factor. Managers on average agreed that information systems of the business units are integrated with each other; they have different performance measures; the quality of the data is excellent and they offer smooth query capability. The mean scores are 5, 4.65, 4.65 and 4.52, respectively. Regarding Cronbach's alpha, the analysis shows acceptable reliability of items (α =.824).

Table 5.17: Descriptive statistics of information technology

	N	Minimum		Maximum		Mean	Std. Deviation	α
		Theoretical	Actual	Theoretical	Actual			
Information technology								.824
The business unit's information systems are integrated with each other.	31	1	1	7	7	5.00	1.506	
Different aspects of cost and performance data are available in the information systems.	31	1	1	7	7	4.65	1.907	
The quality of the operating data is excellent.	31	1	2	7	7	4.65	1.496	
The information systems offer user-friendly query capability.	31	1	2	7	7	4.52	1.387	

Note: A seven-point scale (1= strongly disagree and 7= strongly agree)

- **Top Management Support**

Table 5.18 includes the descriptive statistics of top management support. It is found that managers on average agreed to the items: ABC received active support from top management; top management provided adequate resources; top management exercised its authority and top management effectively communicated its support. The mean scores are 5.77, 5.4, 5.1 and5, respectively. Also, Table 5.18 reveals acceptable reliability of items (α=.948).

Table 4.18: Descriptive statistics of top management support

	N	Minimum		Maximum		Mean	Std. Deviation	α
		Theoretical	Actual	Theoretical	Actual			
Top management support								.948
ABC received active support from top management.	30	1	2	7	7	5.77	1.223	
Top management provided adequate resources to the ABC implementation effort.	30	1	2	7	7	5.40	1.163	
Top management exercised its authority in support of ABC implementation.	30	1	2	7	7	5.10	1.125	
Top management effectively communicated its support for implementing ABC.	30	1	2	7	7	5.00	1.203	

Note: A seven-point scale (1= strongly disagree and 7= strongly agree)

- **Training**

As in information technology, managers on average agreed that adequate training was provided for designing, implementing and using ABC. They also agreed, on average, that training was useful in addressing concerns about the role of ABC. The mean scores of the above items are 5.33, 5.3, 5 and 4.9, respectively (Table 4.19). Also, Cronbach's alpha value (.934) supports internal consistency among items.

Table 4.19: Descriptive statistics of training

	N	Minimum		Maximum		Mean	Std. Deviation	α
		Theoretical	Actual	Theoretical	Actual			
Training								.934
Adequate training was provided for designing ABC.	30	1	2	7	7	5.33	1.295	
Adequate training was provided for implementing ABC.	30	1	3	7	7	5.30	1.208	
Adequate training was provided for using ABC.	30	1	2	7	7	5.03	1.326	
Overall, training was useful in addressing concerns about the role of ABC.	30	1	2	7	7	4.93	1.413	

Note: A seven-point scale (1 = strongly disagree and 7 = strongly agree)

- **Non-Accounting Ownership**

From Table 4.20 below, we conclude that managers on average agreed that non-accounting personnel share ABC information and the implementation team is cross-functional. The means for the above items are 4.6 and 4.7. However, managers on average are neutral to the items: ABC has been linked to the performance evaluation and compensation of non-accounting personnel. As to reliability analysis, Cronbach's alpha value (.843) shows acceptable reliability,

Table 4.20: Descriptive statistics of non-accounting ownership

	N	Minimum		Maximum		Mean	Std. Deviation	α
		Theoretical	Actual	Theoretical	Actual			
Non-accounting ownership								.843
The ABC implementation team was truly cross-functional.	30	1	2	7	7	4.73	1.552	
Departments other than accounting have shown personal ownership for ABC information.	29	1	2	7	7	4.62	1.321	
ABC has been linked to performance evaluation of non-accounting personnel.	29	1	1	7	7	4.34	1.914	
ABC has been linked to compensation of non-accounting personnel.	30	1	1	7	7	3.60	1.773	

Note: A seven-point scale (1 = strongly disagree and 7 = strongly agree)

- **Clarity of Objectives**

The average score for the clarity of objectives falls in the range 5 and 5.7 with standard deviation between 1.08 and 1.2 (Table 4.21). This indicates that officers on average agreed on the clarity and the consensus of ABC objectives. Further, they, on average, agreed that the objectives of ABC were applicable. Regarding reliability test, Cronbach's alpha of .843 indicates good support for internal consistency of items.

Table 4.21: Descriptive statistics of clarity of objectives

	N	Minimum		Maximum		Mean	Std. Deviation	α
		Theoretical	Actual	Theoretical	Actual			
Clarity of objectives								.843
The objectives of ABC were applicable.	30	1	3	7	7	5.70	1.088	
When the ABC initiative began, its purpose was clear and concise.	30	1	2	7	7	5.00	1.114	
When the ABC initiative began, there was consensus about its specific objectives.	30	1	2	7	7	5.00	1.203	

Note: A seven-point scale (1= strongly disagree and 7= strongly agree)

- **ABC Applications**

Table 4.22 indicates that product costing is the main use of ABC. Following that, business units are using ABC to a great extent for pricing decisions, process improvement, performance measurement and budgeting and planning. Business units are using ABC to a moderate extent for product-mix decisions, customer profitability and outsourcing decisions. Moreover, business units are using ABC to a lesser extent for designing products, compensating staff and valuing stock. For reliability test, Cronbach's alpha of .882 supports consistency of items.

Table 4.22: Descriptive statistics of ABC applications

	N	Minimum		Maximum		Mean	Std. Deviation	α
		Theoretical	Actual	Theoretical	Actual			
Applications								.882
Product/service costing	30	1	2	7	7	6.03	1.351	
Pricing decisions	29	1	1	7	7	5.21	1.590	
Performance measurement	30	1	2	7	7	4.93	1.574	
Budgeting and planning	31	1	1	7	7	4.71	2.101	
Process improvement	30	1	1	7	7	4.67	1.953	
Customer profitability analysis	29	1	1	7	7	4.38	2.382	
Product-mix decisions	29	1	1	7	7	4.31	2.072	
Outsourcing decisions	29	1	1	7	7	3.83	1.929	
Product design	29	1	1	7	7	3.14	1.787	
Compensation system	29	1	1	7	7	3.03	1.842	
Stock valuation	29	1	1	7	7	2.93	2.235	

Note: A seven-point scale (1= not used and 7= extensively used)

- **ABC Functions**

Table 4.23 indicates that manufacturing/production departments are the main functions using ABC. Other functions such as engineering, purchasing, quality control, customer service, marketing and sales and distribution are using ABC fairly frequently (the mean range between 2.62 and 3.32). However, R&D departments are slightly lower in their use of ABC (the mean score is 2.25). For reliability test, Cronbach's alpha value (.921) indicates consistency of items.

Table 4.23: Descriptive statistics of ABC functions

	N	Minimum		Maximum		Mean	Std. Deviation	α
		Theoretical	Actual	Theoretical	Actual			
Functions								.921
Manufacturing/Production	29	1	1	7	7	4.00	2.315	
Customer Service	25	1	1	7	7	3.32	2.155	
Quality Control	29	1	1	7	7	3.21	2.042	
Distribution	29	1	1	7	7	3.21	2.094	
Sales and Marketing	29	1	1	7	7	3.00	2.070	
Engineering	29	1	1	7	7	2.79	1.971	
Purchasing	29	1	1	7	7	2.62	2.043	
Research and Development	24	1	1	7	5	2.25	1.422	

Note: A seven-point scale (1 = not used and 7 = extensively used)

- **ABC-based Actions**

Table 4.24 shows that managers on average agreed that ABC has led to changes in pricing strategy and operating process. The average scores are 5.11 and 4.69. Managers on average appear neutral in deciding whether ABC has led to changes in product-mix, product design, customer segments, outsourcing decisions, distribution channels and the organisation of the work force. Conversely, managers on average disagreed with the statement that ABC has led to changes in the compensation system. As to reliability analysis, Cronbach's alpha value (.939) is highly acceptable.

Table 4.24: Descriptive statistics of ABC-based actions

	N	Minimum		Maximum		Mean	Std. Deviation	α
		Theoretical	Actual	Theoretical	Actual			
ABC-based actions								.939
As a result of using ABC, changes are made in pricing strategy	28	1	1	7	7	5.11	1.853	
As a result of using ABC, changes are made in operating processes	29	1	1	7	7	4.69	1.815	
As a result of using ABC, changes are made in the product mix	27	1	1	7	7	4.26	2.123	
As a result of using ABC, changes are made in customer segments	23	1	1	7	7	3.96	2.099	
As a result of using ABC, changes are made in work force organisation	28	1	1	7	7	3.82	1.765	
As a result of using ABC, changes are made in outsourcing decisions	27	1	1	7	7	3.70	1.996	
As a result of using ABC, changes are made in product design	23	1	1	7	7	3.61	1.901	
As a result of using ABC, changes are made in distribution channels	26	1	1	7	7	3.58	1.793	
As a result of using ABC, changes are made in compensation systems	25	1	1	7	7	2.84	1.841	

Note: A seven-point scale (1 = strongly disagree and 7 = strongly agree)

- **Operational Performance**

Table 4.25 indicates that activity efficiency has improved over the time period considered. The average score is 4.96. Below that, there were medium improvements in product quality and cycle time (mean scores are 4.30 and 4.31, respectively).

Table 4.25: Descriptive statistics of operational performance

	N	Minimum		Maximum		Mean	Std. Deviation
		Theoretical	Actual	Theoretical	Actual		
Activity efficiency	25	1	2	7	7	4.96	1.369
Cycle or lead time	26	1	1	7	7	4.31	1.408
Product/service quality	27	1	1	7	6	4.30	1.382

Note: A seven-point scale (1 = extremely lower and 7 = extremely higher)

- **ABC Benefits**

Table 4.26 and Table 4.27 show that managers on average stood neutral as to whether ABC leads to cost savings in distribution and revenue improvement. Conversely, managers on average disagreed with the statements that ABC has led to cost savings in purchasing and marketing. The average scores are 3.42 and 3.40.

Table 4.26: Descriptive statistics of non-process cost improvement

	N	Minimum		Maximum		Mean	Std. Deviation	α
		Theoretical	Actual	Theoretical	Actual			
Non-process cost improvement								.952
ABC has led to cost savings in distribution.	25	1	1	7	7	3.76	2.260	
ABC has led to cost savings in purchasing.	24	1	1	7	7	3.42	1.976	
ABC has led to cost savings in marketing.	25	1	1	7	7	3.40	2.198	

Note: A seven-point scale (1 = strongly disagree and 7 = strongly agree)

Table 4.27 Descriptive statistics of revenue improvement

	N	Minimum		Maximum		Mean	Std. Deviation
		Theoretical	Actual	Theoretical	Actual		
ABC has led to revenue improvements.	27	1	1	7	7	4.22	1.908

Note: A seven-point scale (1 = strongly disagree and 7 = strongly agree)

Table 4.28 shows that managers on average agreed that ABC has led to cost savings in operating processes. The average score is 5. For customer satisfaction, Table 4.29 shows there was a moderate improvement over the time period considered (mean score = 4.30).

Table 4.28 Descriptive statistics of process cost improvement

	N	Minimum		Maximum		Mean	Std. Deviation
		Theoretical	Actual	Theoretical	Actual		
ABC has led to cost savings in operating processes.	29	1	1	7	7	5.00	1.832

Note: A seven-point scale (1 = strongly disagree and 7 = strongly agree)

Table 4.29 Descriptive statistics of customer satisfaction

	N	Minimum		Maximum		Mean	Std. Deviation
		Theoretical	Actual	Theoretical	Actual		
Customer satisfaction	23	1	1	7	6	4.30	1.396

Note: A seven-point scale (1 = extremely low and 7 = extremely high)

- **ABC Success**

Table 4.30 shows that managers on average agreed that ABC was worth implementing. The average score is high and equal to 6.07.

Table 4.30 Descriptive statistics of ABC success

	N	Minimum		Maximum		Mean	Std. Deviation
		Theoretical	Actual	Theoretical	Actual		
Overall, ABC was worth implementing.	29	1	2	7	7	6.07	1.100

Note: A seven-point scale (1 = strongly disagree and 7 = strongly agree)

4.6.3 Hypotheses Testing

By Referring to the literature chapter, the model of ABC success (see Figure 2.12) constructs a logic flow of relationships that end up with ABC success. The left side of the model represents organisational and technological factors that link to the extent of ABC use (applications and functions). Applications and functions are linked to ABC-based actions. ABC-based actions are linked to operational performance (i.e., quality, cycle time and activity efficiency). Operational performance is linked to ABC success through ABC financial benefits and customer satisfaction. Two levels of analysis were run: (1) univariate analyses (2) multivariate analyses including two control variables, time since introducing ABC and government. Importantly, multivariate analysis is the basis to test the hypotheses and report the findings. When univariate analysis is significant but the multivariate analysis is not significant, in such cases the multivariate results are used to reject the hypothesis. While the univariate analysis indicates there is a direct correlation between the independent variable and the dependent variable, the multivariate analysis indicates that once the influence of all other variables are taken into account there is no significant unique influence of the independent variable on the dependent variable. This indicates that the independent variable shares sufficient information with other explanatory variables to not add anything significant beyond the other variables in the model, although if used alone would help predict the value of the dependent variable.

- **ABC Applications and ABC Functions**

This section reports on the relationships between the organisational and technological factors and ABC applications as well as the relationships between these factors and ABC functions (Figure 4.1).

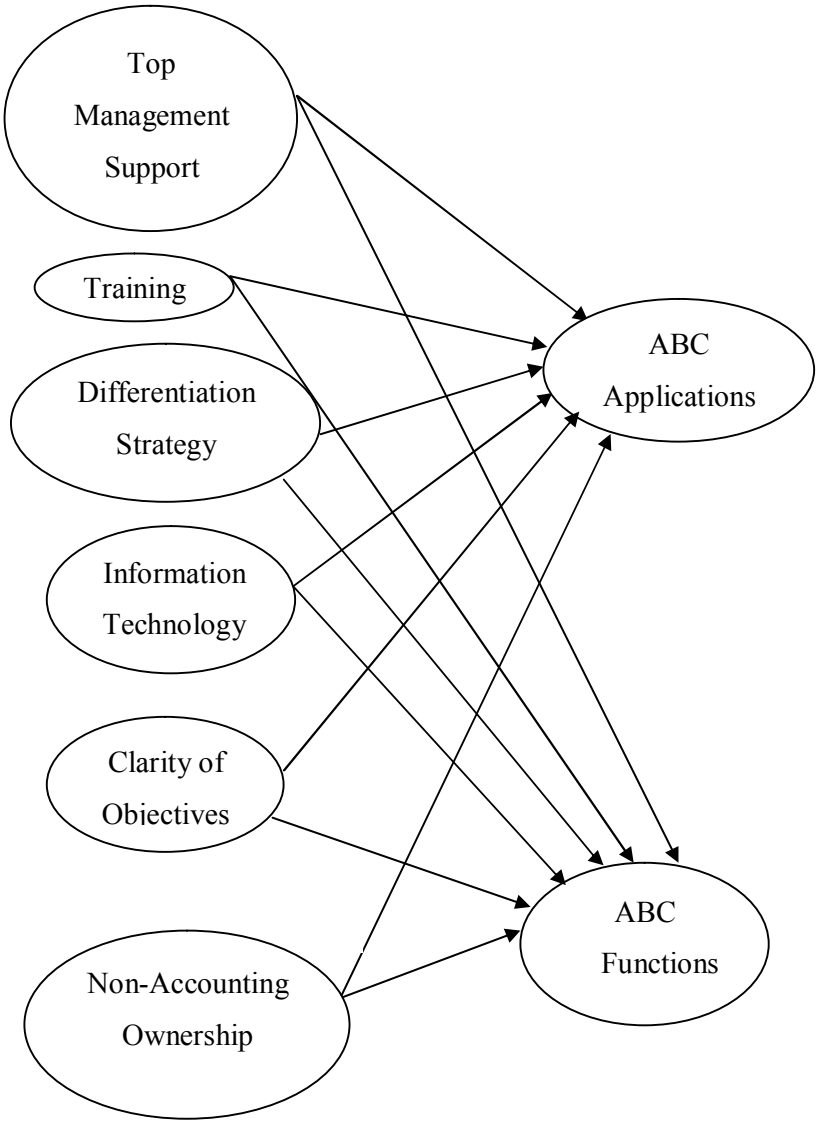

Figure 4.1: The relationships between organisational and technological factors and ABC use

The following tables (4.31 and 4.32) present results of univariate and multivariate analyses for the relationships between organisational and technological factors (independent variables) and ABC applications and ABC functions (dependent variables).

Table 4.31: Univariate analysis of organisational factors with ABC applications and ABC functions (beta coefficients and adjusted R^2 in parentheses)

	ABC Applications	ABC Functions
Top Management Support	.247* (.028)	.243* (.024)
Training	.586*** (.320)	.380** (.113)
Differentiation Strategy	.441*** (.165)	.323** (.070)
Information Technology	.467*** (.192)	.522*** (.246)
Clarity of Objectives	.337** (.082)	.240* (.023)
Non-accounting Ownership	.567*** (.298)	.441*** (.165)

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (one-tailed).

Table 4.32: Multivariate analysis of organisational factors with ABC applications and functions (beta coefficients)

	ABC Applications	ABC Functions
Top Management Support	.004	.530*
Training	.551**	.297
Differentiation Strategy	.279	-.097
Information Technology	.247	.220
Clarity of Objectives	-.594	-.470
Non-accounting Ownership	.514*	.076
Time	-.125	.033
Government	.067	-.320
Adjusted R-square	.429**	.055

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (one-tailed) except for time and government.

The results of the univariate analysis in Table 4.31 indicate that top management support is positively associated with ABC application ($t = 1.350$, $p < .10$). Increase in management support leads to an increase in using ABC applications. Management support explains five per cent of the variance in ABC applications. However, the multivariate analysis in Table 4.32 indicates that top management support has no unique effect on ABC applications. Therefore, (H1a) is rejected and we can conclude that the extent of using ABC applications is not significantly associated with top management support.

Top management support is positively associated with ABC function ($t = 1.300$, $p < .10$). However, the multivariate analysis shows that top management support has a unique effect on ABC functions ($t=1.384$, $p<.10$). The model explains six per cent of the variance in ABC functions. Therefore, (H2a) is accepted, and the analysis shows that the extent of using ABC across functions is positively associated with top management support.

The second factor among the organisational factors is training. Table 4.31 shows a significant association between training and ABC applications ($t = 3.826$, $p < .01$). Training increases the number of ABC applications. Training explains 32 per cent of the variance in ABC applications. As shown in Table 4.32 a combination of training and other organisational factors also reveals a significant relationship between training and ABC applications ($t = 2.036$, $p < .05$). Therefore, (H1b) is accepted and the study concludes that the extent of using ABC applications is positively associated with training.

Table 4.31 indicates a significant association between training and ABC functions ($t = 2.136$, $p < .05$). Training motivates the spread of ABC across departments. Training explains eleven per cent of the variance in ABC functions. Analysing training with other organisational factors does not provide new information on the use of ABC. Therefore, (H2b) is rejected and the study concludes that the extent of using ABC across functions is not significantly associated with training.

Differentiation strategy is another factor that affects the extent of ABC use. Firms are keen to differentiate their products from those of the competitors. Policies and procedures towards this goal differ between companies. ABC systems help managements take decisions on how to renovate their strategies. Differentiation strategy is closely tied to the decision areas 'applications' and departments 'functions'. Table 4.31 shows a significant relationship between differentiation strategy and ABC applications ($t = 2.597$, $p < .01$). This strategy explains 16.5 per cent of the variance in ABC applications. However, this finding is rejected by multivariate analysis with other organisational factors as shown in Table 4.32. Hence, (H1c) is not supported.

Table 4.31 highlights a significant association between differentiation strategy and ABC functions ($t = 1.740$, $p < .05$). However, the analysis with other organisational factors does not show a unique effect of differentiation strategy on ABC functions. Therefore, (H2c) is rejected and the study concludes that there is no significant relationship between differentiation strategy and ABC functions.

Information technology is the technological element that affects the extent of ABC use. It provides a solid infrastructure for viable ABC systems. Integrating ABC with other managerial systems is important for activating and maintaining ABC systems. Table 4.31 shows a significant association between information technology and ABC applications ($t = 2.848$, $p < .01$).An appropriate technological environment extends the use of ABC applications. Information technology explains nineteen per cent of the variance in ABC applications. Analysing information technology with other organisational factors does not reveal a significant association with ABC application. Thus, (H1d) is rejected and it can be concluded that there is no significant relationship between information technology and ABC applications.

Table 4.31 indicates a significant relationship between information technology and ABC functions ($t = 3.184$, $p < .01$). Information technology stimulates the spread of ABC cross-functions. Information technology explains 25 per cent of the variance in ABC functions. A combination of information technology and

other organisational factors does not reveal a significant association between information technology and ABC functions. Hence, (H2d) is rejected and it can be concluded that there is no significant relationship between information technology and ABC functions

Clarity of objectives is important for explaining the purpose of the new system. To succeed with a new system, managers and employees should understand and accept the goals of that system. The relationship between clarity of objectives and ABC applications is significant ($t = 1.896$, $p < .05$). The model predicts eight per cent of the variance in ABC applications. Integrating clarity of objectives with other organisational factors does not indicate any effects of clarity of objectives on ABC. Accordingly, (H1e) is rejected and the study concludes that there is no significant relationship between clarity of objectives and ABC applications.

The association between clarity of objectives and ABC functions is statistically significant ($t = 1.286$, $p < .10$). Clarity of ABC objectives facilitates the use of the system in the different functions. However, analysis with other organisational factors does not identify any unique contribution of clarity of objectives to the prediction of ABC functions. Therefore, the hypothesis (H2e) is rejected and the study concludes that there is no significant relationship between clarity of objectives and ABC functions.

The last factor among the organisational factors is non-accounting ownership. Managers and personnel other than accounting staff should have access to ABC information if this information is relevant to them. The use of ABC information by non-accounting managers is a positive indication of the importance of cost information. The findings suggest a significant association between non-accounting ownership and ABC applications as shown in Table 4.31 ($t = 3.645$, $p < .01$). Non-accounting ownership predicts 30 per cent of the variance in ABC applications. Non-accounting personnel have more access to ABC information when the extent of ABC applications increases. This finding is also corroborated by the analysis with other organisational factors ($t = 1.663$, $p < .10$). On the basis

of this finding, (H1f) is accepted. The extent of using ABC applications is positively associated with non-accounting ownership.

Table 4.31 reveals a significant association between non-accounting ownership and ABC functions ($t = 2.556$, $p < .01$). Non-accounting managers start using ABC information as the use of the system increases across departments. The model explains seventeen per cent of the variance in ABC functions. However, Table 4.32 which includes other organisational factors does not increase the explanatory power of non-accounting ownership. Thus, (H2f) is rejected and the study concludes that the extent of using ABC across functions is not significantly associated with non-accounting ownership.

- **ABC-based Actions**

This section reports on the relationships between ABC applications and ABC functions as independent variables and ABC-based actions as dependent variable (Figure 4.2).

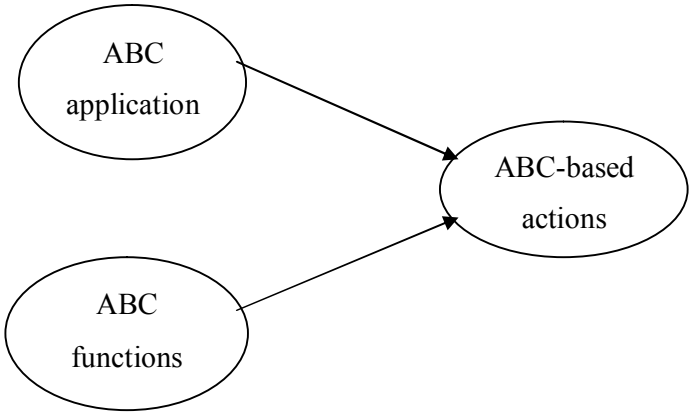

Figure 4.2: The relationships between ABC use and ABC-based actions

ABC applications are the main subjects in which ABC information is used to aid decision making. Extending the use of ABC applications leads to a large number of decision actions. However, ABC functions refer to those departments that have

access to the ABC system. The more managers use ABC information, whether in different applications or different functions, the greater the number of expected actions. As seen in Table 4.33 the individual relationship between ABC applications or ABC functions and ABC-based actions is statistically significant at the one per cent level (adjusted R^2 = .642 & .499 respectively).

Table 4.33: Univariate analysis of ABC applications and functions with ABC-based actions (beta coefficients and adjusted R-squares in parentheses)

	ABC-based actions
ABC applications	.809*** (.642)
ABC functions	.719*** (.499)

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (one-tailed).

Moving to a higher level of the analysis, Table 4.34 shows a significant relationship between ABC applications ($t = 3.145$, $p < .01$) and ABC-based actions. The model explains 70 per cent of the variance in ABC-based actions. These results support (H3a), and the study concludes that there is a positive association between ABC applications and ABC-based actions. Moreover, (H3b) is rejected, which confirms the absence of a significant association between ABC functions and ABC-based actions.

Table 4.34: Multivariate analysis of ABC applications and ABC functions with ABC-based actions (beta coefficients)

	ABC-based actions
ABC applications	.652***
ABC functions	.156
Time	.220
Government	-.114
Adjusted R^2	.701***

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (one-tailed) except for time and government.

- **Operational Performance**

This section reports on the relationships between ABC-based actions and the dimensions of operational performance (see Figure 4.3).

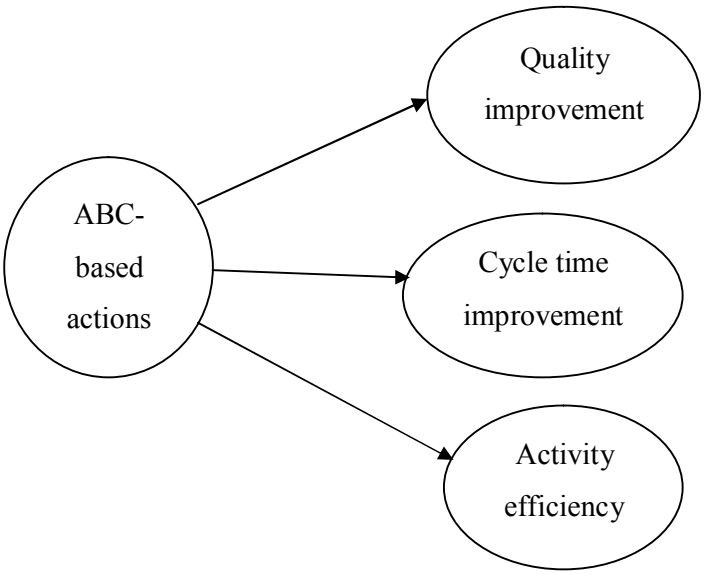

Figure 4.3: The relationships between ABC-based actions and operational performance dimensions

The use of ABC information in the decision-making process is expected to lead to actual improvements on the shop floor. These actions have effects on different dimensions of the operational performance including activities, processes, products and employees. Specifically, this study investigates the improvements in three dimensions of operational performance: product quality, cycle time and activity efficiency.

Table 4.35 indicates a statistically significant relationship between ABC-based actions and product quality ($t = 3.301$, $p < .01$). Product quality is positively associated with ABC-based actions. A combination of ABC-based actions and control variables retains the significance in relationship between ABC-based actions and product quality ($t = 1.748$, $p < .05$) (see Table 4.36). The model explains 26.6 per cent of the variance in product quality. As a result, (H4) is accepted.

Table 4.35: Univariate analysis of ABC-based actions with operational performance dimensions (beta coefficients and adjusted R-squares in parentheses)

	Quality	Cycle time	Activity efficiency
ABC-based actions	.551*** (.276)	.458*** (.177)	.590*** (.320)

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (one-tailed).

Table 4.36: Multivariate Analysis of ABC-based actions with operational performance dimensions (beta coefficients)

	Quality	Cycle time	Activity efficiency
ABC-based actions	.428**	.420*	.520***
Time	.297	.200	.068
Government	-.160	.087	-.125
Adjusted R^2	.266*	.085	.214*

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (one-tailed for ABC-based actions and two-tailed for control variables).

Table 4.35 also points out the significant association between ABC-based actions and cycle time ($t = 2.522$, $p < .01$). More actions shorten the processing time. ABC actions predict eighteen per cent of the variance in cycle time. Analysis with control variables retains the significant relationship between ABC actions and cycle time ($t = 1.425$, $p < .10$) (see Table 4.36). None of the control variables are significant. Based on the above results, (H5) is accepted.

Finally, Table 4.35 also reveals that the association between ABC actions and activity efficiency is statistically significant ($t = 3.505$, $p < .01$). More actions increase the efficiency of activities. The model explains 32 per cent of the variance in activity efficiency. In addition, the multivariate analysis with control variables shows a significant relationship between ABC actions and activity efficiency ($t = 2.247$, $p < .01$) (see Table 4.36). Thus, (H6) is supported.

- **ABC Benefits**

This section reports on the relationships between the dimensions of operational performance and the benefits of ABC (see Figure 4.4).

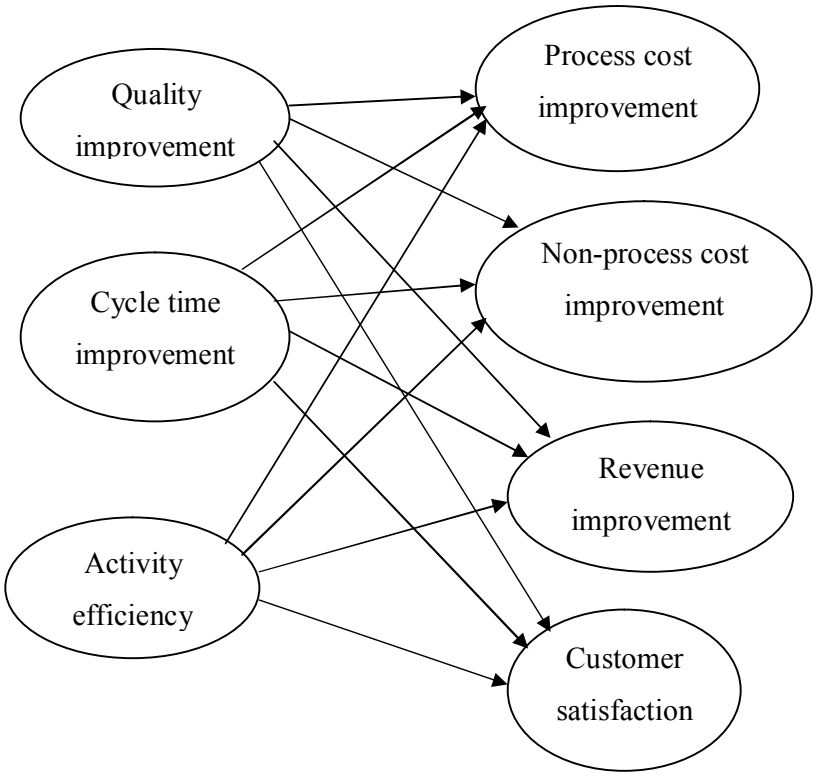

Figure 4.4:The relationships between operational performance dimensions and ABC benefits

ABC benefits have four dimensions: (1) process cost improvement; (2) non-process cost improvement; (3) revenue improvement and (4) customer satisfaction. The model in this study assumes that improvements in the dimensions of operational performance lead to financial and non-financial benefits resulting from ABC.

The first dimension of operational performance is product quality. Table 4.37 indicates a significant association between product quality and process cost improvement ($t = 1.484$, $p < .10$). Higher product quality leads to cost reduction in process costs. The model explains 4.4 per cent of the variance in process cost improvement. Mixing product quality with other performance dimensions does

not prove advantageous for quality over other dimensions (Table 4.38). Therefore, (H7a) is rejected: process cost improvement is not significantly associated with product quality.

Table 4.37: Univariate analysis of operational performance dimensions with process cost improvement (beta coefficients and adjusted R-squares in parentheses)

	Process cost improvement
Product quality	.284* (.044)
Cycle time	.361** (.094)
Activity efficiency	.426*** (.146)

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (one-tailed).

Table 4.38: Multivariate analysis of operational performance dimensions with process cost improvement (beta coefficients)

	Process cost improvement
Product quality	-.145
Cycle time	.075
Activity efficiency	.422*
Time	.514*
Government	.148
Adjusted R-square	.134

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (one-tailed) except for time and government.

Table 4.39 indicates a significant association between product quality and non-process cost improvement ($t = 2.440$, $p < .01$). Higher product quality leads to cost reduction in non-process costs. The model explains 17 per cent of the variance in non-process cost improvement. Mixing product quality with other performance dimensions does not prove advantageous for quality over other dimensions (Table 4.40). Therefore, (H8a) is rejected: non-process cost improvement is not significantly associated with product quality.

Table 4.39: Univariate analysis of operational performance dimensions with non-process cost improvement (beta coefficients and adjusted R-squares in parentheses)

	Non-process cost improvement
Product quality	.453*** (.171)
Cycle time	.456*** (.172)
Activity efficiency	.535*** (.248)

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (one-tailed).

Table 4.40: Multivariate analysis of operational performance dimensions with non-process cost improvement (beta coefficients)

	Non-process cost improvement
Product quality	.150
Cycle time	.020
Activity efficiency	.253
Time	.220
Government	-.083
Adjusted R-square	-.139

Table 4.41 indicates a significant association between product quality and revenue improvement ($t = 2.070$, $p < .05$). Higher product quality increases revenue. The model explains 11 per cent of the variance in revenue improvement. Mixing product quality with other performance dimensions does not prove advantageous for quality over other dimensions (Table 4.42). Therefore, (H9a) is rejected: revenue improvement is not significantly associated with product quality.

Table 4.41: Univariate analysis of operational performance dimensions with revenue improvement (beta coefficients and adjusted R-squares in parentheses)

	Revenue improvement
Product quality	.383** (.112)
Cycle time	.398** (.123)
Activity efficiency	.240 (.013)

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (one-tailed).

Table 4.42: Multivariate analysis of operational performance dimensions with revenue improvement (beta coefficients)

	Revenue improvement
Product quality	.020
Cycle time	.324
Time	.049
Government	.256
Adjusted R-square	-.076

The fourth dimension of ABC benefits is customer satisfaction. The effectiveness (quality measures) and the efficiency of operational performance are expected to induce changes in the attitude of the customers. Table 4.43 reveals a significant association between product quality and customer satisfaction ($t = 7.532$, $p < .01$). Improving quality leads to improvements in customer satisfaction. Product quality predicts 72 per cent of the variance in customer satisfaction. Moreover, combining product quality with cycle time and activity efficiency (see Table 4.44) reveals a statistically significant relationship between product quality and customer satisfaction ($t = 3.293$, $p < .01$). These results support (H10a) and confirm that customer satisfaction is positively associated with product quality.

Table 4.43: Univariate analysis of operational performance dimensions with customer satisfaction (beta coefficients and adjusted R-squares in parentheses)

	Customer satisfaction
Product quality	.854*** (.717)
Cycle time	.739*** (.523)
Activity efficiency	.568*** (.290)

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (one-tailed).

Table 4.44: Multivariate analysis of operational performance dimensions with customer satisfaction (beta coefficients)

	Customer satisfaction
Product quality	.781***
Cycle time	.101
Activity efficiency	.182
Time	-.055
Government	.127
Adjusted R-square	.722***

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (one-tailed).

The second dimension of operational performance is cycle time. The analysis of cycle time with process cost improvement is statistically significant ($t = 1.896$, $p < .05$). Improvement in cycle time decreases process costs. Cycle time predicts 9 per cent of the variance in process cost improvement and the model is significant at 10 per cent (see Table 4.37). The analysis of cycle time with other performance dimensions does not show a unique contribution of cycle time over other dimensions (see Table 4.38). This rejects (H7b) and confirms that process cost improvement is not significantly associated with cycle time.

The analysis of cycle time with non-process cost improvement is statistically significant ($t = 2.401$, $p < .01$). Improvement in cycle time decreases non-process costs. Cycle time predicts seventeen per cent of the variance in non-process cost improvement and the model is significant at five per cent (see Table 4.39). The analysis of cycle time with other performance dimensions does not show a unique contribution of cycle time over other dimensions (see Table 4.40). This rejects (H8b) and confirms that non-process cost improvement is not significantly associated with cycle time.

The analysis of cycle time with revenue improvement is statistically significant ($t = 2.125$, $p < .05$). Improvement in cycle time increases revenue. Cycle time predicts twelve per cent of the variance in revenue improvement and the model is significant at five per cent (see Table 4.41). The analysis of cycle time with other performance dimensions does not show a unique contribution of cycle time over other dimensions (see Table 4.42). This rejects (H9b) and confirms that revenue improvement is not significantly associated with cycle time.

Table 4.43 shows a significant relationship between cycle time and customer satisfaction ($t = 4.900$, $p < .01$). The model explains 52 per cent of the variance in customer satisfaction. However, combining cycle time with quality and efficiency does not indicate any unique contribution from cycle time. Thus, (H10b) is rejected.

The third dimension of operational performance is activity efficiency. Activity efficiency is how efficiently employees use input to produce output. This dimension has a significant impact on process cost improvement ($t = 2.261$, $p < .01$). The higher the efficiency, the lower process costs. The model explains fifteen per cent of the variance in process cost improvement. A multivariate approach with other performance dimensions shows a significance relationship between activity efficiency and process cost improvement ($t = 1.409$, $p < .10$) (see Table 4.38). Consequently, (H7c) is supported, and the study concludes that process cost improvement is positively associated with activity efficiency. The control variable "time" is also significant ($t=1.893$, $p<.10$). Business units that use

ABC for a long time gain lower process costs than those who use the system for a short time.

Activity efficiency has a significant impact on non-process cost improvement ($t = 2.757$, $p < .01$). The higher the efficiency, the lower non-process costs. The model explains twenty five per cent of the variance in non-process cost improvement. A multivariate approach with other performance dimensions shows no significance relationship between activity efficiency and non-process cost improvement ($t = 1.409$, $p < .10$) (see Table 4.40). Consequently, (H8c) is rejected, and the study concludes that non-process cost improvement is not significantly associated with activity efficiency.

Activity efficiency has no significant impact on revenue improvement (see Table 4.41). Consequently, (H9c) is rejected, and the study concludes that revenue improvement is not significantly associated with activity efficiency.

Table 4.43 reveals a significant association between activity efficiency and customer satisfaction ($t = 3.160$, $p < .01$). Improving efficiency leads to improvement in customer satisfaction. Activity efficiency predicts 29 per cent of the variance in customer satisfaction and the model is significant at 1 per cent. Moreover, combining activity efficiency with product quality and cycle time (see Table 4.44) does not show a significant relationship between activity efficiency and customer satisfaction. Thus, (H10c) is rejected.

- **ABC Success**

This section reports on the relationships between ABC benefits and ABC success as shown in Figure 4.5.

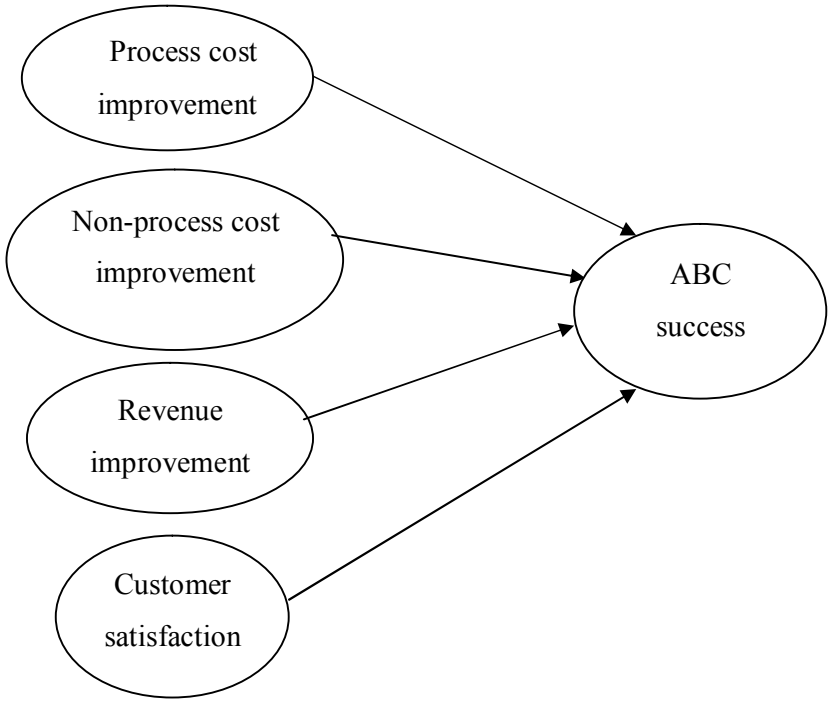

Figure 4.5: The relationships between ABC benefits and ABC success

A measure of ABC success includes overall evaluation by the management of whether ABC was worth implementing. Managers are asked to rate their experience with ABC. It is expected that the financial benefits generated by ABC, together with customer satisfaction will enhance the level of overall ABC success. Overall ABC success is the end point of the model in this study.

Table 4.45 shows a significant relationship between process cost improvement and overall ABC success ($t = 4.306$, $p < .01$). Improving process costs enhances the level of the overall success of ABC. Process cost improvement explains thirty nine per cent of the variance in overall success and the model is significant at one per cent. This finding is also obtained by multivariate analysis as shown in Table 4.46 ($t = 1.799$, $p < .05$). Hence, (H11a) is accepted, and the study concludes that overall ABC success is positively associated with process cost improvement.

Table 4.45: Univariate analysis of ABC benefits with ABC success (beta coefficients and adjusted R-squares in parentheses)

	ABC success
Process cost improvement	.638*** (.385)
Non-process cost improvement	.421*** (.142)
Revenue improvement	.282* (.043)
Customer satisfaction	.376** (.100)

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (one-tailed).

Table 4.46: Multivariate analysis of ABC benefits with ABC success (beta coefficients)

	ABC success
Process cost improvement	.565**
Non-process cost improvement	-.128
Revenue improvement	.122
Customer satisfaction	.252
Time	.041
Government	.042
Adjusted R-square	.210

Note: ***, ** and * indicate statistical significance at the one per cent, five per cent and ten per cent levels, respectively (one-tailed) except for time and government.

Table 4.45 shows a significant relationship between non-process cost improvement and overall ABC success ($t = 1.472$, $p < .01$). Improving non-process costs enhances the level of the overall success of ABC. Non-process cost improvement explains fourteen per cent of the variance in overall success and the model is significant at five per cent. However, this finding does not obtain by multivariate analysis as shown in Table 4.46. Hence, (H11b) is rejected, and the

study concludes that overall ABC success is not significantly associated with process cost improvement.

Table 4.45 shows a significant relationship between revenue improvement and overall ABC success ($t = 2.227$, $p < .10$). Improving revenue enhances the level of the overall success of ABC. However, this finding does not obtain by multivariate analysis as shown in Table 4.46. Hence, (H11c) is rejected, and the study concludes that overall ABC success is not significantly associated with revenue improvement.

Table 4.45 shows a significant relationship between customer satisfaction and overall ABC success ($t = 1.859$, $p < .05$). Improving customer satisfaction enhances the level of the overall success of ABC. Customer satisfaction explains ten per cent of the variance in overall success. However, analysing customer satisfaction with financial benefits (see Table 4.46) shows no unique effect of customer satisfaction on overall ABC success. On the basis of this analysis, (H11d) is rejected, and the study concludes that there is no significant association between customer satisfaction and ABC success.

4.7 Summary

This chapter describes the reasons for organisations to decide not to adopt ABC as well as the reasons for discontinuing the system. Reasons for business units shying away from adopting ABC include the following: ABC is not well suited to their business unit, the existing costing systems already satisfy the needs of the management or other changes or projects assume higher priority. Reasons for business units discontinuing their use of ABC include the following: (1) ABC is too costly to implement and maintain; (2) managers do not believe in or use ABC information; (3) ABC information is difficult to process and interpret; and (4) lack of support from managers and employees. The analysis shows that business units are more interested in other levels of activity management rather than the ABC system. The next chapter will present an overall discussion of the results of this study.

This chapter also contains data analysis pertaining to ABC users. The model of ABC success and the relationship between variables in the model were the main subject of the analysis. Descriptive statistics indicate that the ABC system is not extensively used for outsourcing decisions, designing products, compensating employees and valuing stock. The analysis found that ABC is used mainly for product costing, pricing decisions, performance measurement, budgeting and planning and process improvement.

Differentiation strategy is achieved through product quality, dependability of supply, on-time delivery and broad distribution. There is evidence that on average, ABC implementation teams are cross-functional and non-accounting employees share ABC information. On average, managers expressed agreement on the importance of other organisational and technological factors such as top management support, training, objectives clarity and information technology.

Multivariate analysis including two control variables -time since introducing ABC and government- was used to decide the hypotheses outcomes and report the findings of this study. The univariate and multivariate analyses show different

reactions for factors. Top management support, training and non-accounting ownership have significant effects on the extent of ABC use.

After controlling for other variables, the analysis shows that ABC applications are significant in relation to ABC-based actions. In addition, ABC-based actions hold significant relationships with the different dimensions of operational performance. The descriptive analysis indicates that business units who have used ABC for a longer time have a shorter cycle time and lower process costs and higher level of success. Moreover, business unit size is more related to adoption than success.

Product quality has a significant effect on customer satisfaction while activity efficiency has a significant effect on process cost improvement. However, the overall success of ABC is significantly affected by only process cost improvement.

As shown in Figure 4.6, the bolder lines represent significant relationships and describe pathways to ABC success. Based on the multivariate analysis, two significant continuous pathways are detected. The onset points are training and non-accounting ownership. These lines go through applications and actions to activity efficiency and then to process cost improvement and rest at the end point of the model which is ABC success.

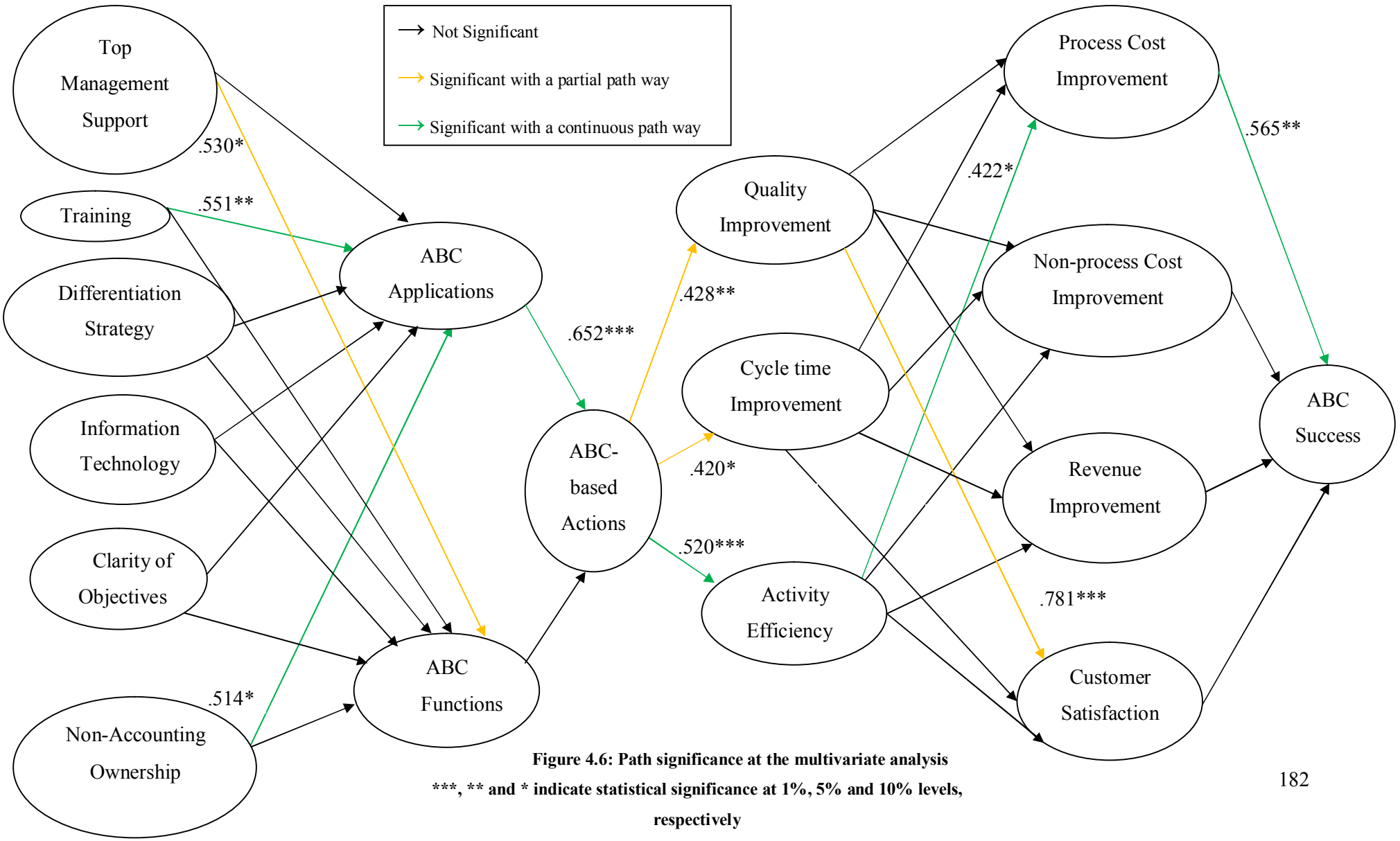

Figure 4.6: Path significance at the multivariate analysis

*****, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively**

Chapter 5: Discussion and Conclusion

5.1 Introduction

This study presents structured analyses of how managers perceive the system's success. The model in this study proposes a pathway of ABC success by linking it to organisational and technological factors as well as to organisational performance. The different factors embedded in the model will mostly form the basis for this discussion. In addition, the reasons for reluctance among businesses to adopt ABC and for discontinuing its use after adoption will be discussed.

5.2 Reasons Why Business Units Have Not Implemented ABC

Investigating the three primary reasons for business units not adopting ABC reveals some interesting findings. The first reason is that ABC systems are not suited to some business units. This general statement implies that business units' characteristics in terms of cost distortion, process complexity and business unit size impact the decision to adopt ABC as cited in the literature (Cagwin & Bouwman 2002; Chongruksut & Brooks 2005; Krumwiede 1998). Importantly, based on responses to the survey, some managers believe that ABC is not suited to them because they do not have manufacturing operations. They just run a business as importers and distributors or service providers. This belief is supported by the literature (Sartorius, Eitzen & Kamala 2007).However, the literature shows that non-manufacturing industries such as the service industry have a high proportion of overhead costs, which suggests the potential applicability of ABC. Moreover, this study has evidence of the growth of ABC in government organisations and financial services. The above discussion implies that ABC is not applicable to every business unit and also implies that some managers have misunderstanding about the applicability of ABC.

The second reason for not adopting ABC is satisfaction with the current cost systems. From the survey, managers do not perceive significant problems with the current systems that impede its functionality. In such circumstances, managers are likely to embark on the decision to simply amend the current systems if there is a demand for greater accuracy of the estimates. Such managers therefore will not see ABC as the means of achieving any desired greater accuracy.

The third reason is that higher priority is given to other innovations or projects. Cost systems may not be of high priority to management. Expenditure on other advanced technologies may be more attractive than cost systems. Innes and Mitchell (1998) reported that many organisations in the UK have changed dramatically in terms of new manufacturing systems, TQM and JIT, but the accounting systems did not change greatly. Moreover, Chongruksut (2002) reported that Thailand companies had the priority over ABC to implement International Organisation for Standardisation (ISO) 9001 – internationally recognised standard for quality management systems certification. This reason is related to the previous one, so if the costs are not highly distorted, managers may not raise concern with the cost system. Instead, managers may not prioritise the need for more accurate cost information. The results in this section are similar to those in the literature (Alsaeed 2005; Cohen , Venieris & Kaimenaki 2005; Hieu 1996; Innes, Mitchell & Sinclair 2000; Nassar et al. 2009). The implication is that cost information is not highly distorted and other technological opportunities are more attractive.

5.3 Reasons Why Business Units Have Discontinued ABC

The view of business units who do not adopt ABC may not be as informed as the views of business units who have implemented ABC for a period and then discontinued it. Business units that adopt ABC for a while are better positioned to evaluate the system and provide a reliable opinion. This study found four main justifications for a business unit to abandon ABC. The results in this section are similar to those in the literature (Cohen , Venieris & Kaimenaki 2005; Hieu 1996; Innes & Mitchell 1998; Jayson 1994).

The first reason for discontinuing ABC is the high cost of operating and maintaining the system. Business units have realised that benefits generated by ABC information have not been enough to repay the related on-going costs. This implies that the feasibility process was not accurate or sufficient to analyse the costs and benefits of the new system. In addition, the implementation costs of ABC differ among business units. For example, using the existing systems to feed ABC and combining related cost drivers is cheaper than a zero-point implementation process with a huge number of cost drivers.

The second reason for discontinuation of the ABC system is that managers did not believe in or use ABC information. They continue to use conventional cost system and consider ABC system as an *ad hoc* system. This implies that ABC objectives were ambiguity and/or there was disagreement about them.

The third reason for business units to discontinue ABC is the difficulties in processing and interpreting information generated by ABC. One explanation for this is that users may possibly not receive sufficient training in how to use the new system. Another explanation is that the features of ABC packaging vary among different types of software and that some software are more attractive than others.

The fourth reason is the absence of support from some managers and employees. The lack of support usually took the form of resistance against ABC. Resistance is one of the major obstacles for successful implementation of ABC. Some managers think that ABC adds additional works to their responsibility centres which they may feel conflicts with the need to meet strict budgets. Other managers also fight against the visibility of the performance of their responsibility centres for different reasons. The implication is there is a need to implement Activity-based budgeting (ABB) to reduce resistance as well as there is a need to well address managers' concerns about the new system in the training sessions.

5.4 ABC Adoption

A majority of organisations are holding on to the conventional systems and are not willing to escalate to a higher level of activity management such as that provided by ABC. AA would be run for the purpose of minimising the effect of factors driving the costs rather than allocating the costs to the outputs. This study shows that the adoption of AA and ACA is considerably higher than the adoption of ABC. This implies that activity management approaches other than ABC are more interesting to organisations.

This study reveals that the adoption of ABC is low compared to findings in most previous studies. ABC systems have been widely advertised by software and consulting firms. However, some of these firms give their products labels other than 'activity-based costing' such as cost control system. Thus, some respondents may understand the concept of ABC under a different name or under other systems as mentioned by Askarany & Smith (2008). Reflecting on our experience with responses, this could be a possible explanation. Moreover, some business units may use a related but less comprehensive method to ABC such as AA and ACA (Bhimani et al. 2007). In this study, these initiatives were explicitly excluded from our definition of ABC.

The findings confirm that large business units are more likely to adopt ABC. These business units have more resources available for such projects and may have unique characteristics, such as product diversity or process complexity, which legitimise the decision to adopt ABC. This finding is consistent with the literature (Askarany & Smith 2008; Chenhall & Langfield-Smith 1998a; Joshi 2001). In contrast, small business units need to be competitive in order to maintain their positions in the market. In case they develop a need for ABC, small business units may be faster in acquiring and implementing advanced technologies (Julien 1993).

5.5 Factors Influence the Management Evaluation of ABC Success

5.5.1 Organisational Factors

The contingency-based model in this study has proposed antecedents, which are organisational and technological factors. This study confirms that top management support is important for using ABC extensively. A significant project such as ABC cannot be successful without commitment from senior management, as the implementation process involves considerable resources that require managerial approval. However, the attention from top management towards ABC is temporary and finishes on completion of the project or when managerial staff become preoccupied with another agenda or even the sponsor leaving the company. This means that top management support is important for successful implementation across functional which is not necessary lead to successful operating of the ABC system. Also, the findings indicate that top management support is significantly affects the spread of ABC across functions of the business unit. This decision needs to be justified given the high costs to implement ABC across functions and the limited benefits of ABC to these functions. Indeed, some functions may not in real need to ABC information. If the business unit has typical customers, then distribution function may not benefit from ABC. This discussion reaches to the implication of top management support being great supportive to the implementation process which contribute to the spread of ABC across functions. However, implementing ABC across functions should not be a main objective for the upper management given that ABC system is not applicable to some functions. This leads to the conclusion that ABC-functions should not consider as a measure of ABC success.

Another organisational factor is training. Training may occur in different stages of the project including design, implementation and using the ABC system. This study supports the view that training is critical for successful ABC implementation, and this outcome is consistent with previous studies (Foster & Swenson 1997; McGowan & Klammer 1997; Sartorius, Eitzen & Kamala 2007; Shields 1995). This study shows that users find difficulty in processing and interpreting data generated by ABC, which implies that training efforts may be

better directed to the end users rather than the staff who prepare the data. In addition, training should be extended to address employees' concerns regarding the role of ABC. Training sessions initially need to explain how ABC would change the corporate culture in terms of behaviour and organisational issues and the expected reactions from managers. Extracting agreement from managers about ABC objectives can secure the success of training.

ABC systems are not exclusively for accounting or finance departments. ABC information could be used by other functions in organisations such as production, marketing and distribution. This study supports the view that non-accounting ownership is a significant factor for the success of the ABC system. This finding is in line with the literature (McGowan & Klammer 1997; Sartorius, Eitzen & Kamala 2007; Swenson & Barney 2001). Granting access to ABC information to other managers optimises the benefits of the new system. It is important to state initially which functions or managers are the potential users of the system. An ABC system is a control system that should be viewed by authorised persons. However, even if other managers have the right to use the system, this may not encourage them to use ABC information, unless the system is linked to their performance and compensation.

5.5.2 ABC Applications

The findings of this study indicate that ABC-applications play an important role in establishing linkage between organisational factors and ABC-based actions. Using ABC applications extensively would increase the benefits and the level of success. Top management may strive to implement ABC cross the business unit functions, but this decision may not affect significantly the level of ABC success. Top management should decide what applications are needed to design and who should use them. The objective of specific application must be written clearly and address the main functions for which this application would be used. Some applications may only use in one function and some may use in multiple functions. The former could be used extensively while the later could be used less extensively. Based on applications, the first one is more successful, but on

functions, the second one is more successful. Accordingly, this study implies that ABC applications are valid and reliable measure of ABC use and ABC systems are mainly used for specific applications in certain functions.

5.5.3 ABC-based Actions

The model in this study is based on a decision-making perspective. The assumption is that ABC is implemented in order to diagnose the current status and aid in decision making. If the decision to adopt ABC were rational, then it would be expected to lead to some changes in the organisation. Using ABC would not translate into improved performance unless there are practical actions. These actions should be linked to the strategic and operational objectives of the organisation to ensure that these actions occur in the right direction. If product quality, for example, is not important to the customer, the management can not invest too much in quality initiatives. The investment decision could improve the quality but would not improve the beneficial outcomes. ABC-based actions could take the forms of implementing advanced practices such as process reengineering. Some studies (Banker, Bardhan & Chen 2008; Cagwin & Bouwman 2002) deal with this point as interaction between ABC and other advanced techniques. However, this study implies that the decision to implement other advanced techniques could be based on using ABC and technological actions are necessary to improve the operational performance.

5.5.4 Activity Efficiency

This study found that ABC system increased significantly the overall efficiency of activities. Operational performance is the output and the subject of the expected improvements that impact the benefits of ABC. This study employs three measures of operational performance; product quality, cycle time and activity efficiency. ABC may increase the efficiency for some functions (e.g., customer service, distribution) but not for other functions (e.g., quality control). To be successful, ABC should at least increase the overall efficiency for activities. In other words, ABC should be successful in lowering the overall costs through

identifying opportunities for cost reductions. On the other hand, cost reduction efforts should not compromise product quality and lunge the level of customer satisfaction.

5.5.5 Process Cost Improvement

The findings of this study indicate that the increased efficiency of activities led significantly to process cost reductions. ABC benefits have two dimensions: (1) financial benefits and (2) customer satisfaction. ABC has led to overall moderate financial benefits, and this finding is consistent with previous studies (Baird, Harrison & Reeve 2007; Shields 1995; Swenson & Barney 2001). It is obvious that management gained more cost savings in primary or process activities than secondary or support activities. This implies that the number of opportunities for cost reductions in process activities is higher than in support activities. Also, it is evident that customer satisfaction comes after the financial benefits in terms of management's priorities.

The findings show that business units who use ABC for a longer time obtain more benefits regarding the ability to reduce cycle time and related costs and increase the level of overall success of ABC. This indicates that ABC adopters need a long time to fully realise the benefits of the new system. This finding is consistent with previous studies (Foster & Swenson 1997). ABC gives signals that induce management to develop beneficial changes. These changes may result in the implementation of other advanced managerial technologies, such as JIT and TQM. For example, when ABC determines the costs of non-value added activities such as material moving or product inspection, management may consider the implementation of such advanced techniques. Moreover, ABC represents an important source of information for these techniques.

5.6 ABC Success

The study found that process cost reductions impact significantly the overall success of ABC system. This study employs management evaluation as the ultimate and aggregate measure of ABC success. When managers compare practically the benefits generated from ABC with the costs to implement and maintain the system, they can reasonably evaluate the new system. The model in the effective state provides guidelines to managers as to what factors should be considered in the evaluation process. When the evaluation process of ABC success takes place during the implementation process or before a certain point of time, the evaluation is an incomplete and may cause the system to be judged mistakenly. Therefore, the assessment of ABC success should be started after the actions have been made as a result of using ABC and the effects of these actions on the operational performance could be realized and measures to a reliable degree of accuracy. The important implication is that management evaluation should be sufficient to measure the success of ABC since other alternative measures are intermediaries and should be considered in the management assessment of overall ABC success.

Respondents to this study strongly express that ABC is worth implementing. This finding is consistent with previous studies (Krumwiede 1998; Nassar et al. 2009; Swenson 1995). While there were overall moderate improvements in the financial benefits and customer satisfaction, this implies that management has other considerations other than those mentioned in this study. Individual behaviour, for example, may change positively as a result of introducing ABC. Importantly, ABC success as perceived by mangers considers both benefits and costs associated with operating and maintaining the ABC system. The following section gives a clear picture of the link between costs and benefits.

5.7 Path Significance of ABC Success

In this section, the path significance is used to determine the paths leading to an evaluation of overall ABC success. The analyses revealed that some factors contribute significantly to the success of ABC. Specifically, the organisational factors (i.e., training and non-accounting ownership) extend the depth of using ABC applications. So, well trained non-accounting managers are able to use ABC applications extensively.

Using ABC applications extensively increase the number of ABC-based actions such as changes in product price or operating processes. This implies that cost distortion has influenced the decision to adopt ABC and subsequently, management left the importance of cost information and used it in the decision making process. According to decision outcomes, some changes were occurred within the organisation. These changes are success indicators and the lack of them indicates that either the decision to adopt ABC was not efficient or lack of support from managers.

Based on cost information generated by ABC, these changes or actions increase the overall efficiency of activities. The increased efficiency translates into process cost savings which increase the level of ABC success. However, the moderate financial benefits confirm that management has also non-financial considerations in evaluating the success of ABC.

5.8 Knowledge Contribution

The main contribution of this study is the development of an integrated model that charts a path to an evaluation of overall ABC success. The model explains the relationships between organisational and technological factors as antecedents and ABC success through a tested pathway. ABC success captures the overall success as perceived by management. Another contribution of this study is the synergy between the various measures of ABC success in the literature.

5.9 Study's Implications

The previous discussion leads to important implications for academics and managers as follows:

- Management assessment of overall ABC success is the ultimate and aggregate measure of ABC success, while other alternative measures of ABC success consider intermediaries or factors influence management assessment of overall ABC success.

- The integrated model with the effective pathway indicates that management assessment of overall ABC success is driven by the ability of ABC to reduce process costs.

- The moderate financial benefits generated by ABC confirm that management has also non-financial considerations in evaluating the overall success of ABC.

- ABC should be successful in lowering the overall costs through identifying opportunities for cost reductions. Noticeably, the number of opportunities for cost reductions in process activities is higher than in support activities. On the other hand, cost reduction efforts should not compromise product quality and decrease the level of customer satisfaction.

- The decision to implement other advanced techniques such as TQM, JIT and process reengineering could be based on using ABC as subsequent actions and these actions are necessary to explain improvements in the operational performance.

- The lack of practical actions indicates that either the decision to adopt ABC was not efficient or lack of support from managers.

- The potential for cost distortion has influenced the decision to adopt ABC and subsequently, management left the importance of cost information and used it in the decision making process and subsequent actions.

- Management exercise caution in the decision to implement ABC system across functions. Implementing ABC across functions may not be justified in terms of high complexity and low needs (high costs and low benefits). Accordingly, function–based success measure is not a valid measure of ABC success since this measure is not applicable to business units that implement ABC in certain functions. In other words, it can not be said that broad implementation of ABC in the business unit is more successful than limited implementation.

- Based on the previous point, top management support should be focused on applications. The selected applications would be related to specific functions with authorised managers. For training, the implication is that managers who use ABC system need more training efforts than staff who prepare the data. In addition, training should be extended to address employees' concerns regarding the role of ABC. For ownership, ABC as a management system who designed to be used by non-accounting mangers, but those managers may not be encouraged to use ABC information, unless the system is linked to their performance and compensation.

5.10 Conclusion

This study aims at evaluating a model of successful ABC adoption. The directional model describes factors (determinants of ABC use) that influence ABC as well as factors that are influenced by ABC. Factors that affect significantly ABC applications include training and non-accounting ownership.

The assumption underlying the model is that the use of ABC would result in decision actions. This study shows that ABC has led to changes in pricing strategy and operating process. The consequences of these actions are realised in the context of the operational performance for the business unit. Different dimensions of performance have been studied in this research. These include product quality, cycle time and activity efficiency. There are moderate improvements reported in these measures over the time period considered. ABC-based actions have significant positive association with all the dimensions of operational performance.

In this study, adoption of an ABC system produces moderate success in the context of financial benefits and customer satisfaction and a high level of success in the context of management perception. This suggests that there are other factors that also contribute to the assessment of overall success. The activity efficiency and product quality measures are significant and positively correlated with process cost improvement and customer satisfaction, respectively. In addition, the perception of overall ABC success is positively and significantly associated with process cost improvement.

The model in this study includes hypothesised determinants of ABC success. Some of the organisational factors (i.e., training and non-accounting ownership) have significant paths linked to ABC applications. All these paths increase decision actions, which in turn improve the overall activity efficiency. The improved efficiency increases process cost savings, which in turn increase the level of ABC success.

The overall success of ABC is associated with the time since introduction of ABC. Business units were able to reduce cycle time and gain cost reductions as the time pass on. In addition business unit size was found to be related to adoption rather than success.

This study also investigated the reasons for business units not adopting ABC as well as the reasons for discontinuing it. This study confirms that ABC systems are not applicable to all business units. Moreover, managers are satisfied to higher degree with the existing systems. In addition, cost systems are not of higher priority to management comparing to other technological changes. On the other hand, investigating business units that have abandoned ABC shows important views as to why they discontinued it. Respondents express four reasons: first, it is too costly to operate; second, managers did not believe in and use ABC information; third, difficulties in processing and interpreting information generated by ABC; fourth, lack of support from employees and managers.

5.11 Limitations and Further Studies

The small sample of respondents was a significant limitation. From the analytical perspective, the normal distribution assumption for the dependent variables used in multivariate analysis and parametric tests need a large number of respondents. The small sample also restricts our ability to conduct the more robust structural equation modelling (SEM).

Given the ultimate difficulty to search for ABC adopters and the need to have a third party to identify them, it cannot be said that the sample is randomly selected and represents the population of ABC adopters.

There are some possibilities for future studies. Getting a suitable size of sample that overcomes the limitations could confirm the findings of this study. Moreover, ABC success model in this study can be assessed in a specific user sector, particularly the government sector or in specific country. The model also can be assessed in different level of activity management other than ABC. In the context

of ABC implementation stages, the model can be assessed in different stages. Finally, it could be investigated whether the implementation process of ABC in the corporate headquarters would be different from other parts or business units of organisations. Reference to the corporate headquarters as the unit of analysis is rarely in the literature which warrants further investigation.

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Appendix A – **Introduction to Survey**

Dear Sir / Madam,

I am working towards a Doctor of Philosophy degree through the School of Accounting at Victoria University, Australia. I am currently conducting a research project which focuses on Activity-based Cost Management (ABCM) system in all types of business. The objective of this study is to assess the use of activity-based cost information in decision-making and evaluate the success of ABCM. This project is under the supervision of Professor Bob Clift.

I would appreciate it if you would give approximately 20 minutes to complete this questionnaire and submit it at your earliest convenience. Your response to the questionnaire will be invaluable and contribute to the overall success of the research. It is important to note that not all the sections of the questionnaire are relevant to you. Indeed, some sections are relevant to non-ABC users and those who have abandoned this accounting method.

The research is being conducted at a business unit level (such as division, plant and single firm) so if your firm has more than one business unit, would you please forward a copy of the questionnaire to the financial controller or equivalent in that business unit.

The project has received and will be conducted in accordance with the ethical approval provided by the Victoria University Human Research Ethics Committee, including maintaining confidentiality of the data.

Your participation in this project may be directed to the principal supervisor Prof. Clift, email: bob.clift@vu.edu.au or the researcher Yousef Aldukhil, email: yousef.aldukhil@live.vu.edu.au. If you have any queries or complaints about the way you have been treated, you may contact the Secretary, Victoria University Human Research Ethics Committee, Victoria University, PO Box 14428, Melbourne, VIC, 8001.

Thank you in advance for your cooperation.

Yours sincerely,
Yousef Aldukhil

Appendix B - Survey on Activity-based Cost Management

SECTION 1: If you are currently using ABC

When did your business unit begin using ABC to aid in decision-making?
Month/Year _____/_____

(A) Business Unit Strategy

Please circle the number which best describes the extent to which your business unit emphasizes each of the following strategy

	Not Emphasised						Highly Emphasised
1 On-time delivery	1	2	3	4	5	6	7
2 Dependable delivery promises	1	2	3	4	5	6	7
3 High quality products	1	2	3	4	5	6	7
4 Effective after-sales service and support	1	2	3	4	5	6	7
5 Changes in design and introduce new products quickly	1	2	3	4	5	6	7
6 Customize products and services to customer needs	1	2	3	4	5	6	7
7 Product and service availability (broad distribution)	1	2	3	4	5	6	7
8 Rapid volume/product mix changes	1	2	3	4	5	6	7

(B) Information Technology

Please circle the number which best indicates your level of agreement with the following statements.

	Strongly Disagree						Strongly Agree
1 The business unit's information systems are integrated with each other.	1	2	3	4	5	6	7
2 The information systems offer user-friendly query capability.	1	2	3	4	5	6	7
3 Detailed sales and operating data are available in the information systems for the past year.	1	2	3	4	5	6	7
4 Different aspects of cost and performance data are available in the information systems.	1	2	3	4	5	6	7
5 Operating data are updated 'real time' rather than periodically.	1	2	3	4	5	6	7
6 The quality of the operating data is excellent.	1	2	3	4	5	6	7

(C) ABC Implementation

Please circle the number which best indicates your level of agreement with the following statements.

	Strongly Disagree						Strongly agree
1 ABC received active support from top management.	1	2	3	4	5	6	7
2 Top management provided adequate resources to the ABC implementation effort.	1	2	3	4	5	6	7
3 Top management effectively communicated its support for implementing ABC.	1	2	3	4	5	6	7
4 Top management exercised its authority in support of ABC implementation.	1	2	3	4	5	6	7
5 ABC has been closely tied to the competitive strategies of the business unit.	1	2	3	4	5	6	7
6 Adequate training was provided for designing ABC.	1	2	3	4	5	6	7
7 Adequate training was provided for implementing ABC.	1	2	3	4	5	6	7
8 Adequate training was provided for using ABC.	1	2	3	4	5	6	7
9 Overall, training was useful in addressing concerns about the role of ABC.	1	2	3	4	5	6	7
10 Departments other than accounting have shown personal ownership for ABC information.	1	2	3	4	5	6	7
11 The ABC implementation team was truly cross-functional.	1	2	3	4	5	6	7
12 ABC has been linked to performance evaluation of non-accounting personnel.	1	2	3	4	5	6	7
13 ABC has been linked to compensation of non-accounting personnel.	1	2	3	4	5	6	7
14 When the ABC initiative began, its purpose was clear and concise.	1	2	3	4	5	6	7
15 When the ABC initiative began, there was consensus about its specific objectives.	1	2	3	4	5	6	7
16 Following the introduction of ABC, its initial objectives were extended.	1	2	3	4	5	6	7
17 The objectives of ABC were applicable.	1	2	3	4	5	6	7

(D) ABC Use

Please circle the number which best indicates the extent of using ABC for the following purposes and functions.

	Not Used						Extensively Used
1 Product/service costing	1	2	3	4	5	6	7
2 Pricing decisions	1	2	3	4	5	6	7
3 Product-mix decisions	1	2	3	4	5	6	7
4 Process improvement	1	2	3	4	5	6	7
5 Product design	1	2	3	4	5	6	7
6 Customer profitability analysis	1	2	3	4	5	6	7
7 Outsourcing decisions	1	2	3	4	5	6	7
8 Performance measurement	1	2	3	4	5	6	7
9 Compensation system	1	2	3	4	5	6	7
10 Budgeting and planning	1	2	3	4	5	6	7
11 Stock valuation	1	2	3	4	5	6	7
12 Accounting/Finance	1	2	3	4	5	6	7
13 Manufacturing/Production	1	2	3	4	5	6	7
14 Engineering	1	2	3	4	5	6	7
15 Purchasing	1	2	3	4	5	6	7
16 Quality Control	1	2	3	4	5	6	7
17 Research and Development	1	2	3	4	5	6	7
18 Customer Service	1	2	3	4	5	6	7
19 Sales and Marketing	1	2	3	4	5	6	7
20 Distribution	1	2	3	4	5	6	7
21 Other, please specify	1	2	3	4	5	6	7

(E) ABC-based Actions

Please circle the number which best indicates your level of agreement with the following statements.

	Not Applied	Strongly Disagree						Strongly Agree
1 As a result of using ABC, changes are made in pricing strategy.	0	1	2	3	4	5	6	7
2 As a result of using ABC, changes are made in product mix.	0	1	2	3	4	5	6	7
3 As a result of using ABC, changes are made in operating processes.	0	1	2	3	4	5	6	7
4 As a result of using ABC, changes are made in product design.	0	1	2	3	4	5	6	7
5 As a result of using ABC, changes are made in customer segments.	0	1	2	3	4	5	6	7
6 As a result of using ABC, changes are made in outsourcing decisions.	0	1	2	3	4	5	6	7
7 As a result of using ABC, changes are made in distribution channels.	0	1	2	3	4	5	6	7
8 As a result of using ABC, changes are made in compensation systems.	0	1	2	3	4	5	6	7
9 As a result of using ABC, changes are made in work force organisation.	0	1	2	3	4	5	6	7

(F) Operational Performance

Please circle the number which best indicates the extent to which the following performance measures have improved over the last three years**.**

	Extremely Lower						Extremely Higher
1 Product/service quality (%)	1	2	3	4	5	6	7
2 Manufacturing/operations costs ($)	1	2	3	4	5	6	7
3 Cycle or lead time	1	2	3	4	5	6	7
4 Employee productivity (employee output/employee input)	1	2	3	4	5	6	7
5 Activity efficiency (activity input/activity output)	1	2	3	4	5	6	7
6 Customer satisfaction- survey rating (%)	1	2	3	4	5	6	7

(G) ABC Success

Please circle the number which best indicates your level of agreement with the following statements.

	Not Applied	Strongly Disagree						Strongly Agree
1 ABC has led to cost savings in purchasing.	0	1	2	3	4	5	6	7
2 ABC has led to cost savings in product design.	0	1	2	3	4	5	6	7
3 ABC has led to cost savings in operating process.	0	1	2	3	4	5	6	7
4 ABC has led to cost savings in marketing.	0	1	2	3	4	5	6	7
5 ABC has led to cost savings in distribution.	0	1	2	3	4	5	6	7
6 ABC has led to revenue improvements.	0	1	2	3	4	5	6	7
7 Overall, ABC was worth implementing.	0	1	2	3	4	5	6	7

(PLEASE GO TO SECTION 4)

Section 2: If you have never adopted ABC

1. Please indicate the reasons you remain with your current system. (Please tick only the reasons that appear to be the case in your business unit)

- □ Lack of awareness of ABC development
- □ Costly to switch to ABC
- □ ABC system is not well suited for the business unit
- □ ABC system is too complex to implement and/or utilize
- □ Advantage conferred by ABC system is negligible
- □ Problems with current costing system are not significant
- □ Current systems have already satisfied the needs of management
- □ Current costing system has been modified by using more appropriate cost allocation bases
- □ Benefits of ABC are still not totally demonstrated in practice
- □ Difficulties in collecting data on the cost drivers from the existing system
- □ Difficulties in selecting cost drivers
- □ Higher priorities of other changes or projects
- □ Lack of internal resources
- □ Top management do not support the implementation of ABC
- □ Lack of support from employees or management other than yourself
- □ Other (please specify)

2. Has your business unit identified and analysed the various activities involved with providing services or producing products?

- □ Yes
- □ No

3. Has your business unit identified and calculated the costs of the various activities involved with providing services or producing products for the purpose of identifying the factors which influence costs?

- Yes
- No

4. Does your business unit plan to implement ABC in the future?

- Yes
- No
- Not Sure

(PLEASE GO TO SECTION 4)

Section 3: If you adopted ABC in the past but have now discontinued it

1. What reasons drove your business unit to discontinue ABC? (Please tick only the reasons which were present in your business unit)

- □ A decision from the parent company
- □ Too costly to operate (benefits did not justify implementation costs)
- □ Information from ABC was not significantly different from the old system
- □ Modifying the old system was the better solution
- □ Information generated by ABC was not useful for decision making
- □ Difficulties in processing and interpreting information generated by ABC
- □ Managers did not believe in and use the ABC information
- □ Lost internal champion
- □ Lack of support from employees or management other than yourself
- □ Other (please specify)

2. Has your business unit identified and analysed the various activities involved with providing services or producing products?

- □ Yes
- □ No

3. Has your business unit identified and calculated the costs of the various activities involved with providing services or producing products for the purpose of identifying the factors which influence costs?

- □ Yes
- □ No

4. Does your business unit plan to implement ABC again in the future?

- □ Yes
- □ No
- □ Not Sure

(PLEASE GO TO SECTION 4)

Section 4: General Questions (Demography)

1. How would you classify your business unit?

- □ Division
- □ Headquarters
- □ Single firm
- □ A company which belongs to a group of companies
- □ Other (please specify)

2. In which country is your business unit located?

- □ Australia
- □ Other (please specify)

3. In which industry is your business unit involved?

- □ Manufacturing
- □ Construction
- □ Wholesale/Retail
- □ Government and Non-profit Organisations
- □ Financial and Insurance Services
- □ Energy and Utilities
- □ Transportation, Storage, Packaging
- □ Telecommunication and Media
- □ Information Technologies (IT)
- □ Technical Services and Consultations
- □ Leisure and Entertainment
- □ Hospitality
- □ Publishing
- □ Education and Training
- □ Health Care Services
- □ Other Services (Please specify)

4. How many employees in your business unit? _____

5. Please provide the following information for the person completing the questionnaire.

Job title_____

Number of years in this position _____

Number of years in this business unit _____

6. Would you agree to be interviewed as part of a confirmatory study?

- □ Yes
- □ No

7. Would you like to receive a copy of the summary report of the study?

- □ Yes
- □ No

8. If yes to question 6 and/or 7, please fill in the form below.

Name: _____

Company: _____

Postal Address: _____

Telephone (full code): _____

Email: _____

Thank you very much for taking the time to complete this questionnaire. Your help in providing this information is greatly appreciated. If there is anything else you would like to tell us about, please do so in the space provided below.