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A Contingency Model of Activity-Based Costing (ABC) Systems: An Empirical Investigation in the UK's Manufacturing Business Units

Amr Mohamed Said Abdel Halim

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ABSTRACT

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A CONTINGENCY MODEL OF ACTIVITY-BASED COSTING (ABC) SYSTEMS: AN EMPIRICAL INVESTIGATION IN THE UK'S MANUFACTURING BUSINESS UNITS

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The contingency approach is a recent and important development in ABC research. It is suggested that ABC system adoption and success will depend upon specific organisational factors such as strategy, structure, technology, and environment. However, less contingency-based research has been done on ABC systems in the UK. Therefore, a contingency model of ABC systems has been developed in order to empirically examine the relationship between ABC systems, competitive strategy, advanced manufacturing technology (AMT), management accounting practices, and the performance of the UK's manufacturing business units.

Precisely speaking, this study examines one major question: How does the fit between ABC systems, competitive strategy, AMT, and management accounting practices affect the performance of the UK's manufacturing business units? To investigate this question, a reliable and valid instrument was developed. Extensive efforts were made to ensure content validity during instrument development by carefully designing processes for item generation, pre-testing, and pilot study testing. A cross-sectional mail survey of a sample of 112 UK's manufacturing business units has been conducted.

The empirical findings of the study show that the use of ABC systems is associated with the performance of the UK's manufacturing business units. In addition, structural equation modeling (SEM), AMOS 5.0 analysis, offers statistical evidence that the patterns of ABC use by the adopters would influence business units' performance. The results also indicate empirical support for the study major premise that the fit between competitive strategy, AMT, and management accounting practices will be associated with the adoption of the different patterns of ABC systems.

This study contributes to the knowledge and management accounting literature by providing some explanations on the contextual factors that influence the adoption and success of ABC systems. The study concluded that it is not necessarily true that business units that have not adopted ABC systems could improve their performance by simply introducing ABC as stand alone techniques. While ABC systems may provide information that contributes to accurate decisions, leading to performance enhancement, according to the study sample, it can be stated that the decisions that led to a higher performance in the ABC business units were due to the application of particular patterns of ABC systems and other contingent factors. This finding has significant implications for designing and implementing ABC systems and other types of management accounting techniques. Moreover, the use of SEM to test the study hypotheses can be viewed as an important methodological contribution. Finally, the study suggests several avenues for further research.

Dedication

To my dear father and to my beloved mother

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Chapter 1: Introduction

The management accounting literature has provided four genres of ABC research: consulting, basic, critical and contingency research. It can be claimed that the genre of contingency research is the most recent and important development in the ABC literature. It is suggested that ABC adoption and success will depend upon specific organisational factors. However, contingency-based research has been given less attention particularly in the UK. Therefore, this study develops a new and complex contingency model of ABC in order to examine the relationship between ABC systems, competitive strategy, AMT, management accounting practices, and the performance of the UK's manufacturing business units.

1.1 Theoretical Background

Management accounting does not exist for its own sake; organisations have it because they need the information it could provide. The purpose of management accounting is to contribute to four major activities (Shillinglaw, 1982, p. 3): (1) managerial planning and control, (2) preparation of financial statements, (3) preparation of business income tax returns, and (4) determination of the reimbursable amounts under cost-based contracts or similar pricing or funding arrangements.

Strategic planning is specifically mentioned as a major type of managerial planning activity. However, careful examination of the management accounting literature reveals little discussion of how management accounting data can be used for strategic planning. All organisations make decisions that affect their long-run competitive position and profitability. Some, perhaps many, of these decisions turn out to be mistaken. Strategic planning is an attempt to formalize the process of making these important decisions and so reduce the incidence of costly mistakes. The purpose is to help the organisation position itself against its competitors in the pursuit of competitive advantage (Hergert and Morris, 1989).

The general irrelevance of traditional costing systems for strategic decision-making has been commented on by a number of academics (e.g., Kaplan, 1984; Hergert and Morris, 1989; Berliner and Brimson, 1988). Kaplan (1984) said about traditional cost accounting and management control systems (MCS):

> [...] Virtually all of the practices employed by firms today and explicated in leading cost accounting textbooks had been developed by 1925. During the last 60 years there has been little innovation in the design and implementation of cost accounting and management control systems.

Hergert and Morris (1989) pointed out that traditional costing systems initially developed to measure true costs, have been bereft of significant innovation for the last 60 years, are not able to furnish the data required by the modern strategic planning frameworks of the 70s and 80s.

Berliner and Brimson (1988, p. vii) argued that with such traditional costing systems many organisations are struggling with important economic issues, such as how to cost-justify capital investments, how to improve product cost information, how to change decision-support tools like product-abandonment models and make/buy decisions, and to revise performance measures that currently encourage only short-term productivity.

In the years since Woodward's (1965) seminal work, new developments have occurred in manufacturing technology. Advanced manufacturing technologies (AMT), such as robotics, computer-aided design (CAD), and flexible manufacturing systems (FMS), have revolutionized the manufacturing shop floor. They have dramatically changed manufacturing cost-behaviour patterns. Overhead costs have risen dramatically and now exceed direct costs. It is not surprising to find that direct labour accounts for only 8-12 percent of total cost at many factories. This trend is predicted to be even more pronounced in the factory of the future (Berliner and Brimson, 1988; Brimson, 1991; Kerremans et al., 1991).

Traditional costing systems do not adequately support the objectives of international competition and the AMT environment for several reasons (Berliner and Brimson, 1988; Brimson, 1991): first, the philosophy of absorbing overhead costs by allocating them on the basis of production volume-related has caused distortions of overhead costs allocation. With distorted costing, some products are overcharged while others are subsidized. Thus, profitable organisations are lost through overpricing, and unprofitable organisations win through underpricing. Second, they are plagued by high overhead rates resulting from inadequately traced costs, and they do not pinpoint the activities that generate unnecessary costs rather than customer-perceived value. Third, information obtained from traditional costing systems is usually inadequate for strategic cost analysis because it does not help the organisation understand the behaviour of costs from a strategic perspective.

In the light of the above, it can be stated that the progressive use of AMT has made the traditional costing systems obsolete by creating an overhead-intensive environment (Brimson, 1991). Such systems are inadequate to allow organisations to compete successfully in the current business environment (Cunningham, 1992). Although recognizing the problem is a good beginning, the pressing need now is for a solution. It is an illusion that changing the basis of overhead costs allocation would solve all cost management problems (Berliner and Brimson, 1988). Therefore, ABC has emerged as the key alternative to traditional costing systems. ABC recognizes that many overhead costs vary in proportion to changes other than production volume. By identifying the cost drivers that cause costs to change and assigning costs to products on the basis of cost driver usage, ABC can more accurately measure the resources consumed by products. This cause and effect relationship provides a superior way of determining relevant costs. Moreover, ABC can be used for a range of cost management applications such as value chain analysis, customer profitability analysis, and business process management (Drury, 2001, p. 179).

1.2 Overview of Methodology

1.2.1 A Contingency-Based Research Methodology

The ABC literature has devoted limited attention to methodological issues in empirical research (Foster and Swenson, 1997). The majority of the research to date has comprised descriptive case studies, which have indicated that ABC helps to reduce the cost of products, and provides more accurate information for estimating product profitability and for making product pricing and production decisions. However, the conditions under which ABC systems would provide relevant information for such decisions were given less attention (Noreen, 1991).

Therefore, the use of a contingency approach has developed in the ABC literature. It is suggested that ABC adoption and success will depend upon the specific organisational circumstances. The major feature and intention in the contingency approach to ABC research is to provide possible integrations between ABC systems and other contingent variables. It can be argued that the contingency approach is an important development in ABC research.

The idea of a contingency theory of organisations was first presented in an explicit way by Lawrence and Lorsch in their book *"Organization and Environment"* (Lawrence and Lorsch, 1967, pp. 7/186). They pointed out that as systems have become large they have been divided

into parts, the functioning of which has to be integrated if the system as a whole is to be viable. Thus, they have argued that modern, complex organisations need to be examined as multivariate systems. Then, the contingency approach to the study of organisations as open systems came into increasing prominence during the 1970s. This approach asserts that the effective operation of an enterprise is dependent upon there being an appropriate match between its internal organisation and the nature of the demands placed upon it by its tasks, its environment, and the needs of its members (Burrell and Morgan, 1979, p. 164).

Accordingly, a wide range of effective organisations could be observed, but their differences are not random. The form of the organisation makes a difference, all of which suggests a new set of questions. On what factors does the choice of organisation form depend? What are the characteristics of organisational contexts which appear to make a difference? (Galbraith, 1973, p. 2).

The contingency approach has a long tradition in the study of MCS. It attempts to explain the effectiveness of MCS by examining designs that best suit the nature of the organisation strategy, technology, size, and other organisational variables. In recent years, the new stream of contingency-based studies has been related to the role of an organisation's strategy to MCS design (e.g., Chenhall and Langfield-Smith, 1998b). Competitive strategy is somewhat different from other contingency variables. It is not an element of context, rather it is the means whereby it can influence the organisation's external environment, AMT level, MCS design, and performance (Chenhall, 2003).

Contingency-based research is just starting to be published, identifying contingencies surrounding the adoption of ABC systems. Luft and Shields (2003) indicated that ABC adoption has larger positive effects on performance in organisations facing higher competition. They also stated that ABC uses activity cost and performance information to guide the formulation of strategic plans and operational decisions, and identify improvement opportunities. Consequently, evidence suggests links between competitive strategy and ABC systems and to the formality of performance evaluation (Gosselin, 1997; Chenhall and Langfield-Smith, 1998b; Frey and Gordon, 1999).

The importance of technology to MCS design has been discussed by research drawing on the manufacturing literature (Hayes et. al., 1988; Tushman and Anderson, 1997). Different aspects of AMT are investigated in several contingency-based studies (Woodward, 1965;

Perrow, 1967; Mia and Chenhall, 1994; Chong, 1996). Thus, Young and Selto (1991) and Chenhall (2003) suggest that the area of AMT has provided many opportunities for contingency-based research. More specifically, Bruggeman and Slagmulder (1995) point out that more research is recommended to design a contingency framework of how AMT affects costing systems in different environments. Porter (1980, 1985) indicated that AMT is among the most prominent factors that affect the business unit competitive strategy.

Management accounting practices need to become strategy-driven; that is they should be designed to provide feedback on those dimensions of value which are central to an organisation overall competitiveness, whether those dimensions are cost or non-cost factors (Samson et al., 1991). Khandwalla's (1972) seminal work examined the different types of competitive strategies, such as price, market, and quality strategies, and the use of management accounting practices. He found a positive relationship between the type of competition and the use of management accounting practices. Nevertheless, Cunningham (1992) pointed out that significant gaps in the knowledge base remain to be filled if management accounting practices are to be designed to support a competitive strategy.

Functionalist/contingency-based research assumes that MCS is adopted to achieve some desired organisational outcomes or organisational goals. Thus, contingency-based studies should include organisational performance as the dependent variable. If performance is the dependent variable, then contingency theory is required to show how the combination of MCS and context could enhance organisational performance. Linkages between MCS and organisational performance are quite explicit, as a primary function of MCS is to measure progress towards achieving desired organisational performance (Chenhall, 2003).

Up to this point no relationship has been investigated between ABC systems, competitive strategy, AMT, management accounting practices, and performance. Therefore, this study focuses on ABC, but emphasizes its link with a business unit's competitive strategy, AMT, management accounting practices, and performance. Precisely speaking, this study hopes to make a contribution by examining the contingency relationship between ABC systems and the selected variables. It will attempt to find out whether the research variables can be fitted together into a sensible consistent contingency model that meshes with the present contingency studies. Can this model provide a needed direction for future research and contribute to the emerging new studies of contingency-based research?

It can be argued that the contingency approach of ABC research has been a prominent topic of investigation in recent US, Australian, and Canadian survey-based studies (Gosselin, 1997; Chenhall and Langfield-Smith, 1998b; Frey and Gordon, 1999). However, less contingency-based research has been done on ABC systems in the UK. Therefore, this study is one of the few contingency-based studies to ABC research in the UK.

This study adopts Porter's (1980; 1985) strategic typology. Business units' competitive strategies were classified into two main types: cost leadership and differentiation. Consequently, this study investigates the influence of each type of competitive strategy (cost leadership and differentiation) on the use of management accounting practices in terms of traditional practices (e.g., standard costing and budgets) and strategic practices (e.g., ABC, life cycle costing, target costing, and value chain analysis).

Contingency means that one factor depends upon other factors, and for organisations to be effective, there must be a "goodness-of-fit" between both their internal conditions and external environment (Daft, 1995). Since a number of relationships between ABC systems, competitive strategy, AMT, management accounting practices, and business unit performance would be hypothesised, such relationships can only be understood if they are analysed "simultaneously" (Drazin and Van de Van, 1985). However, the normal regression approaches (e.g., multiple regression models) do not depict the expected relationships between the study variables simultaneously (Gerdin and Greve, 2004). Therefore, another statistical model should be used.

1.2.2 A Cross-Sectional Mail Survey Method

It is argued that management accounting research over the past years has been largely exploratory and somewhat fragmented. Therefore, the task now is to move forward to develop and test theories relating to changes in management accounting. It appears that researchers will have to make more ingenious use of modeling techniques, existing data bases, and survey-based research methods (Young and Selto, 1991).

In fact, there is a place for both case and survey-based research, and both forms of research should continue to play a role in contingency-based research. However, survey-based research may reflect a greater maturity in the structure of the contingency-based research design and could draw on the insights and perspectives provided by innovative case studies (Langfield-Smith, 1997). Early research on ABC was conducted in a case study setting.

Studies focused on innovative firms and used these cases to articulate a conceptual framework of resource consumption in the firm. As ABC entered the mainstream, it became possible to move out of the case study setting to investigate widespread and contingency phenomena associated with the adoption of ABC, employing data collection methods such as mail surveys (Anderson and Young, 2001).

The mail questionnaire survey is a well established research method, and, in recent years, has been used in a management accounting context to provide both specific and general evidence on the nature of practice. It also provides a means of collecting information on the extent and rate of adoption of new techniques (e.g., ABC systems) (Innes and Mitchell, 1997). Moreover, it has been recommended that further survey-based research could target more focused combinations of competitive strategy and management accounting practices (Chenhall and Langfield-Smith, 1998b).

Consequently, the data for this study were drawn from a cross-sectional mail survey conducted to investigate the contingency relationships between the research variables. Using data collected through cross-sectional mail survey methodology is appropriate, because the research question posed in this study lends itself to investigation of the relationships between multiple variables. Therefore, a large sample size is required to obtain reliable and valid research results. It is relatively inexpensive and has the greatest potential for reaching a large number of widely dispersed respondents (Alreck and Settle, 1985).

1.2.3 A Structural Equation Modeling (SEM) Statistical Method

The new stream of contingency-based studies attempts to identify the antecedents to MCS, or they demonstrate how the relationship between MCS and the organisation performance is explained by intervening variables (Chenhall, 2003). Until recently, accounting researchers did not have access to a statistical technique powerful enough to allow for an effective interplay between theory and data in systems of relations incorporating such intervening variables (Rodgers, 1991). They used a combination of linear regression and simple correlations to identify causal paths between contingent variables (Chenhall, 2003).

More recently, powerful structure equation modeling (SEM), using computer programs such as LISREL, EQS, and AMOS, has been developed, which enables latent variables to be constructed from multi-item questionnaires and to identify, simultaneously, statistical significance with multiple dependent variables. SEM provides the researcher with a

systematic methodology for testing alternative theoretical structures (Rodgers, 1991; Hunton et al., 2000). Using SEM, it is possible to combine mediating variables within an intervening model by examining the extent to which a variable mediates the effects on one or more paths (Anderson and Young, 1999; Scott and Tiessen, 1999; Shields et al., 2000; Chenhall, 2002; Chenhall, 2003; Baines and Langfield-Smith, 2003).

Moreover, SEM has the capability to analyse: (1) multiple criterion variables, (2) unobservable theoretical variables, (3) errors in measurement, and (4) confirmatory applications. Although, other statistical techniques (e.g., multiple regression models, ANOVA, ANCOVA, MANOVA, and exploratory factor analysis) can address one to three of the four aspects, none is well equipped to cope with all of them. For example, exploratory factor analysis handles unobservable variables but is not confirmatory; multiple regression can be applied in a (weak) confirmatory sense by testing the significance of estimated parameters and regression equations, but it is limited to a single observable criterion variable (Rodgers, 1991).

Therefore, SEM has been employed as a statistical technique to "simultaneously" test the contingency relationships between the variables of interest in this research. The SEM approach attempts to map the research contingent variables and demonstrate potential relationships between these variables, and indicate potential links with business units' performance.

1.3 Contribution and Principal Research Findings

The central and indeed ultimate function of management accounting research should be to develop and improve practice (Mitchell, 2002). Analysis of the literature has illuminated four genres of ABC: consulting research, basic research, critical research and contingency research. This research project concentrated on the genre of contingency research as a recent development in the ABC literature. It has contributed to knowledge by offering an insight into the understanding of how organisational contexts affect the adoption and success of ABC systems. Such an understanding has important implications for effective management accounting systems design.

This study extends the ABC literature in two ways. First, it examines the contingency relationship between ABC systems, competitive strategy, AMT, management accounting

practices, and the performance of the UK's manufacturing business units. Competitive strategy and AMT are novel variables that the theory suggests interact with management accounting practices in general and ABC systems in particular. Second, this is the first study in the UK, to the best of the researcher's knowledge, to examine such a relationship using SEM.

In contrast to the previous studies, this study examines the degree of ABC adoption by classifying the sample business units into four sequential levels: activity analysis (AA), activity cost analysis (ACA), ABC and activity-based cost management (ABCM). The empirical findings of the study show that business units' performance would be associated with the patterns of ABC use by the adopters. Precisely speaking, higher performance was associated with the adoption of AA and ACA, than with the adoption of ABC and ABCM.

The study provides empirical evidence that the use of strategic management accounting (SMA) practices is related to the adoption of ABC and ABCM. Moreover, the results support the expectation that there is a significant relationship between differentiation strategy and AMT and the use of SMA practices. Therefore, it appears that the effect of a differentiation strategy and AMT on the adoption of ABC and ABCM is an indirect one via the use of SMA practices as a "mediating" variable.

In the light of the above, this study contributes to the management accounting literature by providing some explanations on the contingent factors that influence the adoption and success of ABC systems. These include competitive strategy, AMT, and management accounting practices. Using the study sample, it has been concluded that it is not necessarily true that business units that have not adopted ABC systems could improve their performance by simply introducing ABC as a stand-alone technique. This finding has significant implications for designing and implementing ABC systems and other types of management accounting techniques. Moreover, the use of SEM as a statistical technique can be viewed as an important methodological contribution.

1.4 Organisation of the Research

This research includes ten substantive chapters in addition to this introduction. The next three chapters, 2, 3, and 4, review the relevant literature. Chapter 2 explains how ABC is introduced as a paradigm to overcome many of the limitations of traditional costing systems

and, thereby, provide more relevant information for resource-allocation decisions. It also discusses further applications of ABC information in terms of cost objects and activity-related applications. Finally, it demonstrates four genres for the ABC literature published to date: consulting, basic, critical and contingency research. It has been argued that the genre of contingency research is the most recent and important development in ABC literature.

Chapter 3 addresses the relationship between contingency theory and MCS. It begins by defining the concept of MCS in general. The concept of systems theory and the distinction between closed-system and open-system approaches are highlighted. Then, the theme of contingency theory is discussed. This includes three approaches to contingency theory, based on the concept of fit (selecting, interaction, and systems approaches), and the situational factors of contingency theory. Moreover, the contingency-based research in MCS has been classified into four categories, according to the complexity of analysis. Finally, the contemporary developments of contingency theory in management accounting are explored.

In Chapter 4, the relationship between strategy and management accounting is manipulated. It defines the concept of strategy and identifies three levels of organisational strategy (corporate, business, and functional strategy). Then, three strategic typologies are distinguished: Miles and Snow (1978), Porter (1980; 1985), and Gupta and Govindarajan (1984a, b) and Govindarajan and Gupta (1985). The chapter also explains AMT strategy and its impact on cost, quality, and profitability. Finally, strategic management accounting is discussed in terms of its concept, themes, and practices.

Chapter 5 points out the differences between the four research paradigms in social science and accounting research: functionalist, interpretivist, radical humanist, and radical structuralist. It presents the case for the contingency/functionalist (positivistic) paradigm, as the study attempts to test existing theory. Then, the research dependent and independent variables are constructed. A new and complex contingency model of ABC systems is developed, based on the existing literature presented in Chapters 2, 3 and 4. In this model, several contingent variables that might explain the contingency relationship between ABC systems and the UK manufacturing business units' performance are included. The research hypotheses and their relation with ABC systems are developed. Furthermore, the questionnaire research methodology is justified. Finally, SEM has been suggested as a suitable statistical technique for the study.

Chapter 6 builds a conceptual context for SEM, relative to other kinds of multivariate techniques such as multiple regression and ANOVA. It introduces ideas and characteristics that are essential to understand the general rationale of SEM. Moreover, it discuses the features of three widely used computer programs for SEM: LISREL, EQS, and AMOS. Then, an AMOS computer program is justified as the most suitable software for SEM.

Chapters 7 to 10 address the fieldwork for this research. Chapter 7 contains two main parts: first, the development of the questionnaire instrument and the measurement of variables are described; second, there is a description of the sample used to test the research hypotheses. In other words, the data set is introduced and summarized, which opens the way for the statistical analysis undertaken in Chapter 8 and Chapter 9.

Chapter 8 provides an initial analysis of the questionnaire data. It can be stated that every effort was made at the design stage of this research to obtain reliable and valid findings. Nevertheless, both construct reliability and the validity of variable construction is assessed through (1) Cronbach's alpha and (2) exploratory factor analysis respectively. Then, logistic regression analysis was conducted to test the research null hypotheses.

In Chapter 9, two contingency models of ABC systems are developed and tested using SEM. The use of SEM in this research recognizes that the contingent variables of this study do not impact independently. This provides a macro-view of ABC systems, providing a big picture perspective instead of a focus on the results of individual regression equations.

Chapter 10 provides a more detailed discussion of the empirical findings of the study in the light of previous research. It includes a discussion of the empirical findings of both the preliminary and SEM statistical analysis conducted in Chapter 8 and Chapter 9. Furthermore, it provides further discussion and a critique of the phenomenon of apparent ABC/M failure to improve performance obtained in this study.

Chapter 11, the final chapter, draws conclusions and highlights the contributions of the research, starting with a summary of the principal research question. Then, the chapter discusses the theoretical and methodological contributions of the research. Moreover, it suggests potential avenues for further research. Finally, the closing remarks of the research are summarised.

Chapter 2: Activity-Based Costing (ABC): a Review and Applications

2.1 Introduction

ABC has, within the last two decades, generated a voluminous literature that has paralleled its increase in popularity with practitioners. This chapter discusses the different points of view of ABC and the different applications that extend throughout the main areas of management accounting. The objective of the literature review is to establish the current state of knowledge related to ABC, and to provide a framework in which empirical data collection and analysis could be designed.

The ideal starting point for the literature review of ABC is to identify key publications and the development of the literature from them; this has proved useful in developing the review of the ABC literature. Moreover, the goal of identifying the key applications of ABC is to recognize that the information that it provides can go beyond producing a better-cost estimation for a product or a service.

The rest of the chapter is organised as follows. Section 2.2 discusses traditional costing systems and the distortions of indirect cost allocation found in them. Section 2.3 introduces ABC as the key alternative to traditional costing systems. Section 2.4 explains the different applications of ABC systems. Section 2.5 reviews the genres that emerge from the ABC literature. The last section contains the main conclusion.

2.2 Traditional Costing Systems

Traditional costing systems use volume-related measures, such as direct labour hours or machine hours, to allocate indirect costs to cost objects. Volume-related allocation bases accurately measure the resources that are consumed. Resources include direct labour, materials, energy, and machine-related costs. However, many resources exist for activities that are unrelated to physical volume. Non-volume-related activities consist of support activities such as material handling, material procurement, performing set-ups, production scheduling, and inspection activities. Therefore, traditional costing systems, which assume that products consume all resources in proportion to their production volumes, provide distorted product costs (Drury, 1997).

Before the advent of modern manufacturing technologies and the change from a production-driven to a market-driven economic environment, traditional costing systems were adequate for two reasons (Andrade et al., 1999):

- The fraction of total product cost due to the direct cost component was larger than the indirect cost component.
- The indirect cost component was more expensive to determine than the direct cost component.

Drury (2001, p. 123) illustrated that manufacturing organisations assign costs to products for two purposes:

- For internal profit measurement and external financial accounting requirements in order to allocate the manufacturing costs incurred during a period between costs of goods sold and inventories.
- To provide useful information for managerial decision-making requirements.

Jermias (2001) argued that the rapid and accelerating changes in production systems, manufacturing technology, and particularly the enormous innovation in information processing, would be expected to cause significant changes in management accounting systems in order to provide the relevant and timely information demanded by managers.

However, management accounting systems, particularly costing systems, have been slow to change. As a result, it is argued that these costing systems often provide information that is too late, too distorted, and too aggregated to be relevant for management decision-making in today's business environment. This has three important consequences (Johnson and Kaplan, 1987, pp. 1-3):

- Management accounting systems are of little help to operating managers as they attempt to reduce costs and improve productivity.
- Management accounting systems also fail to provide accurate product costs.
- Managers' horizons contract to the short-term cycle of the monthly profit and loss account.

Nowadays, organisations attempt to seek competitive advantage by applying customer-focused strategies (Kaplan and Norton, 1992). Customer-focused strategies have received considerable recent attention in the marketing literature concerned with relationship marketing (Cravens, 1995; Gronroos, 1994). This attention for market orientation motivates

its examination in an accounting study that has as its central focus a marketing construct i.e. customers. Organisations with a high market orientation have a relatively strong external focus (Kotler, 1984).

In order to increase customer service (e.g., short lead time and on-time delivery), product quality, and manufacturing flexibility, many organisations have adopted advanced manufacturing technologies (AMT) and philosophies such as computer-aided design (CAD), computer-aided manufacturing (CAM), flexible manufacturing systems (FMS), computer-integrated manufacturing (CIM), material requirements planning (MRP), just-in-time (JIT), total quality management (TQM), etc.

AMT have caused significant changes in cost structure. Hardy and Hubbard (1993) reported that in many organisations, direct labour, which used to constitute 40% to 60% of the total cost of a product, decreased to 5% or less. On the other hand, indirect costs significantly increased to 50% or more of the total cost. Traditional costing systems that usually use direct labour as a basis for allocating indirect costs do not reflect these changes in cost structure. Therefore, these systems have become unable to provide accurate product costs (Hozler and Norreklit, 1991).

2.3 Activity-Based Costing (ABC)

It is against the previous background that ABC has emerged. ABC was born in studies of local US manufacturing sites that were experiencing global change. It was developed in response to the opportunities and threats of new technology and increasing international competition (Jones and Dugdale, 2002).

Although ABC has existed for several decades (Staubus, 1971), it was only in the latter half of the 1980s that it emerged as a popular form of costing system. Its rapid emergence is largely attributable to Professors Kaplan of the Harvard Business School and Cooper of the Claremont Graduate School, who found the ABC concept being applied in a small number of larger US manufacturing businesses, where some dissatisfaction with costing systems had been apparent. The experiences of these organisations were published and the application of ABC developed. Thus, ABC owes its current status both to the practitioners who first designed and effected its practical implementation and then to the academics who translated

this work into a more general framework, and who contributed to its popularity and dissemination through their publications (Ashton et al., 1995, pp. 115-116).

The central idea of ABC is that activities consume resources and then cost objects consume activities. Therefore, the total cost of a cost object is the product of the consumption of all resources by all activities consumed by that cost object. In this manner, all costs become essentially direct costs as they are traced, in principle, correctly to their respective cost objects (Horngren et al., 1999; Andrade et al., 1999). This focus on activities is explained in detail by Cooper (1990a), using four categories of an organisation activities and resource consumption: (1) unit-level activities; (2) batch-level activities; (3) product-sustaining activities; and (4) facilities-sustaining activities.

ABC methodology is comprised of three stages, as is shown in Fig. 2.1 (Shapiro, 1999). In the first stage, indirect costs in the general ledger are aggregated into indirect cost pools, such as supervisory labour or utility costs. Direct costs from the general ledger are aggregated directly into activity cost pools without this intermediate step. In the second stage, ABC analysis consists of an allocation of the indirect cost pools to activity cost pools. In the third stage, cost drivers determine how the various activities contribute to the total cost objects carried out.

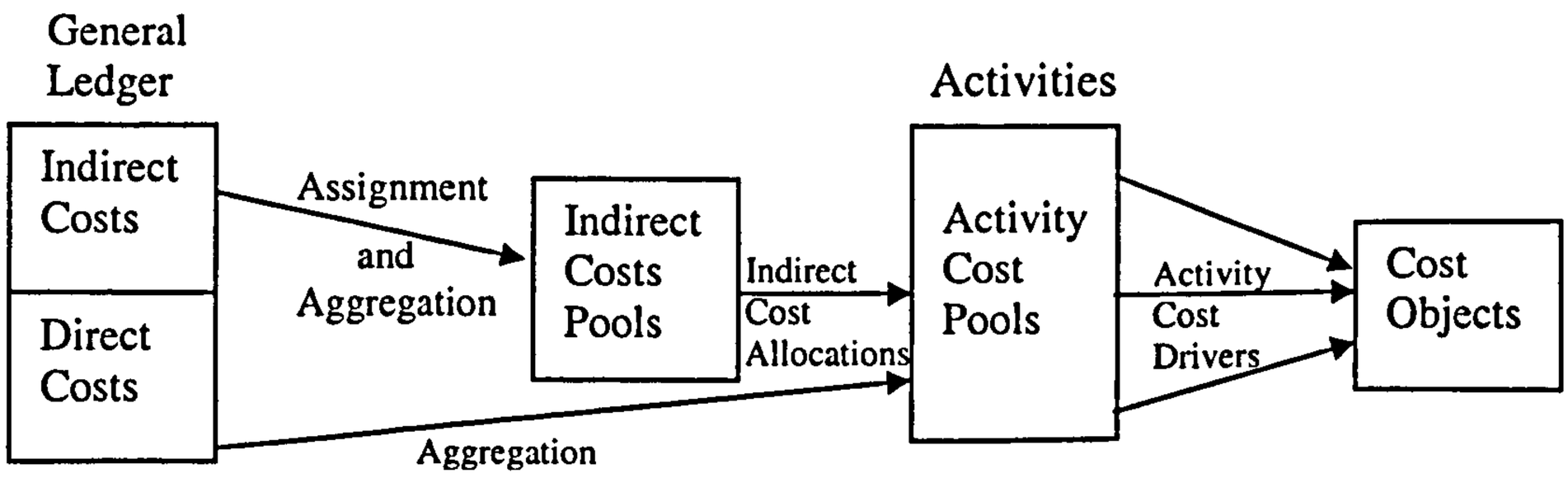

Fig. 2.1 ABC methodology (adapted from Shapiro, 1999)

It can be stated that ABC aims at eliminating the distortions of indirect cost allocation found in traditional costing systems. This distortion comes from the use of indirect cost allocation based on volume-related measures, and consequently ignores indirect production costs, which are not necessarily related to volume. ABC has the following special features different from traditional costing systems (Tsai, 1996):

- ABC uses multiple resource and activity drivers to improve the causal relationship between the product and the costs incurred. Thus, it reports more accurate product costs than the traditional cost systems.
- ABC provides useful information about activities for continuous improvements, including the resources required to perform activities, the costs of activities, and the distinctions between value-added and non value-added activities.
- The latest version of ABC takes customers, channels, and markets as the cost objects to include overhead costs outside the plant in the ABC analysis. Therefore, the resulting cost information can be used to analyse the profitability of customers, channels, or markets.

2.4 ABC Applications

The goal of any cost management system is to provide relevant and timely information to management. This information supports better management of corporate resources in the production of products or the provision of services, and improves competitiveness in terms of costs, quality, and profitability. In this context, a cost management system can also be viewed as a planning and control management system (Berliner and Brimson, 1988). Therefore, ABC has been extended into activity-based cost management (ABCM) to include other considerations, such as customer profitability, distribution channels, and other management issues. ABC is the information system that reveals the cost and profitability structure of products and services in an organisation, while ABCM describes the actions taken to improve quality and reduce costs and cycle time, once information about activities' costs is known (Babad and Balachandran, 1993).

Generally speaking, the term ABCM has emerged to describe any application of ABC information to the vast amounts of information gathered by ABC. It recognizes that the information that the ABC provides can go beyond merely supplying a better-cost estimate for a product or a service (Raz and Elnathan, 1999). As can be seen in Fig. 2.2, ABC has two primary viewpoints: a cost assignment view and a process view, each of which plays a critical role in ABCM as follows (Turney, 1992; Turney and Straton, 1992):

- **Under the cost assigning view:** ABC reflects the need to assign the cost of resources to activities and the cost of activities to cost objects in order to take critical decisions. These decisions include pricing, product design decisions, and setting priorities for improvement efforts.

- **Under the process view:** ABCM reflects the need for a new category of information about activity performance. This information shows what causes work (cost drivers) and how well it is done (performance measures). It helps to identify improvement opportunities and ways to improve.

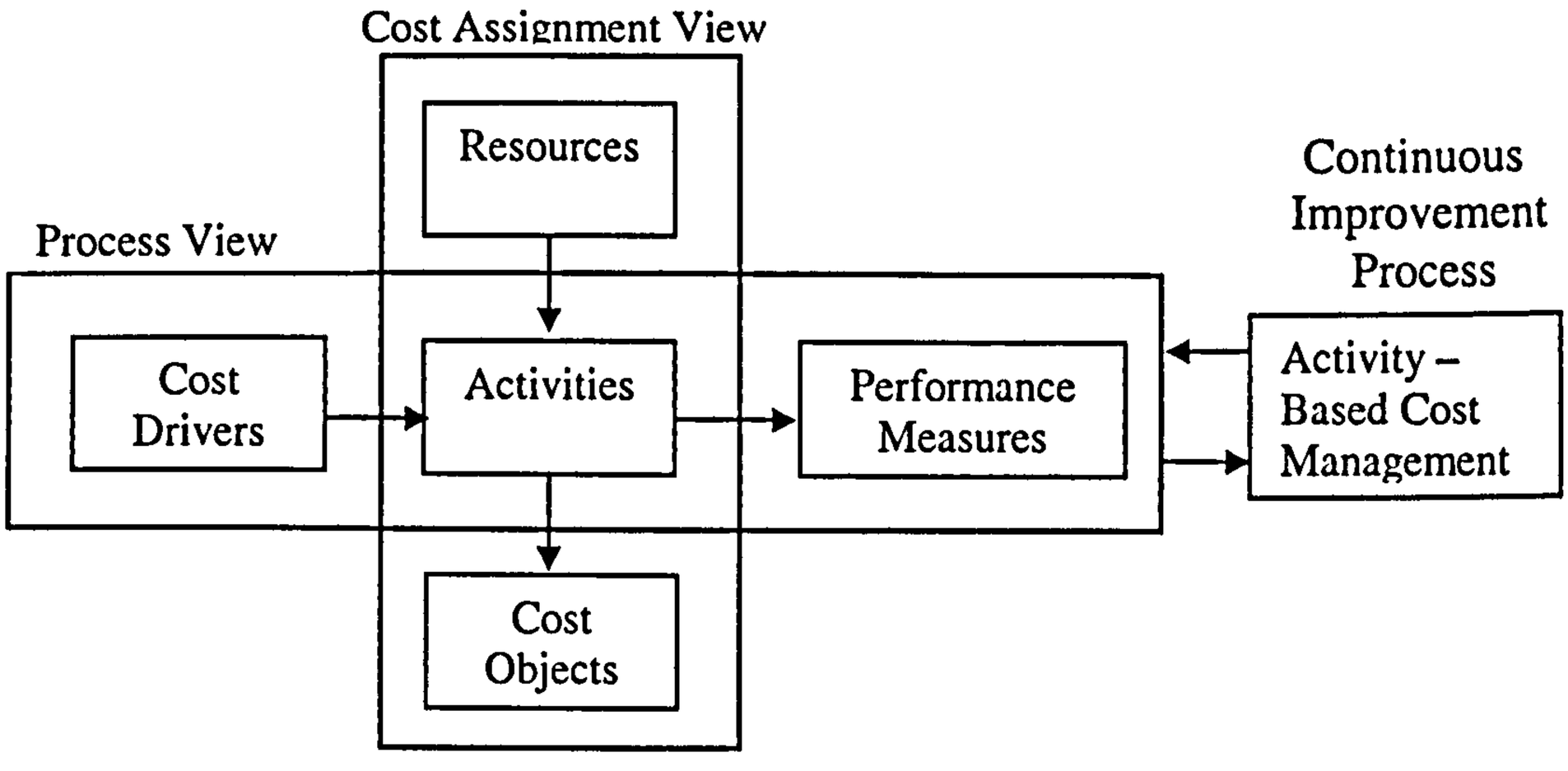

Fig. 2.2 How ABCM uses ABC information (adapted from Turney, 1992)

In the light of the above, ABC generates decision-relevant information, which may be used in two ways: cost objects and activities applications.

2.4.1 Cost Objects and Related Applications

Cost objects can be further sub-divided to help with the following decision areas:

2.4.1.1 Stock Valuation

External financial reporting organisations must value stock at full production cost (Drury and Tayles, 1994). Mitchell (1994) and Innes and Mitchell (1995) explored three reasons why ABC is certainly capable of performing this task. First, ABC is a methodology designed originally to generate full product costs. Second, cost normality impinges on ABC and lies in the concept of normal output activity, which is adopted as a basis for unitising fixed costs, and is now enshrined in financial accounting standards. Third, the unit cost produced by an ABC organisation may by considered a superior financial estimate of resource consumption contingent upon production output, simply because of the enhanced sophistication of the surrogate measures used to determine the links between the products and resource use.

2.4.1.2 Pricing Decisions

Various costing systems are used to produce increased accuracy about product costs and pricing. Some experiences reveal that distortion in reported product costs and, in turn, using ABC could reduce product pricing (Gunasekaran and Sarhadi, 1998). Innes and Mitchell (1995) argue that the variation found in comparison with conventionally determined unit costs and the systematic cross subsidization highlighted in several cases add weight to ABC's significance pricing decisions. Moreover, Innes and Mitchell (1991) also illustrate that ABC provides more relevant product costs leading to:

- Better product and pricing strategies through more realistic information on product profitability being available.
- Greater understanding of the product line profitability of certain product groups with additional emphasis on management to reduce costs.
- More accurate costs reflecting all overhead costs associated with the product.

2.4.1.3 Product Design

ABC can provide useful insights into product design decisions. ABC can identify activities which add to or create product value and those that are unnecessary. Innes and Mitchell (1995) stated that ABC could have a motivational impact on the designers of new products or services. This occurs through the provision of cost driver rates to those involved in design. These highlighted the product and production characteristics that cause cost, and they could therefore promote cost-effective designs particularly when combined with the institution of target costs. Moreover, Kaplan (1992) pointed out that several organisations developed an ABC model primarily to provide economic information to product designers and product engineers. The model output helps designers understand the manufacturing or operating cost consequences from their product-design decisions.

2.4.1.4 Customer Profitability Analysis

The ABC methodology has been used with the customer rather than the product or service as the prime cost object (Bellis-Jones, 1989). Customer profitability analysis (CPA) involves calculating profit earned from a specific customer. The profit calculation is based on costs and sales that can be traced to a particular customer. This technique is sometimes referred to as customer account (CA) (Guilding and Mc Manus, 2002). Consequently, the overall profit and loss account can be analysed to produce an individual profit statement for each customer (Bellis-Jones, 1989). This type of analysis has provided a means for reviewing the profile of

customer profitability and providing a prompt for strategic decisions on pricing, service, distribution, promotion and financing policies (Innes and Mitchell, 1995).

2.4.1.5 Activity-Based Budgeting

A new approach for building an effective continuing management process is known as activity-based budgeting (ABB). This approach has been developed from the basic framework of ABC (Brimson and Fraser, 1991). Mitchell (1994; 1995) point out that, at the stage of actually setting budgets, an activity-based framework has several benefits:

- It provides an activity profile, which can be used as a set of building blocks to construct the budget.
- The availability of measures of activity outputs (cost driver volumes) provides an indication of service level volumes and so provides a starting point for negotiations on the resource requirements of each activity.
- Variance information will be produced for each activity and this locates over and under spends firmly in the region where responsibility and cause should be identifiable.

2.4.1.6 Advanced Manufacturing Systems Justification

New concepts in manufacturing such as design for quality, design for production and design for distribution are based on ABC, which aims to eliminate the non value-added activities. In addition, with the role of support services increasing in the advanced manufacturing systems environment, the need for controlling the cost of overheads has increased (Gunasekarn and Sahadi, 1998; Kim et al., 1997). Therefore, Anglis and Lee (1996) present a methodology that ties investment decisions to ABC using the analytical hierarchy process (AHP). By using such a methodology, both monetary and non-monetary benefits can be included in the analysis. First, the relationship between goals, activities, cost, and performance measures are developed, then they are combined to make two models: a cost impact model and a performance impact model.

Moreover, Ioannou and Sullivan (1999) developed a two-stage method for the justification of investment in modern material handling systems. The underlying approach placed heavy emphasis on the use of cost avoidance data quantified by ABC. The model performed an economic value analysis (EVA) for each material-handling alternative. In doing so, it offered a sound basis for different economic systems.

2.4.2. Activity-Related Applications

Returning now to activities and activity analysis, there are a number of valuable applications at this level:

2.4.2.1 Value-Added and non Value-Added Analysis

The relative value of activities can be determined according to how they contribute to customer value or to meeting an organisation's goals (Dierks and Cokins, 2001). Turney (1992) states that activities with value fall into one of two categories. In the first, an activity has value if it is essential to the customer. In the second, an activity has value if it is essential to the functioning of the organisation. Hixon (1995) complements this by defining non value-added activities as anything that can be eliminated without detriment to the final product or service.

Moreover, Ashton et al. (1995, p. 129) indicate that for many organisations the non value-added activities arise because mistakes have been made and have to be corrected. This is therefore one area where some organisations have established a link between ABC and TQM. With ABC and the TQM philosophy of doing everything right first time, many non value-added activities can be eliminated. Non value-added activities include not only inefficient activities, but also ineffective activities.

2.4.2.2 Process Redesign

A business process consists of sequentially related activities. Therefore, business process redesign is the examination of the flow of the activities and information that make up the key business process in an organisation with a view to simplicity, cost reduction, or improvement in quality or flexibility. Most business processes have never been designed, but have evolved over time to meet changing circumstances and to fix problems that have occurred historically. They may have also evolved in an environment where control was more important than simplicity, flexibility and cycle time (Morrow and Hazell, 1992).

Morrow and Hazell (1992) classified process redesign into five steps:

Step 1: understanding what the process is supposed to deliver to the business.

Step 2: understanding the demands on the process so that account can be taken of resources requirements.

Step 3: understanding the present process in terms of activities and resources consumption.

Step 4: either altering the process in an evolutionary way by simplification or reduction in cross-departmental linkages that are no longer required.

Step 5: totally questioning the basis of the present process and altering the way people involved in the process think about their role, so that a step change in performance can be achieved.

2.4.2.3 Value Chain Analysis

Porter (1985) identified the value chain, which is the linked set of value-creating activities from raw material sourcing to the final product or service being delivered to the customer. Morrow and Ashworth (1994) summarised the value chain concept in a business as a series of linked activities that ultimately add value to the customer.

ABC recognises this concept and therefore helps management to view the organisation by understanding the activities, their cost and how they link together to form a simple chain of value-creating activities for a business (Morrow and Ashworth, 1994). Moreover, ABC has emphasized that product costs are affected by all activities in the value chain, not just by manufacturing activities alone. Thus, inventory costs are incomplete measures of produce costs for decision-making (Horngren, 1995).

2.4.2.4 Continuous Improvement

Continuous improvement requires the identification of both priority and systematic influences. Priority refers to those improvement activities that will return the most savings for the effort invested. Systematic influences, on the other hand are the key to process improvement (Albright and Reeve, 1992).

Kaplan (1992) documented the fact that ABC can play different roles to support an organisation's operational improvement and customer satisfaction:

- ABC can provide an attention–getting mechanism for organisations not yet indoctrinated into the religion of the lean production paradigm. It collects data on activities and business processes that cut across traditional organisational functional boundaries. Often managers can see, for the first time, the cost of design activities, the cost of new product launches, and the cost of administrative activities. Therefore, the

high cost of these activities can stimulate organisations to adopt TQM, JIT, and business process improvement programs.

- The ABC model also produces, for individual products, services, and customers, the bill of activities that describes the cost build-up for these outputs. Managers can see how much of any unexpectedly higher costs arise from inefficient or unnecessary activities. The bill of activities information will indicate the opportunities for cost reduction and profit enhancement from improving quality or reducing the cost of batch and product – or customer – sustaining activities.

2.4.2.5 Benchmarking

Benchmarking involves comparing key activities with world-class best practices. It attempts to identify an activity, such as customer order processing, which needs to be improved and it finds a non-rival organisation that is considered to represent world-class best practice for the activity and study how it performs the activity. The objective is to find out how the activity can be improved and ensure that the improvement is implemented (Drury, 2001).

Coburn et al. (1995) describe how benchmarking with ABC performed successfully for the various accounting productivity strategies at the Marketing Resource Group of US West. This approach to benchmarking with ABC applied the following five steps:

Step 1: identifying major activities.

Step 2: establishing major resource pools.

Step 3: collecting cost driver information.

Step 4: analysing processes with costs, outcomes and benchmarks.

Step 5: identifying additional improvement opportunities.

2.4.2.6 Cost of Quality

In the 1980s, most European and American organisations considered quality to be an additional cost of manufacturing, but by the end of the decade they began to realize that quality saved money. Organisations discovered that it was cheaper to produce the items correctly the first time rather than wasting resources by making substandard items that have to be detected, reworked, scrapped, or returned by customers (Drury, 2001, p. 466).

Gupta and Galloway (2001) indicated that ABC could play a significant role in the prioritisation and cost justification of quality improvement projects. Because it includes non

value-added activities in the costs, ABC can provide information that allows an organisation to determine what impact each project would have, and therefore a means to determine which ones to pursue first. Without this insight into prioritisation, an organisation can pursue several low impact improvement projects at great cost and little gain, while overlooking other projects that might have a tremendous impact.

2.5 Genres of ABC Literature

ABC has attracted high levels of interest from both academics and practitioners since its emergence in the late 1980s (Bjornenak and Mitchell, 2002). It is likely that the fragmented genre structure in the ABC literature indicates a more general dispersion in management accounting academia overall. The situation realised in the ABC literature, may be a reflection of a communication structure in management accounting academia (Lukka and Granlund, 2002).

Some articles have emerged to classify ABC literature. Young and Selto (1991) reviewed the literature in the rapidly developing field of modern cost management research, framing the review with a model of six variables: organisation strategy, accounting techniques (in particular ABC), manufacturing practices, behavioural effects, and internal and external performance.

Recently, Jones and Dugdale (2002) provided two methodological resources for ABC: first, actor-network theory for the detailed analysis of the building of the ABC bandwagon, and second, core discussion of the dynamics of modernity to connect local and global aspects of this building work.

Lukka and Granlund (2002) pointed out that there are three genres that emerge from ABC literature: consulting research, basic research, and critical research. They paid attention to their effects both on the progress of management accounting in general and ABC research in particular.

However, based on an extensive review of the ABC literature published to date, it can be argued that there are four genres of ABC literature: consulting research, basic research, critical research, and contingency research:

- **Consulting research:** the typical features of consulting research are strong practicability, occasional empirical evidence of the case-study type, and a prescriptive and propagating style overall (Lukka and Granlund, 2002). In other words, the major feature and intention in the ABC literature of this genre is to provide fundamental ideas about ABC as a new costing system. The source of those ideas is an ABC practitioner. The authors of the ABC literature in this genre include practitioners, consultants, and academics.

- **Basic research:** the first studies in this genre emerged shortly after the introduction of ABC in the consulting research genre. The objective of basic research is to describe, explain and understand with scientific rigour to which extent, how and why ABC is used (Lukka and Granlund, 2002). The nature of the ABC literature in this genre includes a conceptual analysis and clarification of ABC, the mathematical analysis of practical ABC solutions based on case studies and survey questionnaires in order to examine the width of ABC diffusion within different sectors or countries.

- **Critical research:** it is important to include in ABC research studies which have analysed the foundations of ABC. Only looking for the label ABC in titles or abstracts of studies would miss the clearly existent (but relatively seldom published) genre of critical research (Lukka and Granlund, 2002). Based on basic research of the ABC literature, the fundamental goal of this genre is to criticise ABC as a new phenomenon in management accounting.

- **Contingency research:** the contingency approach to management accounting is based on the idea that there is no universally appropriate accounting system that applies to all organisations in all circumstances (Otley, 1980). It can be stated that the impact of ABC on performance may be problematic, given the likely joint effects of changes in the costing system and other variables associated with such changes (Young and Selto, 1991). In fact, the use of a contingency framework for the analysis of ABC information is a recent fashion in the ABC literature. It is argued that the contingency approach is an important development in ABC research. The major feature and intention in the studies of this genre is to provide examples to guide costing system design in organisations

within a contingency theory framework. Therefore, the studies of this genre propose possible integrations between ABC and other relevant contingent variables.

The four genres mentioned above should be understood as the four key dimensions, around which it is convenient to cluster pieces of ABC literature.

2.5.1 The Genre of Consulting Research

A large number of ABC articles have been published in professional journals, such as Management Accounting (US), Management Accounting (UK), Harvard Business Review, and Journal of Cost Management. The authors of these articles have often worked close to the practical realisations of ABC. It can be argued that without these articles in this genre, the other three genres in the ABC literature might have had nothing to elaborate.

The articles by Kaplan during the 1980s (Kaplan, 1983, 1984a, b), though not directly dealing with ABC, can be viewed as clearing the path for the actual ABC articles to come. In those articles, Kaplan argued that management accounting had become irrelevant within the modern production environment. He mentioned biased product costs as one of the areas of obsolescence.

Kaplan (1983) pointed out that problems with the performance of US manufacturing organisations have become obvious in recent years. Japanese and Western European manufacturers are able to produce higher quality products with lower inventory levels than comparable US organisations. The ability of foreign organisations to become more efficient producers has gone largely unnoticed in the education and research programs of many US business schools. Therefore, Kaplan indicated that a much greater commitment to understanding the factors critical to the success of manufacturing organisations is needed, while an understanding of the determinants for successful manufacturing performance will require contributions from many disciplines. He suggested that management accounting can play a critical role in this effort.

Consequently, Kaplan (1984a) surveyed the development of cost accounting and managerial control practices in the 1980s and assessed their relevance to the changing nature of industrial competition. He started with a review of cost accounting developments from the 1850s through to 1915, including the demands imposed by the founding of the railroad and steel

enterprises and the subsequent activity from the scientific management movement. The Du Pont corporation (1903) and the reorganisation of General Motors (1920) provided the opportunity for major innovation in the management control of decentralized operations, including the ROI criterion for evaluation of performance and formal budgeting and incentive plans. He offered the criticism that the cost accounting and management control procedures developed more than 60 years ago, for the mass production of standard products with high direct labour content, might no longer be appropriate for the planning and control decisions of contemporary organisations in the technological age.

Moreover, Kaplan (1984b) argued that cost accounting and control systems have major problems: they distort product costs; they do not produce the non-financial data required for effective and efficient operations; and the data they do produce reflect external reporting requirements far more than they do the reality of the new manufacturing environment. He claimed that only when management accounting systems are brought in line with the new competitive environment will efforts to upgrade production prove genuinely successful and permanent.

Referring to Kaplan's work in their book *"Relevance Lost"*, Johnson and Kaplan (1987) argue that management accounting systems, particularly costing systems, often provide information that is inappropriate for decision-making in today's business environment.

At the end of the 1980s, Cooper and Kaplan (1988a) presented three important criticisms against traditional costing systems and a solution model, which they called *"Transaction Costing"*:

- Traditional costing systems that allocate costs to products using volume-related measures distort product costs.
- The distortion is that low-volume products are undercosted, and high-volume products are overcosted.
- Accurate product costs cannot be achieved by traditional costing systems that rely only on volume-related bases. Different types of allocation bases must be used for overhead costs that vary with the number of transactions performed, as opposed to the volume of product produced.

Subsequently, Cooper (1988a, 1988b, 1989a, 1989b) published a series of four articles in the Journal of Cost Management, which defined ABC and gave examples and general guidance, and thereby placed the name "Activity-Based Costing" firmly in the literature. At the same time, Cooper and Kaplan (1988b), presented ABC to the broader audience of the Harvard Business School. The point about cost allocation was well made here:

> [...] The process of tracing costs, first from resources to activities and then from activities to specific products, cannot be done with surgical precision. We cannot estimate to four significant digits the added burden on support resources of introducing two new variations of a product. But it is better to be basically correct using activity-based costing, say within 5% or 10% of the actual demands a product makes on organizational resources, and then to be precisely wrong (perhaps by as much as 20%) using outdated allocation techniques.

In the 1990s, the ABC literature moved into new considerations such as application possibilities and experiences gained from various industries. Bussey (1993) illustrated that, not only is ABC usable in service organisations, but the basic principles were developed in one such organisation (BT) from a series of committee meetings which took place in the early 1970s, long before ABC was defined.

Carr (1993) proposed that ABC enabled Boston's Braintree Hospital to satisfy the insurance industry's changing approach to reimbursement. It positioned the hospital to enter the 1990s with the shifting payment paradigm of managed care. Knowing the cost of nursing care provided to each individual patient by diagnosis gave management reliable data to negotiate rates.

Sephton (1990) pointed out that ABC provides retail financial services institutions with the basis for producing meaningful business performance information. ABC with its concentration on overhead costs and their relationship to products and customers is suitable for retail financial services with its complex product-to-process relationship, and high fixed cost base. It has been claimed, however, that ABC is not only a basis for product costing, it is an ongoing cost management process, which can be used to control costs and to identify investment opportunities.

Bjornenak (2000) examined a different cost driver approach in a public sector setting. The study was based on data from primary and secondary schools in the four largest cities in Norway. The finding of this study showed that the cost driver concept, although ambiguous, might be a tool for understanding cost causality in schools. The activity analysis provides disaggregated data to better understand differences in the public sector and may be used both

for performance measurement and to identify and adopt better ways to organize and execute activities. The most important insight of this study is the development of knowledge that can be used in structural cost driver analysis and the product attribute approach.

Gordon and Silvester (1999) recognized that an assessment of the ABC-organisations performance link via stock market returns has limitations. Thus, they investigated the stock market effects of announcing the adoption of ABC. The research methodology included both parametric and non-parametric tests for excess market returns from a seemingly unrelated regressions model with a matched pairs sample of organisations. In sum, the study indicated that the adoption of ABC in the US was not associated with a significant (either positive or negative) stock market reaction.

After this, the topic moved into instruction relative to ABC implementation. Morrow and Connolly (1994) classified the practical problems of implementing ABC into two major factors: getting the right structure and getting the right focus. The structure must provide the project team with whatever support it requires to pull together the wide range of data that arises during the project, never letting it lose sight of the required outcome. The focus depends on setting business-driven project objectives, supported and sponsored by senior management and users alike.

Noriewicz (1994) illustrate that Pennsylvania Blue Shield (PBS) supported its complex decisions by making lengthy studies together with extensive cost data good for only short-term use. PBS followed the prescribed methods of financial recording and reporting as recommended by the Blue Cross Blue Shield Association. This cost allocation methodology was adequate for product pricing but failed to provide the level of information necessary for management decisions. The senior vice president of finance saw that PBS needed timely and accurate cost data to react to the dynamic health insurance environment. It was believed that improved financial information could enhance the strategic and operational decision-making process and provide better measures to quantify product and organisational performance. Therefore, the decision was made to implement ABC through nine steps.

Ittner (1999) explained how ABC can be adapted to measure quality costs and prioritise quality improvement efforts. This study reviewed three levels of activity analysis that can be used to quantify the internal costs arising from failure to meet customer requirements. It then

highlighted how ABC can be extended to encompass quality costs arising from supplier deficiencies and the opportunity costs of lost sales due to quality problems.

Noreen (1991) indicated that the aim of ABC is to estimate product profitability more accurately for the purposes of making product pricing and drop decisions and to reduce the cost of manufacturing products in the design stage, by providing more accurate cost information concerning alternative design specifications. In this study the conditions under which ABC would provide relevant information for such decisions were classified into three major conditions:

- Total cost can be partitioned into cost pools, each of which depends solely upon one activity.
- The cost in each cost pool must be strictly proportional to the level of activity in that cost pool.
- Each activity can be partitioned into elements that depend solely upon each product.

2.5.2 The Genre of Basic Research

The largest volume of studies in this genre appeared during the mid-1990s. Four main sub-genres of basic research in the ABC literature can be distinguished as follows:

2.5.2.1 Conceptual Research

The objective from this sub-genre of ABC research is to clarify the concepts of ABC and to identify similarities and differences compared to practices that have already prevailed for a longer time in certain countries. For instance, Boons et al. (1992) described ABC from the point of view of the German/Dutch cost pool method. It had been argued that, in German cost theory, activity costing and cost drivers seem to be incorporated. Therefore, it was suggested that German cost theory would be a useful basis for further analysis of the characteristics of ABC. In sum, the study described the similarities and differences between ABC and German cost theory in general, and more specifically its practical implementation to the cost pool method of cost accounting.

Clarke et al. (1999) examined the adoption of one innovative technique of ABC in Ireland, reporting that the rate of adoption was lower in Ireland than in Anglo-American countries. The study indicated that the marginalisation of managerial accounting in Ireland may be because of low supply of innovative managerial accountants, due to a lack of compulsory

continuing professional education, practitioner journals being devoted specifically to management accounting, and neither executive nor academia in Ireland have demanding sweeping changes in the accounting curricula. Therefore, it was suggested that changes in the supply and demand of innovative management accountants would allow managerial accountants in Ireland to become agents of change rather than marginalized recorders of the past.

2.5.2.2 Mathematical Modeling in ABC Research

Studies of this sub-genre have focused on the mathematical relationships between costs and the activities that cause them. Many of these studies present suggestions for improving decision-making under certain operative conditions. The main objective from this sub-genre of research is to formulate mathematical models to support the role of ABC under the competitive environment.

Degrave and Roodhooft (2000) argue that vendor selection greatly affects organisations' competitive positions as procurement costs account for a large percentage of total costs. Supplier selection decisions are multi-objective in nature, as different and sometimes conflicting aims have to be considered. The study introduces a new solution to this problem and develops an ABC approach for the determination of procurement strategies. It identifies a hierarchy in the activities related to purchasing decisions, and model its different levels into a mathematical programming decision support system using ABC information to select suppliers over a multi-period horizon. This decision model made ABC information operational in a dynamic purchasing environment by defining the objective function as the total cost of ownership associated with the purchasing decision. Moreover, the solution to the model gave a detailed overview of the different activities that can be eliminated, the resulting savings in flexible resources, and the potential saving in committed resources.

Homburg (2001) indicated that, in implementing ABC, the selection of cost drivers is a major issue, since accuracy must be traded off against the complexity of ABC. On the one hand, a high accuracy in allocating overhead costs often requires a high number of cost drivers. On the other hand, a small number of cost drivers are desirable to achieve acceptable information cost and to make ABC easier for management to understand. Therefore, a mathematical model to support cost driver selection is developed. While existing approaches considered only the possible replacement of one cost driver by just one other cost driver, the model took

into account the fact that drivers can also be replaced by combinations of cost drivers. This approach yields a more than accurate cost allocation with the same ABC complexity.

2.5.2.3 Statistical Studies on ABC

Statistical studies on ABC use databases or collect statistical data from the field. Survey studies use mail survey questionnaires for data collection. These studies focus on the prevalence of ABC within various sectors or countries, the structure of ABC, and user opinions on ABC.

Innes and Mitchell's (1995) survey confirmed that some UK organisations have adopted ABC and apply it in many of the ways suggested in the extensive literature on the subject. However, the results indicate that, at a practical level, opinions on ABC vary in the UK's largest organisations. Although many respondents had opted to employ it, the clear majority had yet to decide on it, or even begin consideration of it.

Bescos and Mendoze (1995) pointed out that France appears to be in a special position relative to the adoption of ABC. Few organisations in France set up an analysis of costs by ABC. Instead, traditional methods, including full cost, seem to be adequate for French organisations. They suggested reasons for France's non-adoption of ABC. These include: resistance to change, unfavourable economic conditions, cultural factors, and the cost of implementation.

Chenhall and Langfield-Smith (1998a) used a survey to identify the extent to which Australian manufacturing organisations adopted certain traditional and recently developed management accounting practices. The findings indicate that, overall, the rates of adoption of traditional management accounting practices were higher than recently developed techniques. However, newer techniques, such as ABC, were more widely adopted than found in prior surveys.

Bjornenak (1997) focused on the diffusion of ABC in Norway. The findings showed that a large number of organisations have adopted ABC as an idea, i.e. they have implemented ABC or plan to do so. Moreover, different variables related to cost structure competition, existing costing system and product diversity were tested for their relation to ABC adoption (planned or actual), but only cost structure was found to be statistically significant. Organisations with knowledge of ABC were significantly larger than the others. However,

size did not significantly discriminate between adopters and non-adopters within this group. The source of information on ABC was also examined and the empirical data indicated a diffusion process that takes a contagious form and points out the importance of institutional influences.

Malmi (1999) presented four perspectives with potential to explain the diffusion of accounting innovations: efficient-choice, forced selection, fad, and fashion perspectives. The diffusion of ABC in Finland provided an empirical context to study how the four perspectives apply to management accounting innovation. The study proposed that the driving forces behind innovation diffusion in management accounting change over the course of diffusion. Efficient choice may explain the earliest adoptions, whereas fashion-setting organisations diminishes. Further diffusion was explained both by mimetic behaviour and efficient-choice.

Today, there is a distinctive group, which concentrates on the successfulness of and satisfaction with ABC implementation. Shields (1995) provided exploratory empirical evidence on 143 organisations' degree of success with ABC and on implementation variables that are associated with ABC success. Four primary results were stated:

- Several behavioural and organisational variables are important in explaining cross-sectional variation in ABC success, particularly top management support, link to competitive strategies, link to performance evaluation and compensation, training, ownership by non-accountants, and adequate resources.
- There is considerable variation in the degree of success organisations have with ABC.
- These implementation variables are used in patterns that can be interpreted as behavioural and organisational implementation strategies.
- ABC success is not significantly associated with the use of four technical implementation variables, specifically canned software, custom software, external consultants, and stand-alone vs. integrated systems.

Anderson and Young (1999) investigated associations between evaluations of ABC, factors related to the individual asked to render an evaluation, and factors related to the ABC implementation process (divided into two types: those that reflect interactions between the ABC project team and the organisation, and those that reflect the internal functioning of the ABC project team). The study proposed and tested a model that links previous research to "process theories" of ABC implementation and examined the stability of the model across

several settings. The results supported the proposed model; however, the significance of specific factors was sensitive to the evaluation criterion. The model was stable across organisations and respondents, but was sensitive to the maturity of ABC.

Anderson et al. (2002) examined how the group dynamics of ABC development teams and the level of organisational resources devoted to model development affect model complexity and development time. A theoretical framework was developed based on the organisational literature on teams. The framework was tested using survey data from ABC team members. The study results indicated that ABC team cohesion was the key determinant of the time it took to develop the first ABC model. In addition, the ABC model became more complex in the presence of an external consultant and as the level of competition increases.

Cagwin and Bouwman (2002) investigated the improvement in financial performance that is associated with the use of ABC, and the conditions under which such improvement is achieved. The research instrument was a cross-sectional mail survey of 1058 internal auditors, claimed to be knowledgeable and unbiased in the assessment of costing systems. Results showed that there is a positive association between ABC and improvement in ROI when there are limited numbers of intra-company transactions, when ABC is implemented in complex and diverse firms, and when ABC is used in environments where costs are relatively important.

2.5.2.4 Case Studies on ABC

Most case studies on ABC have examined ABC by comparing it with previously used systems, with the decision-making implications as well. Foster and Gupta (1990) empirically examined hypotheses from the accounting, manufacturing, and strategy literatures about volume-based, complexity-based, and efficiency-based drivers of manufacturing overhead costs. Cross-sectional data from a questionnaire of thirty-seven facilities of an electronics organisation was examined. Subject to caveats regarding the cross-sectional tests, the strongest empirical association was found for volume-related cost drivers. There was no consistently strong association for the complexity and efficiency-related drivers, including proxy problems with the complexity and efficiency concepts and problems in developing uniform measures of variables across a broader section of facilities.

Anderson (1995) provided a structured account of experimentation with, and adoption of, ABC in the General Motors Corporation, from 1986 to 1993. From this case, the study

developed a framework for evaluating ABC implementation and hypotheses about factors that influence implementation. The search for factors that influence ABC implementation success was guided by the information technology (IT) and organizational change literatures, as well as anecdotal evidence of factors that influence ABC implementation success.

Swanson (1995) measured financial and operating managers' satisfaction with ABC at a variety of manufacturing organisations. The study evaluated the use of ABC information to support decision-making. The findings reported significant improvements in cost management systems following the implementation of ABC. Evidence was provided about how managers actually used ABC information to support strategic and operating decisions.

Malmi (1997) explored the origins of resistance to ABC in a case setting, looking at diverse interests of organisational stakeholders, and the role of existing control and information systems in ABC implementation. It was shown that the resistance may have several sources: some associated with organisational power and politics, and some pertinent to organisation culture. The practical implication of this study hinged on the notion that, although resistance to ABC may come from various sources, these sources appear fundamentally structural and are unlikely to be dealt with by employing implementation-based strategies.

Friedman and Lyne (1997) found in a study of eleven medium and large sized companies that all of the companies had attempted to implement activity-based techniques (ABT) and this process had led to a substantial improvement in the beancounter image of management accountants. Moreover, they proposed three scenarios for the future of ABT and the management accountants' image as a beancounter. In scenario one, ABT become widespread and dominant. In scenario two, ABT ossify to such an extent that their practitioners are again seen as beancounters. In scenario three, ABT are successfully introduced to companies, usually by or with the support of management accountants. They suggested the most likely contingent variables which may lead to one or other of the scenarios becoming reality. Some of the scenarios are more likely to occur in the short or medium term, whereas others are long term possibilities. They concluded that there is a promising future for ABT in the medium term.

Soin et al. (2002) used institutional theory to interpret the role of ABC in organisational change. The study reports on a longitudinal empirical case study of the implementation of ABC in the Clearing Department of a UK-based multinational bank. They identified tensions

between the need to establish ABC as an organisational routine, thereby ensuring its reproduction, with the less routine but more revolutionary aspirations of ABM. Their case suggested that the ABC team succeeded in institutionalizing a version of ABC that revealed new links between costs and products but did not transform the strategic thinking of the bank's senior management. They argued that there is a need for future longitudinal case study research on ABC, with particular emphasis on a processual interpretation of the ABC/ABM relationship that further explores the trade-off between strategic capability and the establishment of management accounting routines.

2.5.3 The Genre of Critical Research

In the critical research genre, the book by Johnson and Kaplan (1987) – important as regards both the recent development of management accounting in general and ABC in particular – has attracted criticism in many studies. Most of these studies try to find the shortcomings in Johnson and Kaplan's arguments concerning management accounting systems.

Ezzamel et al. (1990) criticised the Johnson and Kaplan diagnosis of the problem with modern US management accounting systems, and challenged both their historical analysis and their proposed remedy. The study traced the genesis of the knowledge-based disciplinary power of management accounting systems from the 1830s in the US and contrasts the development of the US/UK focus on managing by numbers with the different way that knowledge-power has been used by, and has interacted with management accounting systems in Japan. The study also argued that the problems to be confronted with management accounting systems are inherent in the historical genesis of such systems and that it is the behavioural limitations in the way organisations deploy management accounting systems that most need attention. In addition, the interrelationships of control between the accounting measurements that create visibility within and without the organisation require that greater attention be paid to the technical limitations of financial accounting. In conclusion, it was suggested that the differing alignments of knowledge-based expertise and the disciplinary practices of management accounting systems that have developed in the US/UK and in Japan reflect deeper differences in their culture and history.

Hopper and Armstrong (1991) also criticised the book by Johnson and Kaplan. The study identified major deficiencies in conventional historical studies of management accounting and offered possibilities for their resolution. After noting the limitations of transaction cost theory for theorisation of organisations and their history, it has been argued that accounting

controls were not a consequence of economic or technological imperatives, but rather were rooted in struggles, as organisations attempted to control labour processes in various epochs of capitalistic development. Management accounting developments are related to the destruction of internal subcontracting, the craft control of production in early factories, the advent of scientific management and homogenised labour and, post-1930, the accord between primary sectors of labour and corporations, which led to an increased emphasis on monopoly pricing, smoothing production and hence employment patterns and producer markets. The study concluded by arguing that, in the context of today's globalisation of capital, the control associated with the labour and capital accord is being abandoned as corporations experiment with new methods and ideologies of control which are reflected in current fashions in accounting research.

2.5.4 The Genre of Contingency Research

The use of a contingency approach developed in the ABC literature at the end of the 1990s. In fact, there is no evidence of a contingency approach to ABC research before the mid-1990s. The goal of contingency research should be to develop and test contingency models that include ABC and other control systems. However, there are very few empirical studies in this matter.

Brignall (1997) states that the use of traditional budgetary control techniques to control all types of manufacturing service operations has become controversial, and alternative nostrums such as ABC or throughput accounting (TA) were promoted. This study summarizes the differing positions and proposed two theories to guide costing system design in services within a contingency theory framework: life cycle theory and service process type theory. The study proposed an integration between ABC and TA in order to improve product-costing systems by attracting different parts of the two-stage allocation apportionment procedure. It also proposed the integration of costing system design in services with that of a performance measurement system as a part of wider management information systems. In fact, this study made some tentative normative proposals about good costing system design in services which may by used to identify symptoms indicating a potential mismatch between a service's costing system and relevant contingent variables.

Hoque (2000) carried out an empirical study on the relationship between JIT production, automation, ABC, and the relative use of cost information for making and evaluating managerial decisions in New Zealand-based manufacturing organisations. This study had two

purposes. First, it examined the effect of JIT production systems and automation on the organisation choice of ABC. Second, it investigated how JIT production systems and automation are associated with the extent to which an organisation uses cost information for day-to-day managerial activities. The results indicated that the choice of ABC was negatively associated with the extent to which organisations use a JIT approach to manufacturing, but positively associated with increased automation in the factory, as hypothesized. Furthermore, the increased use of JIT production was found to be associated with a decreased use of detailed costing information. The study found some support for the hypothesis that increased automation was associated with the increased use of costing information for managerial decisions.

Keep and Schmidt (2000) suggested that ABC and the theory of constraints (TOC) represent alternative paradigms for evaluating the economic consequences of production-related decisions. However, their application can lead to contradictory product-mix decisions. To resolve this conflict, it was suggested that the TOC is appropriate for the short-run, while ABC is appropriate for the long-run. This study modelled the selection of a product-mix with the ABC and TOC models integrating ABC with the capacity of production-related activities. The study also demonstrated that management's discretionary power over labour and overhead resources determined when ABC and TOC may lead to optimal product-mix across a wide range of economic conditions. The study developed a more general model of the product-mix decision and demonstrated that ABC and TOC were special cases of this model. Finally, the study discussed how the general model might be used to supplement information provided by ABC and TOC.

It is argued that research on the use of ABC systems in organisational contexts to date has to a large extent been anecdotal (Briers et al., 1997). Therefore, in recent years, a contingency approach to ABC research has provided additional explanation by examining to what extent contextual factors like competitive strategy and organisational structure influence the adoption and success of ABC (Gosselin, 1997; Chenhall and Langfield-Smith, 1998b; Frey and Gordon, 1999).

Gosselin (1997) examined the effect of strategic posture and organisational structure on the adoption of general forms of activity management (AM) approaches in Canadian manufacturing organisations. Chenhall and Langfield-Smith (1998b) examined how combinations of management techniques and management accounting practices (e.g.,

activity-based techniques) enhance the performance of organisations, under particular strategic priorities in Australian manufacturing organisations. Frey and Gordon (1999) examined whether the performance effects of ABC are contingent upon the competitive strategy being deployed in the US manufacturing business units.

2.6 Summary and Conclusion

The roles and objectives of the first three genres of ABC literature (consulting, basic, and critical research) are somewhat fuzzy as follows (Lukka and Granlund, 2002):

- The genre of consulting research seems to have only few connections to any of the other interest options. Consulting research aims directly to introduce a new costing system, which would increase the quality of organisations' costing systems and thereby improve their decisions. Therefore, the results of the consulting research genre are primarily oriented towards making the construction of ABC a marketable costing system. In other words, the genre of consulting research identifies a marketing process which first pointed to the need for redesign of new organisations' costing systems, and then offered ABC as an alternative costing system after a wide range of ABC studies.
- The genre of basic research has no doubt increased our knowledge about ABC and its implications. It has examined the diffusion of ABC, and shed light on the reasons leading to ABC adoption and its success. Typical modes of basic research include a conceptual analysis and clarification of ABC notions, the mathematical analysis of interrelationships of ABC systems, an analysis of practical ABC solutions based on case studies and surveys, and the examination of the speed and width of ABC diffusion in practice.
- The genre of critical research is more difficult to identify in the ABC literature, as its relation with ABC differs from that of the two previous genres. Most of the studies in the genre of critical research offer a broad critique of the various arguments in Johnson and Kaplan's book. In fact, there are much fewer studies offering fundamental criticism regarding ABC than the studies included in the two previous genres. It is also to be noted that this genre is a relatively new phenomenon in accounting research overall.

Recently, it has been suggested that particular features of ABC will depend upon specific organisational circumstances, such as competitive strategy and structure. Thus, the contingency approach to ABC research must examine the specific factors associated with the adoption and success of ABC. In sum, it can be stated that the genre of contingency research is an important development and the fourth genre in ABC literature. But although relevant contingent factors are specified, few practical guidelines are given as to their impact on the adoption and success of ABC and consequently on performance. Therefore, this research aims to address such an inquiry.

Chapter 3: The Contingency Theory of Management Control Systems

3.1 Introduction

Many factors jointly influence the management control process in an organisation. Researchers have attempted to examine these factors by applying what is called contingency theory. The name simply means that management controls are contingent on various internal and external factors that influence the design of management control systems (MCS), some of them being competitive strategy, technology, and environment. Consequently, there is no universally appropriate control system that can be applied in all circumstances (Fisher, 1995).

Contingency theory has become one of the dominant paradigms for research on MCS design (Dent, 1990). This chapter explains the link between contingency theory and MCS. It discusses the contingency theory approach in general. In addition, the different roles that contingency theory plays in organisations are considered, in particular in MCS design.

The rest of the chapter is organised as follows. Section 3.2 defines the concept of MCS. Section 3.3 explains systems theory in an organisation. Section 3.4 discusses the contingency theory of MCS design. Section 3.5 classifies the contingency literature in MCS. Section 3.6 indicates the contemporary developments for contingency theory of management accounting. The last section contains the main conclusion.

3.2 Management Control Systems

Organisations have entered dynamic environments, and as the environment changes, the organisation must adapt to change, and modifying its behaviour to meet both internal and external demands. The success of a business enterprise depends upon how well it adapts to its environment. MCS is the processes by which managers attempt to ensure that their organisation adapts successfully to its changing environment (Emmanuel et al., 1990).

Management accounting has three sub-divisions: full cost accounting, differential accounting, and MCS. Full cost accounting measures the full cost of cost objects such as process, products and services. Its most important use is as an aid in product pricing and measuring product profitability. It is also used for inventory evaluation and for the analysis of long-run

decisions. Differential accounting estimates what costs would be under alternative courses of action (Anthony and Govindarajan, 1998). MCS is used to create conditions that motivate the organisation to achieve its objectives (predetermined outcomes) (Fisher, 1995; Otley, 2003).

Many accounting researchers have devoted themselves solely to defining MCS. Anthony's (1965) classic definition of MCS was:

> [...] The process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of the organization's objectives.

A more comprehensive definition of MCS was provided by Lowe (1971) is:

> [...] A system of organizational information seeking and gathering, accountability and feedback to ensure that the enterprise adapts to changes in its substantive environment and that the work behaviour of its employees is measured by reference to a set of operational sub-goals (which conform with overall objectives) so that the discrepancy between the two can be reconciled and corrected for.

Berry et al. (1995) defined MCS in a similar way as:

> [...] The process of guiding organizations into viable patterns of activity in a changing environment.

Anthony and Govindarajan (1998) defined MCS as follows:

> [...] The process by which managers influence other members of the organization to implement the organization's strategies.

Merchant (1985; 1998) defined MCS in an operational sense as including four major steps that managers take to ensure that organisational strategies are implemented: (1) definition of goals; (2) communication of goals; (3) monitoring; and (4) rewarding.

Kloot (1997) illustrated that MCS are concerned with planning, the actions taken to implement plans, the monitoring of both these actions and the plans and any necessary modification to the plans. In addition, MCS are used by managers to assist them in performing all of the control functions of planning, decision-making, motivating, coordinating, communicating objectives, providing feedback and integrating activities within complex organisations, indicating the broad nature of control, not limited to accounting and budgeting systems.

In the light of the above, it should be noted that MCS incorporates both strategic planning and operational control. Strategic planning is concerned with setting goals and objectives for an organisation over the long-term. However, operational control is concerned with the down-to-earth activity of ensuring that immediate tasks are carried out. Global goals have to

be broken down into sub-goals for parts of the organisation; long-term goals have to be solidified into shorter-term goals. Therefore, MCS is designed to ensure that the daily tasks performed by all those involved in the organisation come together in a coordinated set of actions, which assist overall goal attainment. This can be seen as the planning and coordination function of the MCS. The other side of MCS coin is its monitoring and feedback function. Regular observations and reports on actual achievement are necessary to ensure that planned actions are achieving desired results. Thus daily, weekly, monthly, quarterly, and annual feedback is necessary to enable the timely corrective action to be taken when things do not go to plan (Ashton et al., 1995, pp. 46-47).

It can be argued that effective MCS is not only concerned with following with predetermined procedures and the assurance that individuals are working productively towards predefined objectives (Simons, 1995); MCS is a broad concept that includes far more than accounting and budgeting systems. It combines a view of management as being concerned with acting for the benefit of the organisation, and as involving both ends, means, and an overall view of the organisation and its interaction with the environment (Otley, 1990).

Moreover, MCS does not necessarily mean that actions should correspond to a plan, such as a budget. The stated plans may have been based on circumstances that, at the time when they were formulated, were believed to exist, both inside and outside the organisation. If the circumstances are now believed to be different from those assumed in the plan, the planned actions may no longer be appropriate. Therefore, MCS should anticipate what conditions are going to be in the future (Anthony and Govindarajan, 1998, p. 7).

Generally speaking, there are three basic approaches to studying the effects of MCS on organisational performance, as follows (Fisher, 1995):

- ***Situation-specific approach***: the rationale of the situation-specific approach is that the factors affecting each MCS decision are unique, so general rules and models cannot be applied. The researchers must study each organisation and MCS individually. Generalization to other organisations or situations is suspect. Therefore, MCS design depends upon an understanding of the unique factors affecting the organisation. The situation-specific approach is similar to the contingency approach, but the number of possible combinations of

contingent factors is so large that attempting to find broad classes of contingent factors is seen as futile.

- ***Universalistic approach*:** the rationale of the universalistic approach is that optimal MCS design holds in all settings and organisations. Many of the portfolio models of strategy formulation and implementation are based upon the universalistic view. At the extreme, a universalistic approach implies that there is only one contingency setting. Given the empirical evidence of contingency relationships, the universalistic view does not appear to be a valid description of MCS.
- ***Contingency approach*:** this is situated between the two previous approaches. According to contingency theory, the appropriateness of different MCS design depends upon the setting of an organisation. However, in contrast to the situation-specific approach, MCS can be made for classes of organisation settings. This approach differs from the universalistic approach, because more than one contingency factor can influence the effectiveness of MCS. Therefore, contingency frameworks have become one of the dominant methods for research on MCS design.

Finally, it can be claimed that, for business organisations at least, management accounting systems are of major importance because they represent one of the few integrative mechanisms capable of summarizing the effect of an organisation's actions in quantitative terms (Emmanuel et al., 1990, p. 4). Thus, the primary focus of MCS is to study how management accounting systems should be designed to enable effective management control of the organisational activities to be achieved (Emmanuel et al., 1990, p. xi).

3.3 Systems Theory

Systems theory is mainly concerned with problems of relationships, structure, and interdependence, rather than with the constant attributes of objects. It resembles field theory, except that its dynamics deal with temporal as well as spatial patterns (Katz and Kahn, 1966). In an explanation of systems theory, Amey (1979) stated that:

> [...] A system is a collection of objects united by some form of interaction or interdependence. In this sense almost everything is a system.

It can be stated that any system essentially includes three main conditions (Amey, 1979). First, it is a set of interrelated elements, each element being connected to at least one other element. Second, the whole can act in methods that none of its parts can; its behaviour is more than the sum of the behaviours of its elements. The system cannot be broken into independent subsystems, and its performance depends upon how well the parts fit and work together, not upon how well each performs when considered independently. Third, at any time, the relationships between some system elements must be more or less stable, otherwise it could not be identified as a system.

One significant development in the study of organisations was the distinction between closed-system and open-system (Daft, 1995). Haas and Kleingeld (1999) have explained the distinction between closed-system and open-system in systems theory as follows:

- ***The closed-system approach*:** stems from the days of mass-production. This traditional approach models an organisation as a static machine within its stable environment. Organisation design from a closed-system approach focuses attention on maximization of internal effectiveness. Given today's generally agreed turbulent business environment, the organisation as a closed-system is no longer appropriate. Hence, the open-system approach to an organisation is required.
- ***The open-system approach*:** is a more modern approach, modeling the organisation as an adaptive organism within its dynamic environment. Organisation design from an open-system approach results in a market-driven, focused organisational attention on the maximization of external effectiveness. Hence, the organisation informal network is composed of all its internal customer/supplier relations and described in a cross-functional process-map.

Katz and Kahn (1966) view organisations as an open-system of social roles that stand in relation to each other, to the organisation and to the broader environment:

> [...] Social organizations are flagrantly open systems in that the input of energies and the conversion of output into further energic input consist of transactions between the organization and its environment.

Amey (1979) and Ansari (1979) provided arguments that an open-system approach is the best method to view an organisation and MCS. Amey (1979) stated that:

> [...] In particular, one of the principal ideas of new way of thinking, the distinction between closed and open systems, has taken root in sociology, social psychology and organization theory but not in accounting, which continues to discuss business planning and control within a closed system framework.

Ansari (1979) also explored a similar conclusion regarding external interactions and taking an internal organisational viewpoint, that not using an open-system approach within the organisation can cause sub-optimization:

> [...] Managers using a closed systems approach are encouraged toward local rather than global problem solving.

According to the open-system approach, an organisation interacts with, adapts to and seeks to control its environment in order to survive (Thomas, 1991). The contingency approach is close to being an open-system approach, which views the effectiveness of an action as being dependent upon the relationship between the action and other elements of the system, especially the environment with which the system interacts (Shafritz and Ott, 1992). Moreover, the contingency approach recognises that solutions are situational rather than absolute, and that they may become inappropriate under different environmental conditions (Wright and Ashill, 1998).

3.4 Contingency Theory

As organisations have increased in size, organisation theory has increasingly speculated about how they should be managed. Early theories of organisation were universal, attempting to discover the optimal way in which affairs were to be organized. Recently, theories have tended to be contingent, attempting to relate their prescriptions to more specifically defined circumstances (Emmanuel et al., 1990, pp. 38-39). Contingency theory as regards MCS is the opposite of the universal approach to MCS, in that it links the effects or the optimality of MCS to the environment and context (Hartmann and Mores, 1999).

Contingency theory argues that the design and use of MCS is contingent upon the context of the organisational setting in which these controls operate (Fisher, 1998). Within the management accounting and control literature, considerable attention is paid to the organisational effects of using management accounting information for performance evaluation (Hartmann, 2000). A better fit between MCS and the contextual contingency variable is hypothesized to result in increased organisational performance (Fisher, 1998).

The central theme of contingency theory holds that there is no best design of MCS for all organisations, but that it all depends upon situational factors (Otley, 1980). Thus, understanding interactions between multiple contingent and control factors may be essential in determining the effectiveness of MCS design. The simplest contingency models attempt to correlate one contingent factor with one control system. However, more complex contingency models simultaneously examine multiple contingent and control system factors. Therefore, the ultimate goal of contingency-based research in MCS design should be to develop and test a comprehensive model that includes multiple contingent factors, control systems, and organisational performance (Fisher, 1995). In this context, the contingency theory regarding MCS may provide a framework for improving the design of MCS by identifying those circumstances that are most suited to the operation of the different types of control systems (Drury, 1996b).

3.4.1 The Concept of Fit in Contingency Theory

Contingency theory has provided studies of the relationships between organisational structure, strategy, and performance. It has the common proposition that an organisational performance is the consequence of a fit between two or more factors, such as the fit between the organisation's environment, structure, strategy, and culture (Van de Van and Drazin, 1985). In other words, each organisation has its own optimal configuration or best fit of context, structure, and control systems. Deviation from that ideal fit (which is misfit) should cause a lack of coordination, miscommunication, and misunderstanding, which should lead to poor performance (Selto et al., 1995).

Generally speaking, it can be stated that there are three alternative approaches to contingency theory based on the concept of fit (Van de Van and Drazin, 1985):

3.4.1.1 The Selection Approach

In the selection approach, the design of an organisation must adapt to the characteristics of its context. Organisational context is hypothesized to cause organisational design, based upon the premise that an effective organisation adopts structures that fit their situations relatively better than those that are not effective. Therefore, fit has more recently become viewed as the result of natural selection forces in which the distribution of resources in the competitive environment determines organisational structure.

However, many contingency researchers did not test the basic assumption underlying their particular contingency theories; they only examined the organisational context-design link and did not explicitly include an analysis of organisational performance. Unfortunately, most researchers using this approach to define fit do not measure performance and are content to assume a causal impact of context on structure.

3.4.1.2 The Interaction Approach

The interaction form of contingency theory hypothesizes fit as the interaction effect of organisational context and structure on performance, using the analogy of the interaction of sun, rain, and soil nutrients on crop yields. Unlike those who adopt the selection approach of fit and wish to know how sun, rain, and soil nutrients affect each other, the interaction approach to fit one is principally interested in improving crop yields and believes that the answer lies in the joint interactions among sun, rain, and soil nutrients. In other words, the interest is not so much with possible causes and effects that may exist between organisational context and design, but more in the dependence of organisational performance on the interaction of organisation structure with its context. Therefore, the procedure begins by reducing a total possible set of organisational context and design characteristics to a series of context-design relationships and then to examine how these individual pairs of factors interact to explain performance.

It can be argued that the interaction approach confounds our ability to detect performance variations as the result of individual pairs of interactions on performance. In addition, according to this approach our attention is focused on searching for one or two dominant factors that determine performance and controlling for the remaining variance through randomisation. However, in the complex ensembles of form, context and performance that are present in organisations, such an approach may be misleading. By focusing on fit in the overall system itself, rather than the specific forms of fit among individual pairs of factors, we may be able to capture and model fit more adequately. Therefore, the systems approach to fit is beginning to deal with these issues.

3.4.1.3 The Systems Approach

The systems approach is based upon systems theory. It is the recently tested form of contingency theory. Advocates of this approach assert that our understanding of organisation design can advance, if we address, in simultaneous manner, the many contingencies,

structural alternatives, and performance criteria inherent to organisational life. In comparison with the selection and interaction approaches to fit, the systems approach is the most embryonic, consisting not of a dominant, well-developed perspective but rather of several novel alternatives tied together by their interest in characterizing the holistic patterns of interdependencies that are present in social systems.

Another and important view of fit in the systems approach is equifinality. It relaxes the assumption of a one best solution implicit in the selection and interaction approaches to fit. Rather than assuming that there are unique structure solutions for given levels of context, the systems approach recognizes that multiple, equally effective alternatives may exist.

In summary, contingency theory requires two basic and often conflicting choices for organisational designers to select the optimal organisational design pattern that, first, matches the set of contingencies facing an organisation and that second is internally consistent. Therefore, the tasks for the concept of fit in contingency theory are to identify the feasible sets of organisational designs that are equally effective for different context configurations, and to understand patterns of organisational design that are internally consistent and inconsistent. By this formulation, an explanation of organisational performance is found in whether an organisation has adopted a structure that lies within the feasible context-design set and whether the chosen design is internally consistent (Van de Van and Drazin, 1985).

3.4.2 Contingent Factors

A contingent factor is relevant to the degree that businesses that differ on that factor also exhibit major differences in how control attributes or actions are associated with the organisation performance (Fisher, 1998). Because each organisation is unique, the potential range of situations or contingent factors is enormous and it is impossible to study each one separately. To overcome this problem, contingency factors can be classified into categories, which appear to make sense in terms of explaining differences in MCS design (Drury, 2000). Precisely speaking, contingent factors include five major categories that have been examined in the contingent literature.

3.4.2.1 External Environment

The first broad category consists of contingent factors related to the external environment. The external environment will affect the nature of MCS, as the purpose of control systems is

to assist an organisation to adapt to the environment that it faces. For instance, the sophistication of MCS is influenced by the intensity of competition faced by the organisation. Two other environmental characteristics have been proved to affect MCS design, namely the rate of change and the number of different product markets served. Other researchers have identified the degree of structural complexity of an organisation and the degree of turbulence in its environment as exerting a major influence on MCS design (Ashton et al., 1995, p. 53).

The various adjectives proposed by researchers to describe the external environment primarily represent its level of uncertainty (Fisher, 1998). Variability in an organisation environment refers to the presence of changes which are relatively difficult to predict, which involve important differences from previous conditions, and which are likely therefore to generate considerable uncertainty (Child, 1975). Moreover, some of the dichotomies used to describe the external environment include certain vs. uncertain, static vs. dynamic, simple vs. complex, and calm vs. turbulent (Fisher, 1998).

Khandwalla (1972) examined the effect that the type of competition faced by an organisation has on its use of MCS and concluded that product competition was becoming an important factor influencing the usage of sophisticated formal controls in manufacturing organisations.

Waterhouse and Tiessen (1978) explored the issue that, when focusing on organisational sub-units, the external environment can be further differentiated in terms of the environment external to the sub-unit but within the broader organisation and the environment external to both the sub-unit and the broader organisation. Waterhouse and Tiessen stated that each factor in the internal and external environment has a simple-complex and a static-dynamic dimension. The static-dynamic dimension, defined as the extent to which factors are subject to change over time, is an important contributor to uncertainty in decision-making. Therefore, it was suggested that factors in the organisation environment might be mapped on a certainty continuum ranging from highly predictable to highly unpredictable.

Govindarajan (1984) indicated that environmental uncertainty is an important variable that affects the performance evaluation style. His reasoning was that the greater the environmental uncertainty, the more difficult it is to prepare satisfactory targets could become the basis for performance evaluation. The focus in this study was on the uncertainty arising from the external environment and was defined to include unpredictability in the actions of customer, suppliers, and competitors. The study hypothesised that the greater the

environmental uncertainty, the greater would be the need for superiors to rely on subjective rather than formula-based approaches in evaluating the subordinate performance and the subordinate incentive bonus amount.

Jones (1985) recommended that an organisation cannot simply evolve to reflect the goals, motives or needs of its members or leadership since it must bow, at least to some extent, to the constraints imposed by its relationship with the external environment. Therefore, in this study external environmental unpredictability, arising from competition and technological changes, had been hypothesised to have implications for MCS design.

Chapman (1998) illustrated that, as uncertainty increases, the necessary information as to what actions are required to achieve desirable performance, and the possibility of effectively distributing that information through accounting reports, are diminished. He argued that this problem can be dealt with by enhancing vertical systems, such that they can cope with the increase in exceptions that they will be required to deal with as unfolding events prove predetermined expectations, assumptions and standards unreliable. Thus, the alternative to enhancing information-processing capabilities (apart from accepting a lower level of performance) is to reduce the requirement to process information by introducing slack as a buffer against uncertainty.

3.4.2.2 Competitive Strategy

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

Most research on competitive strategy as a contingent factor has focused on classifications provided by Porter (1980), Miles and Snow (1978), and Govindarajan and Gupta (1985). Porter's classification identifies cost leadership, differentiation, and focus competitive strategies. Miles and Snow's classification distinguishes defenders, prospectors, analysers,

and reactors competitive strategies. Govindarajan and Gupta's classification consists of build, hold, harvest, and divest competitive strategies.

Consideration of competitive strategy has rather surprisingly, not been prominent in studies of MCS design, despite arguments that differences in competitive strategy should lead to differences in planning and control systems design. If a control system is concerned with ensuring the attainment of objectives, then attention must be paid to the nature of those objectives, which are codified in competitive strategy (Ashton et al., 1995, pp. 54-55). It can be argued that such a fundamental factor as competitive strategy has been relatively neglected until recently. Therefore, the relationship between strategy and management accounting is discussed in more detail in the next chapter.

3.4.2.3 Technology and Interdependence

The third category consists of contingent factors related to organisation technology and interdependence. It can be stated that a company performance will be enhanced if the organisation is designed to suit the prevailing type of technology (Child, 1975). Technology was introduced as a major contingent factor by Woodward (1965), who classified technology into small batch, large batch, process production, and mass production categories. Subsequently, Perrow (1967) studied two aspects of technology: the number of exceptions that arise in the production process, and the search procedures used to resolve such exceptions, which correlated highly with measures of information systems style (i.e., the amount, focus, and use made of data).

Otley (1980) indicated that an appropriate MCS design depending upon the degree of interdependence that exists between responsibility centres might thus be put forward, because MCS measures of performance become less appropriate. As the degree of interdependence increases, managers tend to use MCS information in a more flexible manner.

Empirically, three different studies by Chenhall and Morris (1986), Gul (1991), and Gul and Chia (1994) examined the contingent relationship between internal and external contingent factors (organisational interdependence, decentralization, and perceived environmental uncertainty) and choice of MCS design. The main conclusion from these studies is that greater organisational interdependence, decentralization, and perceived environmental uncertainty are factors associated with either a greater perceived need for more sophisticated MCS or higher organisational performance with more sophisticated MCS.

Other contingency-based research by Chong (1996) and Mia and Chenhall (1994) examined the role of production technology and task variables in assessing performance and satisfaction with MCS. Chong (1996) found that under high task uncertainty situations, the extent of use of broad scope MCS information led to effective managerial decisions and hence to improved managerial performance. On the other hand, under low task uncertainty situations, the extent of use of broad scope MCS information led to information overload, which was dysfunctional to managerial performance. Mia and Chenhall (1994) proposed that differentiation of activities into areas such as production and marketing is an organisational response to managing uncertainty. In addition, they argued that differentiation of activities moderates the association between the extent to which managers use broad scope MCS information and performance.

3.4.2.4 Organisational Variables

The fourth category consists of organisational variables such as organisation size, diversification, structure, industry, and culture. Otley (1980) suggested that organisation structure affects the manner in which MCS information is best used. Innes and Mitchell (1995) indicated that there is a positive relationship between organisation size and MCS sophistication. Drury (2000, p. 653) provided two possible reasons for this: first, the larger organisations have greater access to resources to experiment with the introduction of more sophisticated MCS, and second, the larger organisations have more resources to develop innovative MCS. It is also more likely that they will be able to implement more sophisticated MCS.

Drury (2000, p. 653) pointed out that organisations adopt the diversification strategy in order to obtain the benefits of economics of scope arising from relationships among the divisions. Organisations pursuing an unrelated diversification strategy do not restrict their activities to their core business. An organisation should adopt MCS that are consistent with its diversification strategy, because of the high interdependence among sub-units that exist when an organisation pursues a related diversification strategy.

There is evidence that MCS has been shown to differ by industry type. For instance, Drury (2000, p. 653) argued that MCS differ in manufacturing organisations that have a large number of standard cost centres working extensively on detailed variance analysis. However, costs in non-manufacturing organisations tend to be mostly of a discretionary nature.

Finally, Flamholtz (1983) examined the relationship between accounting, budgeting, and control in its actual organisational context, from a theoretical as well as an empirical perspective. He developed a schematic model of an organisational core control system consisting of four elements (planning, operations, measurement, and evaluation reward systems), located within the framework of an overall organisational control system, which includes factors such as organisational structure, dominant organisational culture and values, all set within an external environment. He also warned of the dangers of ignoring organisational culture in control systems design.

3.4.2.5 Observability Factors (Outcomes or Behaviours)

The fifth category that has been examined in the control literature consists of observability factors. As noted by both organisational and agency theorists, in performance evaluation, a signal from a worker or business unit is measured, evaluated, and rewarded. The signal measured can be the actions of the employee or the outcomes of those actions. The former implies behaviour control, the later implies output control. Observability (of outcomes or behaviours) implies that control can be placed before factors that are at least observable by the evaluator (Fisher, 1995; 1998).

A vital part of the control process, and one with which management accounting is particularly concerned, is the measurement of actual performance, so that it may be compared with plans. However, it is important to consider that performance measurement is but one stage in the overall control process; it is also necessary to set standards that are attainable. Management accounting has been particularly concerned with standard-setting and performance measurement (Emmanuel et al., 1990, p. 31).

It is of interest to list some of the dimensions of performance that have been considered, namely profit, cost, earnings per share, return on investment, volume of sales, efficiency, productivity, market position, product quality, and product leadership (Emmanuel et al., 1990, pp. 32-33). However, it has been suggested that contingency-based research should incorporate non-financial performance measures (Fisher, 1998; Otley, 2001). Therefore, numerous authors have expressed discontent with traditional measures of performance, and there should be a need to modify existing measures and to add measures such as timeliness, flexibility, and so on (Young and Selto, 1991).

3.5 Contingent MCS Categories

The contingency literature in MCS can be classified into four major categories according to the complexity of analysis (Fisher, 1995; 1998):

3.5.1 One Contingent Factor and One MCS Variable Studies

In this category, one contingent factor is correlated with one MCS variable. However, it can be argued that no evidence has been provided to indicate whether the correlation between the contingent factor and the MCS variable has any effects on organisational performance.

Rockness and Shields (1984) empirically examined the relationship between MCS, transformation process (technological uncertainty), measurability of outputs, task complexity, and task dependence. The study pointed out that the importance of MCS is positively associated with knowledge of the task transformation process (technological uncertainty) but not with measurability of the work group's output, task complexity or task dependence. The results indicated the need for a more complete theoretical framework, as well as attention to measurement issues.

Merchant (1985) examined MCS for discretionary expeditures at the profit centre level. The study hypothesized that MCS would differ according to profit centre strategy. Four different strategies were operationalized: rapid growth, selective growth, maintaining/generating cash flow, and harvest. Merchant found that budget pressure was greater in rapid growth centres than in profit centres with other three strategies. Moreover, it was found that high budget pressure resulted in tight income and headcount targets in rapid growth profit centres.

Macintosh and Daft (1987) investigated the relationship between the organisational characteristic of departmental interdependence and the design and use of three elements in one package of MCS: the operating budget, periodic statistical reports, and standard operating policies and procedures. The findings supported the hypothesis that departmental interdependence is related to the emphasis placed on each MCS. In addition, standard operating procedures were an important control device when interdependence was low. The budget and statistical reports were used more extensively when interdependence was used more extensively than when interdependence was moderate. When interdependence among departments was high, the role of all three control systems diminished.

Simons (1990) examined the relationship between MCS and competitive strategy using a case study approach. The study underscored the importance of the dynamic relationship between formal process and strategy. Moreover, competitive strategic positioning, management control and the process of strategy-making play one upon the other as the organisation evolves and adapts over time. The analysis showed that interactive management control processes can be used to manage emergent strategy rather than to focus on what the organisation already understands. These systems direct organisational attention to emerging threats and opportunities.

The studies reviewed at this level of analysis indicated that one contingent factor is correlated with one control mechanism. The typical hypothesis predicts that the existence of a contingency factor will result in an increased probability that a firm uses a certain control mechanism. However, no attempt is made to assess whether the correlation between the contingent factor and the control mechanism has any effect on firm outcomes or if the control mechanism is correlated with other control mechanisms. Much of the early work in contingency control analysis followed this research design.

3.5.2 One Contingent Factor, One MCS Variable, and Organisational Performance Studies

This level of analysis examines the effect of one contingent factor and one MCS variable on organisational performance. However, it can be argued that the potential interaction between multiple contingent factors and MCS variables is not examined at this level.

Ginzberg (1980) indicated that the interaction of organisational characteristics with MCS characteristics affects organisational performance. The study linked environmental stability and technology routineness, to MCS design. It stated that the rapid rate of change in the unstable environment required the flexibility to respond to environmental changes with changes in plans and actions. This implies a need for substantial non-routine communication, which would have to be handled by some mechanism other than the procedural system.

Govindarajan and Gupta (1985) examined linkages between strategy incentive bonus systems and effectiveness at the strategic business unit (SBU) level within diversified organisations. The study indicated two main results: first, that greater reliance on long-run criteria as well as subjective (non-formula) approaches for determining the SBU general managers' bonus

contributes to effectiveness in the case of "build" SBUs but hampers it in the case of "harvest" SBUs, and second, that the relationship between the extent of reliance on short-run criteria and effectiveness is virtually independent of SBU strategy.

Fisher (1994) extended the research in accounting and management journals emphasising a contingency approach to MCS design. The primary relevance of his study was in its linking of an important element of organisation technology, interdependence, with MCS used by an organisation. The study hypothesized that MCS should focus on these individuals. As an instance of the interdependence-control link, implications for budget-based incentive contracts were analysed. The study also indicated that, the internal interdependence of an organisation implied a functional form of the group labour production function. The labour production function in turn defined the individuals that can affect group performance.

The studies reviewed at this level of analysis examined the joint effect of a control mechanism and a contingent factor on an outcome variable. In a typical study, the existence of a contingent factor and a control mechanism is hypothesized to result in increased effectiveness (or ineffectiveness).

3.5.3 One Contingent Factor, Multiple MCS Variables, and Organisational Performance Studies

At this level of analysis, the correlation between one contingent factor, multiple MCS variables, and organisational performance is examined. This level of analysis contrasts with the two previous levels, by examining the contingency relationship as a system rather than being independent.

Merchant (1981) investigated that how differences in organisation-level budgeting systems were related to organisation size, diversity, and degree of decentralization, and how different choices in system design and use was related to organisational performance and manager motivation and attitudes. The results showed that budgeting, as part of the organisation control strategy, was related to the organisation context. Larger organisations tend to make relatively high use of more formal administrative procedures, as opposed to interpersonal controls. Merchant states that in all organisations, the more formal and elaborate budgeting processes were generally received well by the managers, but in larger organisations they appear to be more positively linked with performance.

Govindarajan (1988) examined the interaction of competitive strategy, administrative and MCS mechanisms, and SBU performance. The empirical analysis included three mechanisms: budget evaluation style, decentralization, and SBU manager locus of control. The study hypothesized that the linkage between the three mechanisms and competitive strategy would increase SBU performance. Moreover, this study compared the results of interaction and systems approaches to fit. The data provided support for the study hypothesis.

Govindarajan and Fisher (1990) empirically examined the relationships among control systems, resource sharing, and competitive strategies and their interactive effects on SBU performance. They focused on the use of output and behaviour control. The study implied that a combination of high resource sharing and output control had a positive influence on the performance of an SBU with a low-cost strategy, whereas a combination of high resource sharing and behaviour control had a positive influence on the performance of an SBU with a differentiation strategy.

The studies reviewed in this level of analysis examined the joint effect of a contingent factor and multiple control mechanism on an outcome variable. This type of analysis assumes that there may be complementary or substitution relationships between the control variables, which may be uncovered by including multiple control mechanisms in the analysis. Control system substitution implies that a use of different control mechanisms can achieve the same desired results. On the other hand, complementary control systems are used in a reinforcing fashion. Most likely, some control mechanisms are used in a complementary way and others as substitutes, depending on the firm's contingent factors and control strategy.

3.5.4 Multiple Contingent Factors, Multiple MCS Variables, and Organisational Performance Studies

At this level of analysis, the correlation between multiple contingent factors, multiple MCS variables, and organisational performance is examined.

Gresov (1989) proposed a multiple-contingencies theory that simultaneously examines the effects of task and dependence on unit design and efficiency. The results of this study indicated three conclusions. First, a multiple-contingencies approach provided additional information about patterns of design in work-units, patterns that would have gone undetected in a unidimensional approach to context. The results obtained from these tests provided

support for the model. Strong support was found for context-design predictions, context-performance predictions, and context-fit predictions; mixed support was provided for fit-performance predictions. Second, the approach isolated instances in which equifinality could be observed. Third, the model provided further insights into both the phenomenon of misfit and the difficulties of observing it. A key finding was that organisations facing conflicting contingencies are more prone to design misfit and lower performance.

Fisher and Govindarajan (1993) examined the potential tension between the build and harvest missions along with the low-cost and differentiation competitive strategies. The study showed that the control design requirements of the build and differentiation strategies were similar. Likewise, the control design requirements of the harvest and low-cost strategies were similar. Therefore, if the SBU product life cycle and competitive strategies are build/differentiation or harvest/low-cost, the design demands are consistent. A univariate model employing either mission or strategy is likely to give a strong acceptance of the univariate hypotheses. The contingency conflict arises when a low-cost strategy and a build mission are used in conjunction, or when a differentiation strategy is employed with a harvest mission. The presence of conflicting contingencies increases the likelihood that compensation design will deviate from the demands of one of the contingencies, resulting in lower SBU performance.

The studies reviewed at this level of analysis simultaneously include multiple contingent factors in determining the optimal control design. It should be noted that designing the control system to simultaneously address several contingences involves trade-offs that preclude a "fit" to all contingencies.

3.6 Contemporary Developments for the Contingency Theory of Management Accounting

The earliest contributors to the performance evaluative style literature were Hopwood (1972) and Otley (1978). Hopwood (1972) operationalized a four-level categorical variable to measure subordinate perceptions of the importance of unit budget results in their superior evaluation of the respondent performance. Otley (1978) sought to replicate Hopwood's study with some modifications in variable specification and method. In particular, Otley chose a site with low between-unit interdependence, suggesting that unit budgets might not be an appropriate control device when interdependencies are high (which was the case in the

Hopwood study). Subsequently, Brownell and Hirst (1986) included budgetary participation as an explanatory variable, and considered managerial performance as the dependent variable. Brownell and Dunk (1991) discussed the danger of mis-specifying the effects of task uncertainty on management accounting systems design when using a concept of task uncertainty that combines the dimensions of task difficulty (task analysability) and task variability (number of exceptions). Abernethy and Lillis (1995) examined the impact of manufacturing flexibility on the design of MCS. In particular, they examined the implications of flexibility on the use of efficiency-based performance measurement systems and the use of integrative liaison devices.

The previous framework (contingency approach) of MCS design is consistent and complete, providing guidelines that might be applied in developing expectations of the impact of various contingent factors in any given setting. However, the framework points to some worrying possibilities for devotees of contingency-based research. The distinction between complexities is crucial to the application of the framework of the contingency approach to MCS design. Typical contingent factors such as environment, technology, and competitive strategy, may be seen as measuring the level of complexity facing organisations (Chapman, 1997).

Recently, two articles by Otley and Fakiolas (2000) and Otley and Pollanen (2000) have indicated that the development of management accounting is becoming increasingly externally and market oriented. Therefore, there is evidence to suggest that the role of MCS is changing and that other, often non-financial, performance measures are increasingly being used. Organisational forms are also undergoing change, with large, divisionalized organisations being replaced by smaller, more focused organisations linked into value chains. Contingency-based studies of the role of management accounting techniques (in particular ABC systems) in organisational control need to ensure that they are able to take account of such changes, and not to assume that control practices have remained constant over the last 25 years.

Otley and Pollanen (2000) suggested three possible paths that appear to offer the potential for developing the contingency approach to MCS design:

First: there is a continuation of the traditional contingency-based research. This needs more careful specification and measurements of factors, both from an accounting point of

view, and in its use of wider, from the point of view of social-psychological developments.

Second: there is considerable scope for more intensive contingency-based studies of organisations aimed at elucidating the impact of different accounting control practices within their wider context.

Third: the new developments in organisational control practices that have been reflected in changes in management accounting practice (e.g., ABC systems) also require contingency-based studies.

Moreover, many new developments for the contingency theory of management accounting come under the general banner of strategic management accounting, and a focus on customers, competitors and other external factors is replacing a solely internal focus. Even internally, the most prevalent new development of the past 15 years, ABC systems, is more concerned with product costing than with internal control. However, the major driver of its development has been the reduced level of direct labour costs relative to overhead costs; this driver also changes the focus of cost control from real-time operations to product planning and design. All of these changes suggest that the roles of accounting-based control techniques are likely to be undergoing substantial change in response to these pressures. At the very least, the design of studies of the impact of management accounting techniques on performance measurement should ensure that they are able to pick up such changing emphasis rather than expecting the world to behave in the same way as it did in the early 1970s (Otley and Fakiolas, 2000).

3.7 Summary and Conclusion

It can be stated that the previous contingency literature on MCS indicated that the universalistic approaches to research on MCS design are too simplistic to explain the effectiveness of MCS (Fisher, 1995). Thus, the contingency approach has become the dominant style for research on MCS. It has provided useful insights on optimal MCS design and should help to increase organisational performance by improving MCS variable selection. Consequently, the role of the external environment, SBU competitive strategy, technology and interdependence, organisations' variables, and observability factors have been found to strongly affect both the selection of MCS and organisational performance.

Although the contingency approach to MCS has provided useful insights into MCS design, the results from research seem to have been less than definitive and the deficiencies afford opportunities for further contingency-based research (Dent, 1990). Several issues must be resolved to improve the strength of the empirical and theoretical results of contingency-based research in this area. Therefore, the recent intention in management accounting studies has been to provide possible integrations between management accounting techniques such as ABC systems and other relevant contingent variables such as competitive strategy and technology.

Chapter 4: Strategy and Management Accounting

4.1 Introduction

Strategy has become an important focus for management and organisational research. Concepts of competitive strategy and strategic management have led to new vocabularies in the literatures of business policy, economics, and organisational theory (Dent, 1990). Interest in the concept of organisation strategy and its relation to management accounting practices has increased rapidly over the past few years. This chapter attempts to reassess the concept of strategy and the conventional wisdom concerning the relationship between strategy and management accounting. It then explores issues in strategic management accounting to gain some understanding of the way they affect this relationship.

The rest of the chapter is organised as follows. Section 4.2 defines the concept of strategy. Section 4.3 explores the hierarchies of strategy. Section 4.4 identifies the major strategic typologies. Section 4.5 explains the strategy of advanced manufacturing technology. Section 4.6 discusses issues in strategic management accounting. The last section contains the main conclusion.

4.2 Defining Strategy

Strategy has been operationalized in many different ways in MCS research (Langfield-Smith, 1997). The development of the concept of strategy as an explicit tool for managing economic and social organisations has its origins in both management theory and practice. Different definitions of strategy are used by leading authors in the field.

Chandler's (1962) definition is typical of early uses in the management literature. Chandler published his seminal work "*Strategy and Structure: Chapters in the History of American Industrial Enterprise*", in which he states:

> [...] Strategy can be defined as the determination of the basic long-term goals and objectives of an enterprise, and the adoption of courses of action and the allocation of resources necessary for carrying out these goals.

This definition is broad, encompassing both ends, in the sense of objectives and goals, and the means for their achievement, including courses of action and allocations of resources. Subsequent definitions have sought to narrow the concept. Hofer and Schendel (1978)

defined strategy as the match an organisation makes between its internal resources and skills and the opportunities and risks created by the external environment:

> [...] Strategy is the match between an organization's resources and skills and the environmental opportunities and risks it faces and the purposes it wishes to accomplish.

Porter's (1980, 1985) notion of competitive strategy limits the definition further, as follows:

> [...] Competitive strategy is the search for a favourable competition position in an industry, the fundamental arena in which competition occurs. Competitive strategy aims to establish a profitable and sustainable position against the forces that determine industry competition.

More recently, Anthony and Govindarajan (1998) pointed out that strategy is the general direction that can help an organisation to achieve its goals:

> [...] A strategy describes the general direction in which an organization plans to move to attain its goals.

From the above definitions, it is clear that the word strategy is used in different ways. However, within this variety, two major themes are evident. First, there is the idea of strategy as a position. This concept involves identifying where an organisation locates itself in its environment. Therefore, strategy is a version of positional analysis, concerned with the status of an organisation relative to competition and the environment. The second major theme is the idea of strategy as a process. Strategy process has been concerned with the way strategy is formed and implemented, whereas what is being decided has been claimed as the province of position-oriented research (Berry et al., 1995).

Moreover, it follows directly from the previous definitions and the need for all organisations to be both effective and efficient that there are four components to any organisation strategy (Hofer and Schendel, 1978, p. 25):

- ***Scope***: that is the extent of the organisation's present and planned interactions with its environment. This component will sometimes be referred to as the organisation domain.
- ***Resource deployments***: that is the level and patterns of the organisation's past and present resources and skill deployments that will help it achieve its goals and objectives.
- ***Competitive advantages***: that is the unique positions an organisation develops vis-à-vis its competitors through its pattern of resource deployment and/or scope decisions.
- ***Synergy***: that is the joint effects that are sought from the organisation's resource deployments and/or scope decisions.

4.3 Hierarchies of Strategy

There are three major levels of organisational strategy: corporate strategy, business strategy, and functional strategy. Each of these types of strategy has the four components explained earlier, although the relative importance and characteristics of these components differ.

4.3.1 Corporate Strategy

The corporate level in complex organisations must deal with operating divisions, groups of divisions, and separate legal business entities. Hence, corporate-level strategy is concerned with answering the question as to what set of businesses should the company be in. Consequently, scope and resource deployments among businesses are the primary components of corporate strategy. Competitive advantage and synergy are also important for related product, multi-industry organisations, but much less for conglomerates (Hofer and Schendel, 1978, p. 27).

Corporate strategy will determine the ground rules for the entire organisation. The starting point will be with company aims. One way to begin is to determine the present potential of company businesses in the portfolio, to compare this with the results of peer corporations, and to compare also with the expectations of the company constituency, such as returns to the investment community. Organisations are considered successful if they meet the test of comparison and if they are able to perform in a manner that satisfies those who have a substantial interest in the organisation (Smith, 1977, p. 138).

4.3.2 Business Strategy

At the business level, strategy focuses on how to compete in a particular industry or product-market segment. Thus, distinctive competences and competitive advantage are usually the most important components of strategy at this level. Scope becomes less important than at the corporate level and is concerned more with product-market segmentation choices and with the stage of product-market evolution than with the breadth of product-market scope. Synergy, by contrast, becomes more important. It focuses on the integration of different functional area activities within a single business. For most businesses, the major functional area policy decisions include product line, market development, distribution, financial, manpower, and R&D policies, plus major manufacturing system design choices (Hofer and Schendel, 1978, pp. 27-29).

Business strategy is the plan for the use of resources in an organisation in a manner suited to the mission and directed at the attainment of the business objectives. In fact, like any other type of strategy, it must be appropriate to the character of the business and it must be compatible with trends in the outside world. As a part of business strategy, resources will be allocated to the various operating functions and each function will have an agreed-upon mission and a set of objectives. It will consider the company position in the organisational field and how plans can be made to gain or to maintain any competitive advantages (Smith, 1977, p. 140).

4.3.3 Functional Strategy

At the functional level, the principal focus of strategy is on the maximization of resource productivity. Synergy and development of distinctive competences, thus, become the key strategic components, while scope drops sharply in importance. Here, synergy involves the coordination and integration of activities within a single function (Hofer and Schendel, 1978, p. 29).

Functional strategy exists to support the attainment of business objectives. Some elements of functional strategy may be important, in that they influence the primary business strategy, so there will need to be functional participation in the preparation of the business program. In addition, the strategies of the several functions must fit together and mesh with the business mission and business objectives. Therefore, as each aspect of functional management proceeds, the interrelationships must be re-examined, and if any conflicts are indicated, they must be resolved and individual plans adjusted accordingly (Smith, 1977, p. 141).

Finally, it can be stated that while each of the three types of strategy are distinct, they should all fit together to form a coherent and consistent whole for any organisation, if the organisation is to be successful over the long-run. This requires that each level of the organisation be constrained by each other level, which usually requires the functional strategy to be constrained by the business strategy and it, in turn, is constrained by the corporate strategy (Hofer and Schendel, 1978).

4.4 Classifying Strategies

The choice of product-market strategy is a fundamental decision component of the formulation and implementation of organisation strategic management (Morden, 1993).

Strategic archetypes demonstrate that organisations can compete successfully in a variety of ways. For instance, superior value can be offered to customers through new product features, high service levels, outstanding quality, or low cost (Porter, 1985). Three major strategic typologies have been identified in this matter as follows:

4.4.1 The Strategic Typology of Miles and Snow (1978)

Previous research by Miles and Snow (1978, p. 29) identified four organisational types. Each type has its own strategy for responding to the environment, and each has a particular configuration of technology, structure and process that is consistent with its strategy. These organisation types, which they have named defenders, prospectors, analysers and reactors, have the following general characteristics:

- ***Defenders*:** are organisations that have narrow product-market domains. Top managers in this type of organisation are highly expert in their organisation limited area of operation, but do not tend to search outside their domains for new opportunities. Therefore, these organisations seldom need to make major adjustments in their technology, structure or methods of operation. Instead, they devote primary attention to improving the efficiency of their existing operations.
- ***Prospectors*:** are organisations that continually search for market opportunities, and they regularly experiment with potential responses to emerging environmental trends. These organisations are the creators of change and uncertainty, to which their competitors must respond. However, because of their strong concern for product and market innovation, these organisations are usually not completely efficient.
- ***Analysers*:** are organisations that operate in two types of product-market domains, one relatively stable, the other changing. In their stable areas, these organisations operate routinely and efficiently through use of formalized structure and processes. In their more turbulent areas, top managers watch their competitors closely for new ideas, and then they rapidly adopt those that appear to be most promising.
- ***Reactors*:** are organisations in which top managers frequently perceive change and uncertainty occurring in their organisational environments but are unable to respond effectively. Because this type of organisation lacks consistent

> strategy-structure relationships, it seldom makes adjustments of any sort until forced to do so by environmental pressures.

A number of studies have sought to ascertain the empirical validity of Miles and Snow's strategic typology. Snow and Hrebiniak (1980) examined the general relationships among strategy, distinctive competence, and organisational performance. Findings indicated that defenders, prospectors, and analysers all show competence in general and financial management. Beyond these two functions, defenders and prospectors have identifiable but different configurations of distinctive competence, while analysers' special capabilities are considerably less apparent. Reactors, as expected, have no consistent pattern of distinctive competence. Finally, defenders, prospectors, and analysers consistently outperform reactors in competitive industries, but not in an industry that is highly regulated.

Hambrick (1981) operationalized strategy by classifying organisations as either defenders or prospectors, on the grounds that these represent extremes of the Miles and Snow's (1978) strategic typology, and they also map onto the input, throughput, and output model of organisations. The results for correlations between industries (with implied environmental contingencies) were broadly as expected. However, the results for strategy correlated with power again failed to return the expected results. Whilst throughput functions (such as accounting) were significantly positively correlated with power for defenders, the results for prospectors were not significant. This left the result that throughput functions such as accounting were not significantly lower in power in prospector organisations, as was originally expected.

Simons (1987) considered differing control attributes between prospectors and defenders and provided preliminary evidence concerning the relative importance of control systems in the two types of organisation. High performing prospector organisations seemed to attach a great deal of importance to forecasting data in control systems, setting tight budget goals, and monitoring outputs carefully. Large organisations appeared to emphasize frequent reporting and the use of uniform control systems. However, defenders, particularly large organisations, appeared to use their control systems less intensively. Negative relationships were noted between performance and attributes such as tight budget goals and output monitoring. Defenders emphasized bonus remuneration based on the achievement of budget targets and tended to have little change in their control systems.

4.4.2 The Strategic Typology of Porter (1980, 1985)

Porter (1980, pp. 35-39; 1985, pp. 12-15) pointed out that the strategic goal for an organisation in an industry is to find a position in the industry where the organisation can best defend itself against competitive forces. He identified three generic strategies approaches to outperforming other organisations in an industry, namely cost leadership, differentiation, and focus, which have the following general characteristics:

- ***Cost Leadership*:** requires aggressive construction of efficient-scale facilities, vigorous pursuit of cost reduction from tight cost and overhead control, avoidance of non value-added activities, and cost minimisation in areas such as advertising and sales force. Therefore, a great deal of organisational attention to cost control is necessary to achieve these aims. Low-cost relative to competitors, which has become the theme running through the entire strategy, through quality, services, and other areas cannot be ignored.

  Moreover, achieving a low-cost position often requires a high relative market share or other advantages, such as favourable access to raw materials. It may well require designing products for ease in manufacturing, maintaining a wide line of related products to spread costs, and serving all major customer groups in order to build volume.

  Having a low-cost position gives the organisation a defence against rivalry from competitors, because its lower cost means that it can still earn returns after its competitors have competed away their profits through rivalry. A low-cost position that defends the organisation against powerful buyers can exert power, only to drive down prices to the level of the next most efficient competitors. Moreover, low cost provides a defence against powerful suppliers by providing more flexibility to cope with input cost increases.

- ***Differentiation*:** the second generic strategy is one that differentiates the product or service offering of the organisation, creating something that is perceived industry-wide as being unique. Approaches to differentiating can take many forms: design or brand image,

technology, customer service, dealer network, or other dimensions.

Achieving differentiation often requires a perception of exclusivity, which is incompatible with high market share. More commonly, achieving differentiation will imply a trade-off with cost position, if the activities required in creating it are inherently costly, such as extensive research, product design, high quality materials, or intensive customer support. Whereas customers industry-wide acknowledge the superiority of the organisation, not all customers will be willing or able to pay the required higher price. In other organisations, differentiation may not be incompatible with relatively low cost and comparable price to competitors.

Differentiation, if achieved, provides insulation against competitive rivalry because of brand loyalty by customers and resulting lower sensitivity to price. It also increases margins, which avoids the need for a low-cost position. The resulting customer loyalty and the need for a competitor to overcome uniqueness provide entry barriers. Differentiation yields higher margins with which to deal with supplier power, and it clearly mitigates buyer power, since buyers lack comparable alternatives and are thereby less price sensitive. Therefore, the organisation that has differentiated itself to achieve customer loyalty should be better-positioned vis-à-vis substitutes than its competitors.

- ***Focus*:** the final generic strategy focuses on a particular buyer group, segment of the product line, or geographical market; as with differentiation, focus may take many forms. Although the low-cost and differentiation strategies are aimed at achieving their objectives industry-wide, the entire focus strategy is built around serving a particular target very well, and each functional policy is developed with this in mind. The strategy rests on the premise that the organisation is able to serve its narrow strategic target more effectively or efficiently than competitors who are competing more broadly. As a result, the

> organisation achieves either differentiation from better meeting the needs of the particular target, or lower costs in serving this target, or both.

Porter (1980, 1985) indicated that the three strategies are alternative, viable approaches to dealing with the competition forces. The organisation failing to develop its strategy in at least one of the three directions – an organisation that is "stuck in the middle" – is in an extremely poor strategic situation. The organisation stuck in the middle is almost guaranteed low profitability. It either loses the high-volume customers who demand low prices or must bid away its profits to get this business away from low-cost organisations. Yet it also loses high-margin businesses to the organisations who are focused on high-margin targets or have achieved differentiation overall.

Shank and Govindarajan (1993, p. 105) point out that the choice of a differentiation strategy rather than a low-cost strategy increases "uncertainty" in a business unit task environment for three reasons:

- **First:** product innovation is likely to be more critical for differentiation business units than for low-cost business units. This tendency is partly due to the fact that a low-cost business unit, with its primary emphasis on cost reduction, typically prefers to keep its product offerings stable over time; however a differentiation business unit, with its primary focus on uniqueness and exclusivity, is likely to engage in greater product innovation. Thus, a business unit with greater emphasis on new product activities tends to face greater uncertainty because the business unit is betting on unproven products.
- **Second:** low-cost business units typically tend to have narrow product lines in order to minimize inventory carry costs as well as to benefit from scale economies. However, differentiation business units tend to have a broader set of products in order to create uniqueness. Product breadth creates high environmental complexity and consequently higher uncertainty.
- **Third:** low-cost business units typically produce no-frill, commodity products, and these products succeed primarily because they have lower prices than competing products. In contrast, products of differentiation business units succeed if customers perceive that the products have advantages over competing products. Because customer perception is difficult to learn about, and because customer loyalty is subject to change resulting from the actions of

competitors or other reasons, the demand for differentiated products is typically more difficult to predict than the demand for commodities.

Most of the researchers that have addressed Porter's strategic typology have examined the control differences between business units pursuing low-cost and differentiation strategies. For instance, Gupta (1987) examined the effects of SBU strategies on the utility of various states of corporate-SBU relations. For SBUs trying to build market share or to pursue differentiation as a competitive strategy, openness in corporate-SBU relations and subjectivity in performance assessment were found to be positively associated with effectiveness; for SBUs trying to maximize short-term earnings or to pursue low-cost as a competitive strategy, the corresponding associations were found to be negative. Moreover, corporate-SBU decentralization emerged as positively associated with SBU effectiveness irrespective of their strategic contexts, although SBU competitive strategies moderated the magnitude of that association, while their strategic missions did not.

Govindarajan (1988) examined the relationship between budget evaluative style and uncertainty, in the context of the relationship between uncertainty and competitive strategy. The study provided support for the systems approach to fit. The results, based on systems analysis, indicated that when budget evaluative style, decentralization, and locus of control were aligned appropriately to meet the requirements of SBU strategy, superior performance occurred. Further, the systems fit was strong among differentiation SBUs but not strong among low-cost SBUs.

Hill (1988) developed a framework that identifies the contingencies under which low-cost and differentiation strategies are compatible. The study identified two main conclusions: first, differentiation can be a way of achieving a low-cost position. Second, because there is often no unique low-cost position, an organisation may have to base its sustainable competitive advantage on the simultaneous and continuous pursuit of both low-cost and differentiation. In general, the simultaneous pursuit of differentiation and low-cost strategies was most likely to be consistent with superior performance in mature industries, where all experience-curve economies had been exhausted and several organisations had achieved a minimum-cost position.

Govindarajan and Fisher (1990) studied whether strategy, resource sharing and control systems have an interactive impact on SBU effectiveness. The study findings indicated that:

(1) SBUs practicing a low-cost strategy tend to have a high level of resource sharing; (2) output control combined with high resource sharing is associated with increased effectiveness for low-cost SBUs; (3) SBUs practising a differentiation strategy in general have lower levels of resource sharing than low-cost SBUs; (4) Differentiation SBUs have a wider range of levels of resource sharing than low-cost SBUs; (5) For differentiation, SBUs with high resource sharing, behaviour control is associated with increased effectiveness; (6) for differentiation, SBUs with low resource sharing, output control is associated with increased effectiveness; and (7) the highest effectiveness for differentiation SBUs occurs when behaviour controls are used in combination with high resource sharing.

4.4.3 The Strategic Typology of Gupta and Govindarajan (1984a, b) and Govindarajan and Gupta (1985)

Gupta and Govindarajan (1984a, b), and Govindarajan and Gupta (1985) introduced a further strategic typology. They viewed strategy as representing a "build" to "divest" spectrum. In general, they proposed the following four strategic missions that a business unit can adopt:

- ***Build*:** this mission implies a goal of increased market share, even at the expense of short-term earnings and cash flow. A business unit following this mission is typically a resource user, due to the heavy investment required to build a competitive position. Business units with low market share in high growth industries typically pursue a build mission.
- ***Hold*:** this strategic mission is geared to the protection of the business unit's market share and competitive position. The cash outflows for a business unit following this mission would usually be approximately equal to cash inflows. Businesses with high market share in high growth industries typically pursue a hold mission.
- ***Harvest*:** this mission implies a goal of maximizing short-term earnings and cash flow, even at the expense of market share. A business unit following such a mission would be a resource provider, in that it generates more cash than is required for further investment. Businesses with high market share in low growth industries typically pursue a harvest mission.
- ***Divest*:** this strategic mission indicates a decision to withdraw from the business, either through a process of slow liquidation or typical divesting of growth industries.

Few studies have sought to ascertain the empirical validity of Gupta and Govindarajan's strategic typology. Gupta and Govindarajan (1984a) supplied the following arguments to

support the expectation that a "build" unit faces greater uncertainty in its external environment than does a "harvest" unit. First, a build mission, which implies a goal of increasing market share in a zero-sum game within an industry, puts an SBU into greater conflict with its competitors than does a harvest mission. An increase in market share implies an increase in production, which results in an increase in the organisation needed inputs. Increasing both inputs and outputs implies a greater number of contingencies for the build manager compared to the harvest manager. Second, as compared to the manager of a harvest SBU, the manager of a build SBU will have less experience in the industry; this would also contribute to the greater uncertainty faced by build managers in dealing with external constituencies. The critical uncertainty difference between the build and harvest strategy is the relationship between the SBU and its external environment.

According to Gupta and Govindarajan's (1984b) questionnaire responses from fifty-eight SBUs' general managers in the study sample (twenty-two build, ten hold, and twenty-six harvest), a relationship was observed between effectiveness at strategy implementation and satisfaction with perceived future career prospects for two sets of general managers, those heading build businesses and those heading harvest businesses. In the case of build businesses, managers who are more effective at strategy implementation, are also more satisfied with their future career prospects. However, in the case of harvest businesses, the relationship between performance and career satisfaction is just the opposite, and strongly so. Moreover, managers in charge of harvest businesses seem to believe that not only would success at executing the harvest strategy not improve their career prospects, it could even worsen them.

Govindarajan and Gupta's (1985) study is based on simple agency theoretical reasoning. Their broad assumptions were that long-run measures, such as sales growth and market share, would be appropriate bases for bonus levels in SBUs at the harvest end of the spectrum. They hypothesized that short-run measures, such as cost control and operating profits, would be more appropriate. The results showed, however, that short-run oriented criteria seemed to be equally relevant for all SBUs, irrespective of differences in their strategies.

In sum, it can be indicated that, while each of the three previous types of strategic typologies are distinguished, this research adopts Porter's (1980, 1985) strategic typology for some reasons have been explored in Chapter 5.

4.5 Advanced Manufacturing Technology Strategy

The relationship between advanced manufacturing technology (AMT) and competitive strategy may indeed be significant. Technological change is one of the principle drivers of competition. Competing in high-technology industries is widely perceived as being a ticket to profitability, while other low-technology industries are viewed with disdain. It can be stated that the recent success of competition, much of it based on technological innovation, has encouraged organisations even more to faster diffusion and investment in AMT (Porter, 1985; Zahra and Das, 1993).

AMT provides organisations with an avenue to gain a competitive advantage through increased flexibility, integration and automation. AMT has some or all of the following components (Anthony and Govindarajan, 1998, p. 640):

- ***Computer-aided design (CAD)*:** use of computers to design new products, replacing the drafting that was traditionally done by hand, and improving the quality of the design effort.
- ***Computer-aided manufacturing (CAM)*:** use of computers to control machine tools and the flow of material.
- ***Numerically controlled machines*:** machine tools that are programmed to perform a variety of functions on parts with different sizes and shapes.
- ***Robots*:** programmable machines with arms and legs that perform a variety of repetitive tasks, such as welding, assembly, and painting.
- ***Automated materials handling systems*:** storage and retrieval systems that locate materials, pick them, and move them from storage bins to the factory floor for processing and to shipping docks for delivery to customers.
- ***Flexible manufacturing systems (FMS)*:** computer-controlled workstations. Often, the machines used for producing one product or product line are grouped together in a single location or cell.

Under AMT, the attributes, whose impact on cost and profitability, become strategic, including the improvements in product quality, productivity, product life-cycle, and reporting timeliness as follows (Sriram and Gupta, 1991):

- ***Product Quality and Profitability*:** many organisations have launched ambitious programmes of AMT to improve quality and manufacturing flexibility, to reduce set-up times, to minimize machine breakdowns, and to eliminate idle-time losses.

Whether such improvements in quality have resulted in net benefits can only be measured adequately in terms of improvement in profits, if more aggressive long-term perspectives replace traditional static cost measurements.

- ***Measuring Productivity*:** AMT, if properly planned and executed, improves productivity. If the improvement in productivity is to be measured in realistic terms, measures should focus more on the ratio of inputs to outputs and how improvements in quality, preventive maintenance of machines and equipment, and activity levels affect the input to output ratio.
- ***Cost, Profit and Product Life-cycle*:** introducing AMT into an organisation can improve the quality of its existing products and often results in the introduction of new products. Using the same cost and profitability measures for both new and existing products would be inappropriate. Unlike measures for existing products, those for new products should focus more on the organisation ability to implement technological innovation and flexibility over a long time. Performance and evaluation of managers introducing new products should not only be based on reducing costs but also on improving quality, meeting customer needs and increasing market share.
- ***Timeliness of Reporting*:** to make reports useful, cost measurement efforts should parallel the cycle of the production process. AMT permits the collection of cost information simultaneously with the production process without significant expense. In fact, AMT can reduce the expense of collecting and processing data, because it facilitates real-time measurements, and it is more convenient than before to allocate overhead costs directly to each manufacturing cell and its production. The cost of supporting departments, such as purchasing, maintenance, scheduling, and information systems, can be directly allocated to the self-contained production cells.

Bruggeman and Slagmulder (1995) studied the impact of changes in manufacturing technology on management accounting. The study focused on the impact of technological change on investment justification and on costing systems. For each of these, the study described how and why traditional management accounting systems have been shown to be no longer appropriate. In addition, the study provided an overview of the ways organisations adapt their management accounting systems to the changes in the technological environment. Some observed changes were a paradigm shift in investment decision-making, more emphasis on throughput control, less emphasis on direct labour measuring, more emphasis on maintenance and tool cost management, and increased use of machine hour rates.

Parker (2000) explored the interaction between strategy and technology and the impact of the interaction on organisational performance. He pointed out that the nature of the interaction between strategy and technology dimensions affects organisational performance.

In the light of the above, this research is concerned with the relationship between, on the one hand, AMT, ABC systems, competitive strategy and management accounting practices, and, on the other hand, AMT and business unit performance.

4.6 Strategic Management Accounting

The main shortcomings of either a financial/management accounting system or a management information system (MIS) are that: (1) they have a tendency to rely on financial information to a large extent; (2) they deal mainly with historical information; (3) they provide internal organisation information but ignore external competitor or environmental information; and (4) what little future-oriented information is provided is usually based on simple extrapolation of the past. In contrast, SMA provides information necessary to perform the following strategic functions: (1) environmental analysis; (2) strategic alternative generation; (3) strategic alternative selection; (4) planning the strategic implementation; (5) implementing the strategic plan; and (6) controlling the strategic management process. In order to fulfil these information functions, SMA must contain information that is: (1) mostly non-financial; (2) focused on the future; (3) both internal and external to the organisation; and (4) based on realistic projections of the future, not simple extrapolations of the past (Brouthers and Roozen, 1999).

In this context, SMA will supplant management accounting as a framework for decision making by demonstrating that management accounting lacks strategic relevance (Shank and Govindarajan, 1988). In other words, management accounting can support the formulation and communication of strategies, the implementation of tactics to carry out these strategies and the development of controls to monitor the success of implementation steps, and the achievement of strategic objectives (Ittner and Larcker, 1997).

This overall area of management accounting has become known as SMA, because strategic management has a clearly identified interest in both the external environment and the internal working of the organisation (Drury, 1996a). However, there is still no comprehensive conceptual definition of what SMA is.

Simmonds (1981, 1982, 1986) first defined the term SMA as:

> [...] The provision and analysis of management accounting data about a business and its competitors for use in developing and monitoring the business strategy, particularly relative levels and trends in real costs and prices, volume, market share, cash flow and the proportion demanded of a firm's total resources.

Bromwich (1990) focused on the organisation's product markets. He defines SMA as:

> [...] The provision and analysis of financial information on the firm's product markets and competitors' costs and cost structures and the monitoring of the enterprise's strategies and those of its competitors in these markets over a number of periods.

Yoshikawa et al. (1993) indicate that the significance of what might be termed SMA has been increasingly recognized in recent years as follows:

> [...] The discipline has developed the approaches, which can generate suitable information on the cost management aspects of strategy.

Coad (1996) noted that:

> [...] SMA is an emerging field whose boundaries are loose and, as yet, there is no unified view of what it is or how it might develop. The existing literature in the field is both disparate and disjointed.

Generally speaking, the term SMA has been established in the management accounting literature for more than a decade. Despite some papers on the subject (Coad, 1996; Lord, 1996; Devine, 2000; Guilding et al., 2000), there still seems to be a paucity of themes and practices of SMA that are actually being used. Therefore, the next two sub-sections aim to address this gap by exploring these issues.

4.6.1 Strategic Management Accounting Themes

One of the earliest contributors to SMA themes was Shank (1989). The SMA themes perspective, first proposed by Shank (1989), involves three key themes that are taken from the strategic management literature: (1) Value chain analysis; (2) Cost driver analysis; and (3) Competitive advantage analysis. Each of the three key themes is a necessary component to SMA analysis; thus a sufficient analysis must involve all three.

4.6.1.1 Value Chain Analysis

Porter (1985) indicated that every organisation is a collection of activities that are performed to design, produce, market, deliver, and support its product. An organisation's value chain and the way it performs individual activities are a reflection of its history, its strategy, its approach to implementing its strategy, and the underlying economics of the activities themselves.

Shank and Govidarajan (1992; 1993, pp. 58-61) indicate that the methodology for constructing and using a value chain involves the following steps:

- ***Identifying the Value Chain*:** the starting point for cost analysis is to define an industry's value chain and allocate costs, revenues, and assets to individual value activities. Each value activity incurs costs, generates revenues, and ties up assets in the process.
- ***Diagnosing Cost Drivers*:** the next step is to identify the cost drivers that explain variations in costs in each value activity. In this context, cost drivers can be broken up into two major categories: (1) structural cost drivers; and (2) executional cost drivers (detailed below).
- ***Developing Sustainable Competitive Advantage*:** once the organisation has identified the value chain and diagnosed the cost drivers of each value activity, the organisation can gain sustainable competitive advantage in one of two ways: (1) by controlling those cost drivers better than competitors; or (2) by reconfiguring the value chain.

4.6.1.2 Cost Driver Analysis

The second major theme in SMA is to determine the cost drivers that affect costs in each value activity. Shank (1996) classifies the cost drivers into two categories as follows:

- ***Structural Cost Drivers*:** they are related to the strategic decisions that an organisation makes about its fundamental economic characteristics, such as scale, scope (degree of vertical integration), experience, technology, and complexity (number of different types of products or services).
- ***Executional Cost Drivers*:** they are related to an organisation ability to deliver the product or service successfully to the customer, and involve employee participation, total quality management, capacity utilization, plant layout efficiency, product configuration, and links with suppliers and customers.

4.6.1.3 Competitive Advantage Analysis

In the SMA perspective, understanding the implications of how the organisation chooses to compete fully is as important for cost analysis as understanding the value chain and the key strategic cost drivers at critical steps in the chain (Shank, 1996). Following Porter's (1980, 1985) delineation of basic strategic choices, a business can compete either by having lower costs (cost leadership) or by offering superior products (product differentiation). These two approaches demand very different conceptual frameworks, as is widely accepted in the strategy literature (Shank and Govindarajan, 1993).

4.6.2 Strategic Management Accounting Practices

Little research has been undertaken on the extent to which organisations use SMA practices. Guilding et al. (2000) recognize the difficulty in identifying what are generally accepted as SMA practices. Based on a review of the literature they identified twelve SMA practices. The following represent the definitions of these practices:

- ***Competitors' Cost Assessment*:** the provision of regularly updated estimates of a competitor's costs based on, for instance, appraisal of facilities, technology, economies of scale. Sources include direct observation, mutual suppliers, mutual customers, and ex-employees.
- ***Competitive Position Monitoring*:** the analysis of competitors' positions within the industry by assessing and monitoring trends in competitor sales, market share, volume, unit cost, and return on sales (ROS). This information can provide a basis for the assessment of competitors' market strategy.
- ***Life Cycle Costing*:** the appraisal of costs based on the length of stages of a product or service's life. These stages may include design, introduction, growth, decline, and eventually abandonment.
- ***Quality Costing*:** quality costs are those costs associated with the creation, identification, repair, and prevention of defects. These can be classified into three categories: prevention, appraisal, and failure costs. Cost of quality reports is produced for the purpose of directing management attention to prioritising quality problems.
- ***Strategic Costing*:** the use of cost data based on strategic and marketing information to develop and identify superior strategies that will sustain a competitive advantage.
- ***Strategic Management Accounting*:** that body of management accounting concerned with the provision of strategically orientated information for decision-making and control.

- ***Strategic Pricing*:** the analysis of strategic factors in the pricing decision process. These factors may include: competitors' price reaction, price elasticity, market growth, economies of scale, and experience.
- ***Target Costing*:** a method used during product and process design that involves estimating a cost calculated by subtracting a desired profit margin from an estimated price to arrive at a desired production, engineering or marketing cost. The product is then designed to meet that cost.
- ***Value Chain Costing*:** ABC systems, where costs are allocated to activities required to design, procure, produce, market, distribute and service a product or service.
- ***Attribute Costing*:** the costing of specific product attributes that appeal to customer. Attributes that may be costed include: operating performance variables, reliability, warranty arrangements, the degree of finish and trim, assurance of supply, and after sales service.
- ***Brand Value Budgeting*:** the use of brand value as a basis for managerial decisions on allocation of resources to support and enhance a brand position, thus placing attention on management dialogue on brand issues.
- ***Brand Value Monitoring*:** the financial evaluation of a brand through the assessment of brand strength factors such as: leadership, stability, market, internationality, trend, support and protection, combined with historical brand profits.

Finally, it has been found that there is negligible use of the term SMA in organisations and that appreciation of the term amongst practising accountants is somewhat limited (Guilding et al., 2000; Tomkins and Carr, 1996).

4.7 Summary and Conclusion

This chapter has reviewed the notion of strategy as it has evolved in the literature. Strategy is defined in terms of four basic components: scope, resource deployments, competitive advantages, and synergy. A distinction is made between three levels of strategy: (1) corporate, (2) business, and (3) functional. Strategy is classified according to three major strategic typologies: (1) Miles and Snow (1978), (2) Porter (1980, 1985) and (3) Gupta and Govindarajan (1984a, b) and Govindarajan and Gupta (1985). The impacts of AMT strategy on product quality, productivity, product life cycle and reporting timeliness have been discussed. Finally, the relationship between strategy and management accounting has been discussed in terms of the concept of SMA, SMA themes, and SMA practices.

It can be concluded that three important generalizations emerge from the strategic way of viewing management accounting (Shank and Govindarajan, 1993):

- **First:** SMA practices may be critically important in strategic decisions. An SMA analysis that is not useful for some purposes may be extremely useful for others. A working knowledge of SMA involves knowledge of the multiplicity of roles SMA information can play. Consequently, specific management techniques such as ABC systems must be considered in terms of the role they are intended to play.
- **Second:** in evaluating the overall management accounting systems for a business, mutual consistency among the various elements is critical. The key question is whether the overall fit with strategy is appropriate. For instance, ABC systems may be an excellent tool for assessing manufacturing performance in a business following a particular type of competitive strategy (cost leadership or differentiation).
- **Third:** management accounting is not an end in itself, but only a means to help achieve business success. There is no such thing as good management accounting practice or bad management accounting practice. Therefore, management accounting techniques, such as ABC systems, must be judged in the light of their impact on business success.

Finally, it can be stated that competitive strategy and AMT are capable of integrating into one contingency framework with the largely separate recent development in management accounting, which has strategic implications, that is ABC systems. Therefore, this research offers scope for increasing understanding of how ABC systems, competitive strategy, AMT and management accounting practices may influence business unit performance.

Chapter 5: Research Methodology

5.1 Introduction

The previous chapter indicated that the concept of competitive strategy has already been discussed in the strategy literature; it has not yet been integrated into management accounting and management control frameworks. Only a limited number of researchers have concentrated on contingency-based research in this area. This study extends the empirical research on the contingency relationship between external competition and ABC systems and explores the potential effects of organisation AMT on this relation. Therefore, this research is an attempt to identify and investigate the contingency relationships between ABC systems, competitive strategy, AMT, and the performance of the UK manufacturing business units.

This chapter explains what methods are used in pursuit of the research objective, and why these methods are adopted. In sum, this chapter provides a detailed view of the research methodology that is employed for this research, providing reasons and explanations where necessary.

The rest of the chapter is organised as follows. Section 5.2 identifies the research paradigms. Section 5.3 indicates the contingency/functionalist (positivistic) research paradigm. Section 5.4 constructs the dependent and independent variables for this research. Section 5.5 explains the research contingency model. Section 5.6 develops the research hypotheses. Section 5.7 deals with the questionnaire as a research methodology. Section 5.8 justifies the multivariate statistical analysis of this research. The last section contains the main conclusion.

5.2 Research Paradigms

The term paradigm refers to the progress of scientific practice based upon people's philosophies and assumptions about the world and the nature of knowledge; in this context, research paradigm refers to how research should be conducted (Hussey and Hussey, 1997).

The many different types of research can be classified according to: (1) the process of the research, (2) the logic of the research, and (3) the assumptions about the nature of social science. Research classified according to its process may be described as being either quantitative or qualitative. Quantitative research is objective in nature and concentrates on

measuring phenomena. Thus, quantitative research involves collecting and analysing numerical data and applying statistical tests. In contrast, qualitative research is more subjective in nature and studies social and human phenomena (Hussey and Hussey, 1997, p. 12).

Research classified according to logic may be described as being either deductive or inductive. Deductive research entails the development of a conceptual and theoretical structure prior to its testing through empirical observation. However, the logical ordering of inductive research involves moving from the plane of observation in the empirical world to the construction of explanations and theories about what has been observed. In this sense, theory is the outcome of inductive research (Gill and Johnson, 1997, pp. 28/33).

In sum, as Hussey and Hussey (1997) indicated, there are two main research paradigms. The two paradigms are labelled positivistic and phenomenological. The differences between the positivistic and phenomenological paradigms are shown in Table 5.1.

Table 5.1: Features of the research paradigms

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

Source: Hussey and Hussey (1997, p. 54)

Burrell and Morgan (1979, p. 21) suggest that assumptions about the nature of social science could be thought of in terms of the subjective/objective dimension, and assumptions about the nature of society in terms of a regulation/radical change dimension, which yields a 2 x 2 matrix comprising four different research paradigms (see Fig. 5.1).

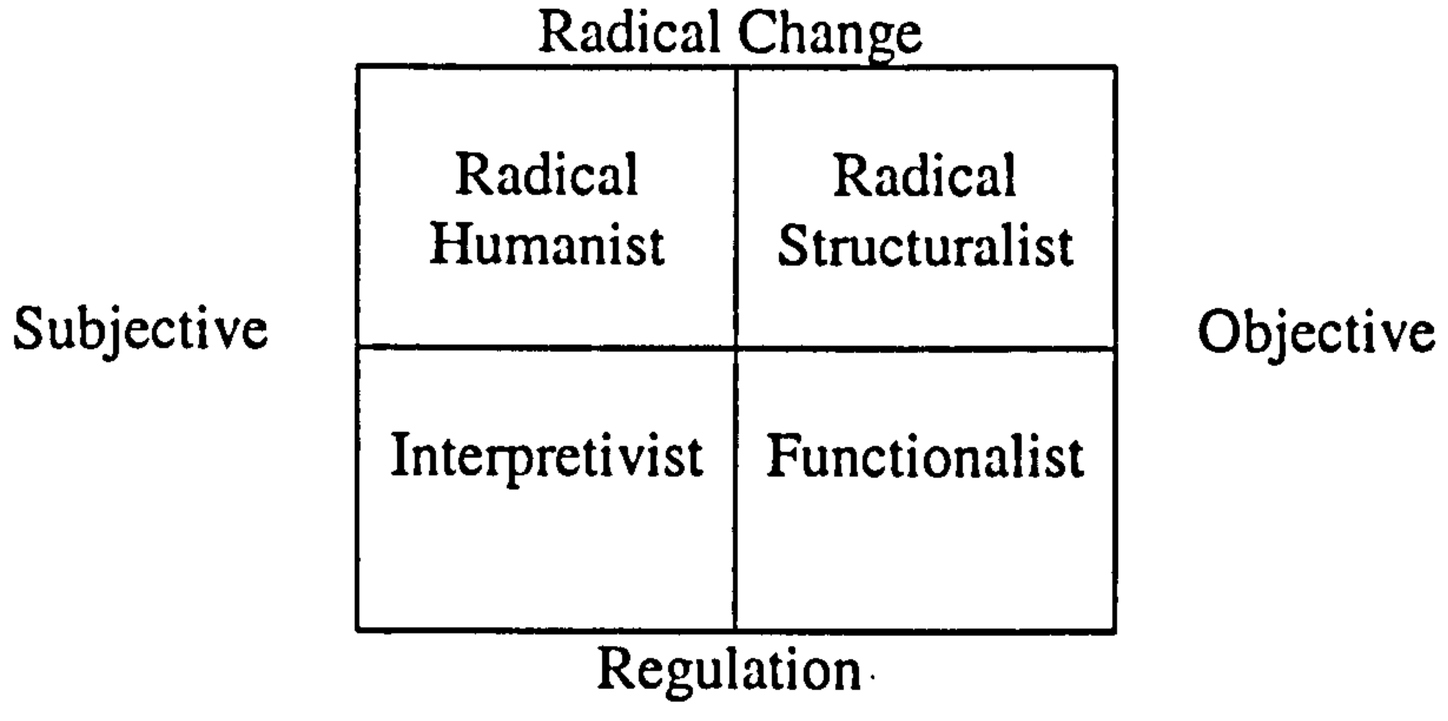

Fig. 5.1 Four paradigms for the analysis of social theory (adapted from Burrell and Morgan, 1979, p. 22)

To be located in a particular paradigm is to view the world in a particular way. The four research paradigms define four views of the social world based on different assumptions (Burrell and Morgan, 1979). Therefore, the four research paradigms shown in Fig. 5.1 offer different treatments of related issues as follows (Gioia and Pitre, 1990):

- ***The Functionalist Paradigm*:** the functionalist paradigm seeks to examine regularities and relationships that lead to generalizations. Organisational structure is taken as an objective phenomenon that is external to, and independent of, organisation members. Theory building takes place in a deductive manner, starting with reviews of the existing literature and operating out of prior theories about organisational structure. Selecting specific variables as likely causes of some designated effect derives hypotheses. Such hypotheses are tentative statements of relationships that extend prior theory in a new direction, propose an explanation for a perceived gap in existing knowledge, or set up a test of competing possible explanations for structural relationships. Data are collected with instruments and procedures designed according to the hypotheses formulated; analyses are mainly quantitative. Variables, categories, and hypotheses tend to remain constant over the course of the theory elaboration processes. Thus, the result of these processes is either the verification or falsification of the hypotheses, with theory building occurring through the incremental revision or extension (or occasionally rejection) of the original theory.
- ***The Interpretivist Paradigm*:** the interpretivist paradigm is based on the view that people socially and symbolically construct and sustain their own organisational realities. Therefore, the goal of theory building in the interpretivist paradigm is to generate descriptions and explanations of events so that the system of interpretations and meaning, and the structuring and organizing processes are revealed. Interpretive

theory building tends to be more inductive in nature. Through this process, researchers attempt to account for phenomena with as few a priori ideas as possible, which implies that existing theories about structuring processes are often accounted for relatively late in the theory building process. The interpretative researcher collects data that are relevant to the informants and attempts to preserve their unique representations. Analysis begins during data collection, and uses coding procedures to discern patterns in the qualitative data, so that descriptive codes, categories, taxonomies, or interpretive schemes that are adequate at the level of meaning of the information can be established.

- ***The Radical Humanist Paradigm*:** theory building in radical humanism is similar to that of interpretivism, but there is the important distinction of having a more critical or evaluative stance. The goal of theory is to free organisation members from sources of domination, alienation, exploitation, and repression by critiquing the existing social structure with the intent of changing it. Critical theorists have been criticised for failing to engage in renewed theory-generation efforts in favour of a propensity to reinterpret existing research rather than collect new data. The presentation of theory in this paradigm is meant to be persuasive, in that theories are intended to serve as a motivating impetus for change towards an ideology.

- ***The Radical Structuralist Paradigm*:** theory building in radical structuralism is related to that of radical humanism by virtue of the shared ideology for change, or for transformation. The goal of radical structuralist theory is to understand, explain, criticize, and act on the structural mechanisms that exist in the organisational world, with the ultimate goal of transforming them through collective resistance and radical change. For the radical structural theorist, like the radical humanist paradigm, the theory-building process is a pronounced exercise in argumentation and marshalling of historical evidence. Theory-building efforts are mainly persuasive constructions about structural features and their implications for the purposes of fomenting transformative. Paradoxically, regarding a paradigm devoted to change, there is little evidence that radical structuralists are inclined towards changing their own theories; thus, there are few actual attempts at new theory generation.

Gioia and Pitre (1990) summarised the differences between the four research paradigms in Table 5.2 as follows:

Table 5.2: The differences between the four research paradigms

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

Source: Gioia and Pitre (1990)

5.3 A Contingency/Functionalist (Positivistic) Research Paradigm

Positivistic accounting theory is being developed and tested through observation, deduction, testing, and evaluation. Research designs are often composed of surveys and statistical methods. Application of the contingency approach within such a kind of research design results in detection of cause and effect relations for description or explanation of an existing reality. Thus, the scientific aim is to produce descriptive or explanatory knowledge (Haas and Kleingeld, 1999). Contingency-based studies have come to be seen as large scale, cross sectional, and postal questionnaire based research, to examine the interaction of a certain number of contingent variables (Chapman, 1997).

As was mentioned in Chapter 3, section 3.4.1, studies that adopt the selection and interaction approaches of contingency theory tend to focus on how single contextual factors affect single structural characteristics, and how these pairs of context and structure factors interact to explain performance. Reductionism treats the anatomy of an organisation as being decomposable into elements that can be examined independently. The knowledge gained

from each element can then be aggregated to facilitate an understanding of the whole organisation system. In addition, the understanding of context-structure performance relationships can only advance by addressing "simultaneously" the many contingencies, structural alternatives, and performance criteria that must be considered holistically to understand organisation design. Therefore, unlike the selection and interaction approaches of contingency theory, the systems approach consists of several novel alternative methods characterizing the patterns of interdependencies present in organisations (Drazin and Van de Van, 1985).

It can be argued that, researchers have been critical of the selection and interaction approaches of contingency theory to analysing fit (Van de Van and Drazin, 1985). Thus, in this research the systems approach of contingency theory is employed because it is expected that various combinations of ABC systems, competitive strategy, and AMT would combine in mutually supportive ways to enhance a business unit performance.

While a considerable number of studies have discussed how MCS should be designed to be consistent with organisational context, little research has directly addressed the issues of the best fit of organisational controls for ABC systems. Therefore, this research addresses the issue of fit among the organisational elements in the UK's manufacturing organisations by studying the relations among ABC systems, competitive strategy, and AMT at the business unit level. Fit is also tied directly to the performance of the business unit.

This research seeks to examine the contingency relationships between ABC systems, competitive strategy, AMT, and business unit performance that lead to generalizations. In the following sections, the dependent and independent variables within the hypotheses are identified throughout this chapter. In addition, hypotheses are developed that identify the contingency relationships between ABC systems, competitive strategy, and AMT, which may enhance business unit performance. Moreover, the systems approach of contingency theory provides a basis to test hypotheses concerning the extent to which a wide range of variables affect a business unit performance.

The outcome of the above is the process of testing, by which the assertions put forward by the hypotheses are compared with the empirical data collected by a mail questionnaire from a large sample of the UK's manufacturing business units. Therefore, this research leans towards the contingency/functionalist (positivistic) paradigm.

5.4 Construction of Dependent and Independent Variables

It is important to identify the particular phenomenon or factor whose variation we are trying to explain or understand. That is, we must identify what is known as the dependant variable. The second step involves identifying the phenomena or factors whose variation, according to the theory or hypothesis we are testing, explains, or causes changes in our dependent variable. These causal variables are usually termed the independent variables, and are the phenomena whose influence upon the dependent variable we are specifically interested in investigating (Gill and Johnson, 1997, p. 39).

The social scientist designing or interpreting an organisational study is in a quandary. Most of the research concerned with the problem has been devoted to the study of the conditions under which organisations are more or less effective (Yuchtman and Seashore, 1967). Therefore, contingency theory first became prominent as a means for explaining organisational structure, suggesting that organisational performance is contingent upon environment, technology, and size. In addition, contingency theory identifies optimal forms of control under different operating conditions and attempts to explain how organisational control procedures operate (Rayburn and Rayburn, 1991).

The most pervasive contingency studies of management accounting identify a number of different variables. For instance, Gordon and Miller (1976) provided a framework comprising environment, organisation, and decision-making style. Hayes (1977) cited three major contingencies that affect sub-unit performance namely, environmental, interdependence, and internal factors. Waterhouse and Tiessen (1978) developed a model based upon two contextual variables: technology and environment.

The contingency theory of management accounting has been subject to the same criticisms as the contingency theory of organisational structure (Tiessen and Waterhouse, 1978; Otley, 1980). Rayburn and Rayburn (1991) argue that:

- The question of the design of management accounting systems, when faced with contingent variables that give conflicting recommendations, has not been fully addressed.
- The operationalisation of contingent variables has been problematic.
- Links with organisational performance are tentative.
- The nature of appropriate contingent variables has not been properly explained.

In the light of the above, this research assumes a contingency relationship between three independent variables (ABC systems, competitive strategy, and AMT), which influence one dependent variable (business unit performance). Therefore, we must account for the following dimensions when we model the independent variables that are going to impact the dependent variable:

- The dependent variable: business unit performance.
- The independent variables: ABC systems, competitive strategy, and AMT.
- The link between the independent variables.

5.4.1 Dependent Variable: Business Unit Performance

Empirical tests of contingency theory have produced mixed results, with as many studies finding significant correlations between measures of fit and business unit performance as not. These mixed results have caused many researchers to criticize past operationalizations of fit itself as being ad hoc (e.g., Van de Van and Drazin, 1985). A few studies have used objective measures of business unit performance when assessing the relation of fit to performance. Most studies have analysed self-assured performance as a function of fit among a limited set of organisational variables (e.g., Macintosh and Daft, 1987; Abernathy and Stoelwinder, 1991).

When performance was included as a dependent variable, it was typically poorly defined. The basic premise of contingency theory is that a proper fit will result in higher performance, but the measurement of performance is problematic. In addition to financial and profit goals, organisations may have other goals such as survivability, growth, or market share. In fact, debate about the nature of organisational goals is ongoing. Certain individuals believe that organisations do not have goals; others believe that organisational goals are just a summation of individual goals, and still others see goals as objective functions that are to be maximized. Moreover, little research has been done on outcome variables other than performance. Thus, contingency-based research in management accounting should explore the possibility that the use of MCS results in higher performance while not affecting (or negatively affecting) other outcome variables (Fisher, 1995).

The measurement of the performance of organisations has long been of central interest to management accounting. However, management accounting has tended to restrict itself to considering only financial performance, and to use frameworks and theories drawn primarily from the discipline of economics (Otley, 1999). Recently, non-financial performance

measures have received considerable attention in practice and in the management accounting literature. Many researchers argue that non-financial performance measures are a valuable supplement to financial measures, as they are required to understand and improve the financial performance of an organisation (Wouters et al., 1999; Otley, 2001).

Therefore, this research will include emphasis on non-financial performance measures in addition to indicators of financial performance measures. Under this framework, it will be logical to treat non-financial performance measures such as new product development and number of customer complaints, and other financial performance measures such as ROI and sales growth rate.

Precisely speaking, this research adopts the three approaches suggested by Govindarajan (1984), Abernethy and Lillis (1995), and Van der Stede (2000) for measuring business unit performance in terms of financial and non-financial measures. Chapter 7 will provide the specific measures that are used to measure the performance of the UK manufacturing business units.

5.4.2 Independent Variables

This research contains three correlated independent variables as follows:

5.4.2.1 ABC Systems

ABC systems produce a range of information, which can be viewed as contributing to the measurement of various aspects of performance (Mitchell, 1994): first, activities can be categorized into those which are value-added and those which are non value-added. Second, a similar categorization is based on core, support and diversionary activities. Third, the activity data can be presented in a more process-oriented manner by mapping the flow of work activity in two dimensions, time and location. Moreover, knowledge of cost drivers provides opportunities to improve performance through exploring the effects of changes in strategic policy on constraining factors. Performance measurement is not only a critical component for assessing the impact on activities of changes in cost drivers but also for expanding knowledge about which cost drivers are critical levers of better performance. Cost drivers are factors that provide information as to why an activity is performed and how much effort must be expanded to carry out the work (Turney, 1992).

In addition to cost information, ABC systems generate sets of non-financial measures through the cost driver information, which is needed for its adoption in output costing. They typically represent activity output measures and so can provide an indication of throughput, which facilitates performance measurement and assessment particularly at an operational level. When related to inputs they can reflect efficiency and productivity, and, when placed in the context of plans and goals, some indication of effectiveness can be ascertained. The availability of cost driver volume statistics is, however, only one dimension of activity performance. The opportunity is also provided to measure several aspects of the quality of activity outputs. For instance, the number of errors made, the volume of duplications, and the amount of returned work could all become measurements devoted to the performance (Mitchell, 1994).

It can be stated that studies need to determine whether improved understanding of cost drivers leads to improved performance. Research on ABC success relies almost exclusively on perceptual outcome measures, such as the extent of ABC systems usage or the perceived benefits from adoption. In general, these studies report moderate satisfaction with ABC. While perceptual measures such as these are useful for evaluating ABC success, they provide no evidence that ABC adopters achieve higher performance than non-adopters. Other studies suggest that many ABC adopters have abandoned their systems, raising questions about the performance consequences of ABC adoption (Ittner and Larcker, 2001).

In contrast, Ittner et al. (2002) examined the association between ABC and manufacturing performance. Using a large sample of US manufacturing plants, they found modest evidence that ABC use was positively associated with manufacturing performance. On average, extensive ABC use was associated with higher quality levels, greater decreases in cycle time, and larger increases in first pass quality. However, on average, extensive ABC use had no significant association with ROA. Instead, the study found some evidence that the relation between ABC and profits varies with the extent to which the decision to use ABC matches the plant's operational characteristics.

Moreover, Kennedy and Affleck-Graves (2001) pointed out that the choice of ABC systems might have a significant impact on organisation value. For a sample of UK organisations, they indicated that organisations adopting ABC systems outperform matched non-ABC organisations by approximately 27% over the three years in which ABC was first adopted. This result was robust to different matching criteria and for both accounting and market-

based measures of performance. The study suggested that ABC systems add to organisation value through better cost control and asset utilization, coupled with greater use of financial leverage.

Nowadays, the focus has been on identifying the contingent factors that influence ABC success or failure. It has long been accepted that the most appropriate ABC systems will be contingent upon the specific organisational circumstances (e.g., Shields, 1995). Therefore, this research identifies new contingent factors influencing ABC systems such as competitive strategy and AMT. Moreover, this research investigates how different choices in ABC systems design and use are related to business unit performance.

In this research, ABC systems are classified into four levels: activity analysis (AA), activity cost analysis (ACA), ABC, and activity-based cost management (ABCM). These four levels represent the range from simple AA without cost tracing to full ABCM reporting. Fig. 5.2 depicts these four levels. AA is the initial level while ABCM is the final and most refined one. ABCM subsumes AA, ACA, and ABC. In addition, AA is a prerequisite to performing an ACA (Gosselin, 1997):

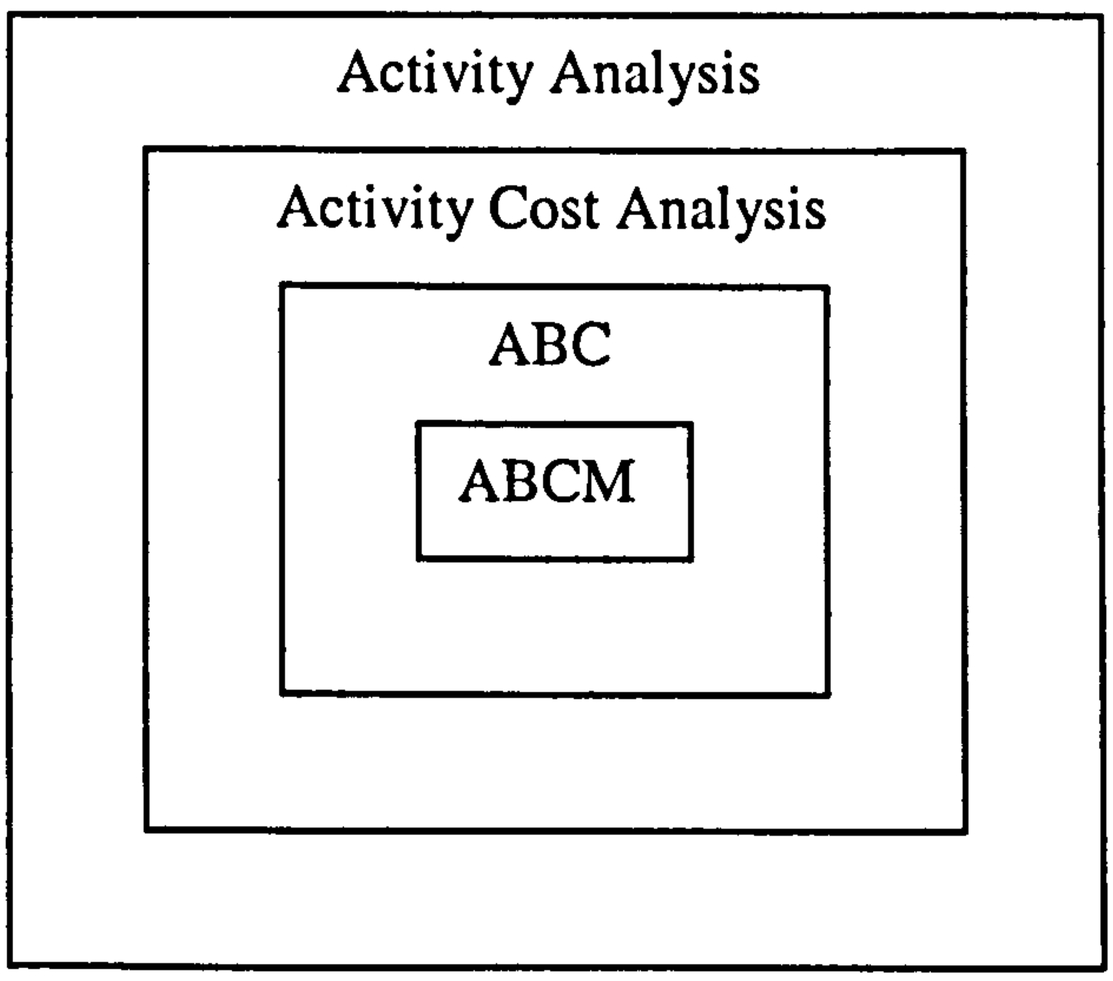

Fig. 5.2 The four levels of ABC systems (adapted from Gosselin, 1997)

The four levels of ABC systems can be distinguished as follows (Gosselin, 1997):

- **Activity Analysis (AA):** the first and most simple level consists of identifying the activities and procedures carried out to convert material,

labour, and other resources into outputs. Activities that do not add to the value of those outputs may be removed, replaced, or diminished. In addition, AA does not require cost analysis and does not necessarily lead to a new overhead allocation method. It is typically a prerequisite to the process of installing ABC systems.

- **Activity Cost Analysis (ACA):** is the next level in the ABC process. ACA subsumes AA, but adds the process of explaining the structural determinants of the costs of the activities. Many authors refer to this level as cost driver analysis (e.g., Shank, 1989). ACA enables identification of the costs of each activity and the factors that cause them to vary. ACA may be accomplished without implementing a product costing system that allocates overhead costs on the basis of these drivers. Many users have not adopted the ABC level, because most of the benefits are found in cost driver analysis. They would prefer to take actions to reduce the effects of the drivers instead of using them to allocate costs. Cost driver analysis allows organisations to prioritise the changes they want to make.
- **Activity-Based Costing (ABC):** enables organisations to measure product and service costs with more accuracy. ABC traces costs to products and services in two distinct steps. First, overhead costs are identified with homogeneous ABC pools. Second, pooled costs are applied to products using measures (cost drivers) of the activities consumed. ABC requires the completion of the AA and ACA levels.
- **Activity-Based Cost Management (ABCM):** in the process of turning activity-based thinking from costing technique to management philosophy the manufacturing organisations make close links between ABC and ABM and treat ABCM and ABM as synonymous (Jones and Dugdale, 2002). Many of the benefits of ABC implementations have resulted not from better knowledge of product costs, but in developing better methods of overhead cost management and business process improvement (Otley, 2001). Therefore, ABC supplies the information, and ABCM

uses this information in various analyses designed to yield continuous improvement (Turney, 1992).

It can be stated that, the decision to adopt ABC systems relies on the perception that business units need to have better information on activities and their related costs and on their impact on product cost and consequently business unit performance (Gosselin, 1997). Therefore, this research attempts to provide empirical evidence on the extent to which adoption of ABC systems depends upon the business unit's competitive strategy and AMT.

5.4.2.2 Competitive Strategy

As indicated in the previous chapter section 4.4, there are three different typologies of competitive strategy. However, Porter's (1980, 1985) seminal work on competitive strategy seems particularly germane to this research because of the importance he assigns to cost management. He presents the concept of the value chain, and shows the role of competitive advantage in affecting the value chain. He also considers the use of the value chain in designing organisational structure. Moreover, he explores the relationship between technology and competitive strategy.

Porter (1980, 1985) pointed out that a cost leadership strategy emphasised the need to incur the lowest costs in the market. Thus, this strategy requires aggressive construction of efficient-scale facilities, vigorous pursuit of cost reductions from experience, tight cost, and overhead control, avoidance of marginal customer accounts and cost minimization in activities like R&D, sales force, advertising, and so on. In a differentiation strategy, a business unit seeks to be unique in its industry along dimensions that are widely valued by buyers. Under this strategy, a business unit selects one or more attributes that many buyers in an industry perceive as important, and uniquely positions it to meet those needs. It is rewarded for its uniqueness with a premium price.

The SMA literature suggests that business units place more emphasis on particular management accounting techniques; depending on which strategic position they take. Using the strategic typology of Porter (1980, 1985), both Shank (1989) and Shank and Govindarajan (1993) analysed the relative importance of several management accounting methods depending on whether the business unit was pursuing cost leadership or differentiation. They suggested that business units choosing cost leadership would focus mainly on controlling costs. Therefore, such business units would put the most emphasis on

the traditional management accounting practices. They would use standard costing to evaluate performance, product cost as an input to pricing decisions, and flexible budgeting for manufacturing cost control. They would perceive meeting budgets to be of great importance (Lord, 1996).

On the other hand, for business units emphasising product differentiation strategies, traditional management accounting practices are unlikely to be sufficient for assessing how production processes support a variety of customer-focused strategies (Shank, 1989). Therefore, business units differentiating their products as a way of achieving competitive advantage put the most emphasis on SMA practices. They would consider marketing cost analysis to be critical to their success. They would consider flexible budgeting and meeting budgets to be of only moderate importance, and rank standard costing for performance assessment and product costing for pricing decisions of little importance (Lord, 1996).

The fact that a business unit pursues a cost leadership does not imply that it can ignore quality, service, features, or other bases for differentiation. Similarly, a business unit pursuing a differentiation strategy cannot ignore costs (Porter, 1980; 1985). Moreover, reducing cost does not always involve a sacrifice in a differentiation strategy. Many business units have discovered ways to reduce cost, not only without hurting their differentiation, but while actually raising it, by using practices that are both more efficient and effective or employing a different technology. Sometimes dramatic cost savings can be achieved with no impact on differentiation at all if a business unit has not concentrated on cost reduction previously (Wit and Meyer, 1998).

SMA practices are experiencing wide-ranging degrees of applications (Guilding et al., 2000). Competitive position monitoring, customer profitability analysis, life cycle costing, quality costing, strategic costing, strategic pricing, target costing, value chain analysis, and ABC systems appear to be the most popular SMA practices. Ghoshal et al. (1991) and Foster et al. (1994) point out that the gap between what is needed and what is supplied by accounting systems can be extended to SMA practices. Therefore, this research attempts to fill such a gap. It is concerned with the relationship between a business unit's competitive strategy and management accounting practices.

Competitive strategy plays a key role in the diffusion of AMT. The necessity to AMT is driven by the type of competitive strategy employed by a business unit. In addition, AMT

brings keen competition among business units pursuing strategies of differentiation over new product developments. The timely introduction of new products into the market is essential to acquire or maintain competitive strength. Cost leaders also have to invest heavily in AMT to maintain their competitive strength as cost leaders. In both strategies, the timely introduction of new products is essential to meet competition (Tani, 1995).

Under a contingency theory view, it has been suggested that management accounting systems should be designed specifically to suit the business unit strategy (Otley, 1980). This research seeks to understand the type of strategy followed by a business unit in relation to other contingent variables relevant to organisational success such as ABC systems and AMT. The relationship between competitive strategy, through the intervening variables of ABC systems and AMT, and business unit performance is not addressed at all. Therefore, within this limited contingency framework this research aims to address a gap by exploring this relationship.

5.4.2.3 Advanced Manufacturing Technology (AMT)

The relationships between technology and organisational effectiveness may indeed be linear (Schoonhoven, 1981). Many early contingency-based studies were congruence theories because they simply hypothesized that technology was related to organisational context without examining, whether or not this contingency relationship affected performance (Drazin and Van de Van, 1985). Moreover, few studies have examined empirically the link between AMT and organisational performance in manufacturing business units (Abernethy and Lillis, 1995).

It should be noted that, AMT affects competitive strategy if it has a significant role in determining relative cost position or differentiation. Since AMT is embodied in every value activity and is involved in achieving linkages among activities, it can have a powerful effect on both cost leadership and differentiation. AMT will affect cost leadership or differentiation if it influences the cost drivers or drivers of uniqueness of value activities. In addition, AMT employed in a value activity is frequently itself a driver when it reflects a policy choice made independently of other drivers. Therefore, a business unit that can discover a better AMT for performing an activity than its competitors gains competitive advantage (Porter, 1985).

Porter (1985, pp. 171-172) indicated that AMT would lead to sustainable competitive advantage under the following circumstances:

- A technological change enhances competitive advantage if it leads to lower cost or differentiation and can be protected from imitation.
- Changing the technology of a value activity or changing the product in ways that affect a value activity can influence the drivers of cost or uniqueness in that activity.
- Even if an innovator is imitated, pioneering may lead to a variety of potential first-mover advantages in cost or differentiation that remains after its technological lead is gone.
- A technological change that improves overall industry structure is desirable even if it is easily copied.

It can be stated that the decision to become a technological leader or follower can be a way of achieving either cost leadership or differentiation, as illustrated in Table 5.3.

Table 5.3: Technological leadership and competitive strategy

	Technological Leader	**Technological Follower**
Cost Leadership	- Pioneer the lowest cost product design. - Be the first business unit down the learning curve. - Create low cost ways of performing value activities.	- Lower the cost of the product or value activities by learning from the leader's experience. - Avoid R&D costs through imitation.
Differentiation	- Pioneer a unique product that increases buyer value. - Innovate in other activities to increase buyer value.	- Adapt the product or delivery system more closely to buyer needs by learning from the leader's experience.

Source: Porter (1985, p. 181)

With the rapid change that has been taking place in manufacturing business units in recent years, most recent studies of practice have focused on the impact of the introduction of AMT on management accounting. Innovation in practice can result in significant changes to the functioning of a business unit. New ways of dealing with suppliers, new ways of production processes, new ways of monitoring and controlling performance, new ways of dealing with customers, and new cost structures are all consequences of these changes. And all of these consequences are potential influences on the design of costing systems (Spicer, 1992).

There is evidence that, AMT has the potential to be an important factor influencing the design characteristics of effective costing systems, that is, one that supports the decision and control needs of management. In addition, it would appear that the decision to invest in AMT influences the cost structure of manufacturing business units and this indicates the relation between AMT and costing systems design (Abernathy et al., 2001).

Two related trends can be noted in the cost structure of many manufacturing business units (Miller and Vollman, 1985): first, overhead costs are increasing as a percentage of total manufacturing costs, and second, volume driven costs are decreasing as a percentage of total manufacturing costs. As a result, costing systems, which allocate overhead costs using only volume-driven allocation bases (e.g., direct labour hours) have been seriously challenged as poorly estimating or even distorting product costs (Cooper and Kaplan, 1988a; Cooper, 1988a).

ABC was introduced as the key alternative to traditional costing systems. In this respect, the adoption and installation of AMT plays an important role in emerging ABC systems. However, up to this point, no research on AMT in management accounting has linked AMT to ABC systems (Young and Selto, 1991). Therefore, this research attempts to answer an important question: what is the impact of AMT on ABC systems?

Based on the contingency theory, this research tries to relate AMT to both competitive strategy and ABC systems. Precisely speaking, this research suggests that competitive strategy, ABC systems, and AMT interaction should be examined on three levels:

- To understand how specific competitive strategy (cost leadership or differentiation) interacts with AMT.
- To examine the impact of AMT on the adoption of ABC systems.
- To examine the impact of competitive strategy, ABC systems and AMT interaction on business unit performance.

5.5 The Research Contingency Model

From the previous discussion, it is generally accepted that business unit performance may be contingent upon ABC systems, competitive strategy, and AMT, and that this contingency relationship is best researched at the business unit level for some reasons that will be explored in section 5.7. In addition, it is clear that the central theme of this research is the

development of a new and more complex contingency model of ABC systems. This view, which is best captured by an open systems model, emphasizes the vast commerce between a business unit and its environment.

A few studies have examined the contingency relationships between contextual variables and ABC (Gosselin, 1997; Chenhall and Langfield-Smith, 1998b; Frey and Gordon, 1999). Most of these studies have investigated the effects of contextual variables such as strategic priorities and organisational structure on the adoption of ABC.

Chenhall and Langfield-Smith (1998b) examined how combinations of management techniques and management accounting practices enhance the performance of organisations, under particular strategic priorities in Australian manufacturing organisations. Organisations were identified as emphasizing product differentiation or low price strategies. A systems approach was used to examine hypothesized associations between performance and a range of management techniques and management accounting practices, under various strategic orientations. A survey was administered to 140 manufacturing organisations, of which 78 replied.

Chenhall and Langfield-Smith developed two hypotheses. First, higher performing organisations that place a strong emphasis on product differentiation strategy will gain high benefits from the following management techniques and management accounting practices: quality systems, integrating systems, team-based structures, human resource management policies, balanced performance measures, benchmarking, and strategic planning techniques. Second, higher performing organisations that place a strong emphasis on low price strategy will gain high benefits from the following management techniques and management accounting practices: improving existing practices, manufacturing innovations, traditional accounting techniques, and activity-based techniques. Overall, the study results indicated that improving existing processes, manufacturing system innovations, and activity-based techniques were important for high performing organisations emphasizing a product differentiation strategy. Moreover, the results provided support for the proposed associations in the second hypothesis.

Gosselin (1997) examined the effect of strategic posture and organisational structure on the adoption of general forms of activity management (AM) approaches in Canadian manufacturing organisations. The study presented and tested hypotheses on the adoption of

either activity management (AM) (broader scope), or ABC (narrower scope). The study hypothesized that a prospector strategy is associated with the depth and breadth of AM in an organisation. Gosselin argued that a mechanistic structure is positively associated with organisations that adopt ABC. He used the concepts of centralization, vertical differentiation, and formalization to develop a scale for organic-mechanistic structure. Then he proposed a negative relationship between formalization and innovation.

To test his hypotheses, he sent a questionnaire to 415 organisations, of which 162 replied. The findings supported his hypothesis on prospector strategy: prospector organisations, which compete through innovation and product and market development, tend to be more open to new techniques, enabling improved processes and information. The results also indicated that mechanistic organisations tend to select ABC while organic organisations prefer AM. Centralized and formal organisations proved to be more closely associated with the adoption of ABC, in contrast to more decentralized and informal organisations.

Frey and Gordon (1999) examined whether the performance effects of ABC are contingent on the competitive strategy being deployed in US manufacturing business units. A survey was administered to 622 manufacturing business units, of which 123 replied. The study developed three null hypotheses. First, business units adopting ABC (whether pursuing cost leadership strategy or differentiation strategy) perform no better than those not adopting ABC. Second, the decision to adopt ABC is independent of the business unit choice between following a cost leadership strategy or a differentiation strategy. Third, the relative benefits of adopting ABC will be no different for business units pursuing cost leadership strategy than for those choosing differentiation strategy. The empirical findings of the study indicated that the use of ABC is associated with better performance. However, this association appears to be driven by the group of business units following a product differentiation strategy, as contrasted with the group following cost leadership strategy.

While these studies provide interesting insights into the fit hypothesis, very few attempts have been made to link all the variables to performance in terms of financial and non-financial measures. In addition, a few studies have examined effective ways to implement diverse strategies at the business unit level (Govindarajan and Gupta, 1985; Gupta and Govindarajan, 1984a, b).

Moreover, Chenhall and Langfield-Smith (1998b) indicated that it is possible that other variables such as AMT are implicated in the relationship examined in their study. Frey and Gordon (1999) pointed out that further research may utilize more refined measurements of certain variables such as the use of AMT. In fact, to gain competitive advantage, the appropriate positioning of manufacturing can be achieved by the development of AMT, which is consistent with overall business unit strategy. An investment in AMT changes the costing systems and affects the competitive priorities of the business unit (Pirttila and Sandstorm, 1995).

Therefore, the need to link AMT to competitive strategy and ABC systems has been recognised in this research. In sum, the question that needs to be clearly addressed is whether there is a relationship between the three independent variables (ABC systems, competitive strategy, and AMT) and the dependent variable (business unit performance) in this research? The objective of this research is to attempt to provide some answers to this question.

It is generally accepted that ABC systems are used differently in different organisations. This research adopts the view that ABC systems may be conceptualised in terms of a continuum from simple types (AA and ACA) to sophisticated types (ABC and ABCM). The question that guides the study in this respect is: to what extent do ABC systems have an impact on the performance of the UK's manufacturing business units? Moreover, this research provides additional explanations by examining to what extent contextual factors like competitive strategy and AMT influence the adoption of ABC systems. In fact, this research is one of the few contingency-based studies on ABC systems.

Like Guilding et al.'s (2000) study, this study relates to the scope of practices to be considered, i.e., what management accounting practices comprise SMA? However, the criteria adopted in Guilding et al.'s do not relate to the proximity of the accounting practices to business unit's competitive strategy, rather they relate to the extent to which management accounting practices embody strategic orientations. Therefore, this research attempts also to understand how business unit competitive strategy and AMT affect the adoption of management accounting practices.

Moreover, the contingency model developed here treats management accounting practices as an intervening variable that influences the relationship between competitive strategy and

AMT, and the adoption of ABC systems. To date, no research has examined the "mediating" effect of management accounting practices on the extent of use of ABC systems.

In this research a conceptual model of business unit performance, based on contingency theory, is selected as a framework. The objective of this model is to use contingency theory, in an empirical study of the UK manufacturing business units, to establish if there is a relationship between performance and the level of fit between a business unit's ABC orientation and its context. Thus, the contingency model depicted in Fig. 5.3 provides the hypothesized structural relationships among the variables of interest in this research.

Most ABC studies, however, continue to reflect a closed system view of a business unit. They currently constrain business unit development, since the ABC systems information provided fails to capture the impact of a system environment on its performance. To solve these problems, an alternative scheme for ABC systems is proposed here. The attempt is to discover and recognize those key causes whose impact extends well beyond ABC systems. In closing, it should be noted that what is proposed here is a change in both the philosophy and structure of ABC research.

As indicated in Chapter 3, section 3.4.2, contingent factors include five major categories that have been examined in the contingent literature: (1) external environment, (2) competitive strategy, (3) technology and interdependence, (4) organisational variables (e.g., size, diversification, structure, industry, and culture), and (5) observability factors (outcomes or behaviours). Typical contingent factors from broader contingency theory, such as environment and structure, have not been included in the study's contingency model. There are several reasons for excluding such typical contingent factors. The study contingency model is already complex and so it was realised that including additional factors would make it even more complicated. A problem that adds to this complexity is data availability. In addition, by limiting the model to specific contingent factors (e.g., competitive strategy, ABC systems, AMT, management accounting practices, and business unit performance) the questionnaire length of this study would be shorter thereby ensuring a high response rate. Further, the contingency relationships covered in the model have not previously been well covered and some of them have not been covered at all particularly in the UK. Nevertheless, future research can cover the factors left out from the model.

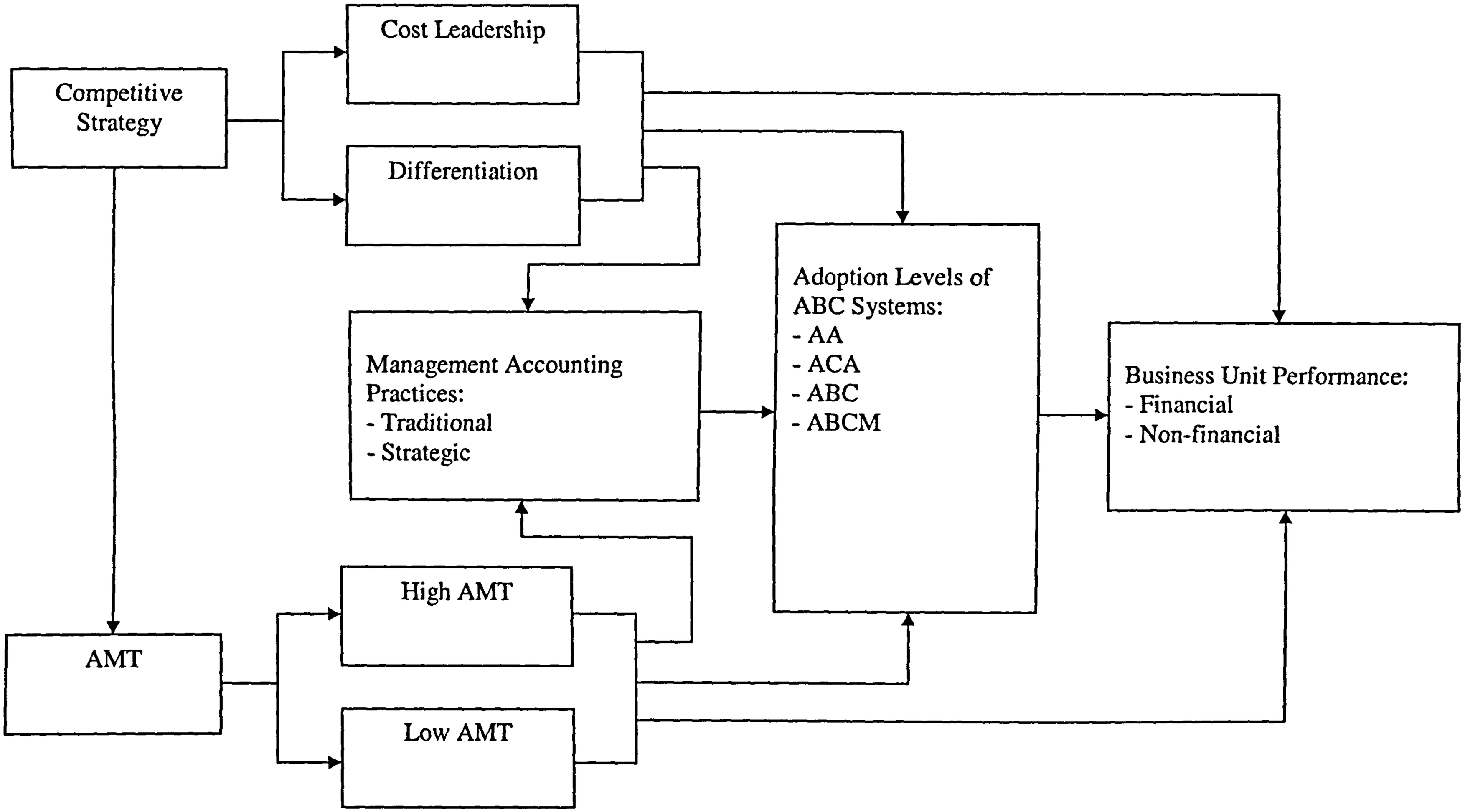

Fig. 5.3 The research contingency model

5.6 Development of Hypotheses

Any theory is a network of hypotheses advanced so as to conceptualise and explain a particular social or natural phenomenon. In this sense, each hypothesis presents an assertion about the relationship between two or more concepts (Gill and Johnson, 1997, p. 26). Under a functionalist/positivistic paradigm, it is traditional to state the research questions as hypotheses (Hussey and Hussey, 1997). Consequently, the research hypotheses will identify the dependent and independent variables.

After the previous discussion of the contingency model for this research, it can be developed into a number of hypotheses about the way the various model dimensions can be expected to affect each other and business unit performance. Therefore, this research reports upon tests of eight hypotheses, which arise from the contingency model as follows:

5.6.1 Competitive Strategy and Management Accounting Practices

As indicated in Chapter 4, section 4.4.2, the choice of a differentiation strategy rather than a cost leadership strategy would increase "uncertainty" in a business unit. Thus, a greater amount of information would be required, and such business units are likely to use SMA practices. In contrast, if a business unit chooses a cost leadership strategy, the environment in which it operates will be relatively "stable". This, in turn, will induce such business units to employ traditional management accounting practices (Chong and Chong, 1997). Therefore, the following two hypotheses are tested:

Hypothesis 1 (H1): business units that place a strong emphasis on cost leadership strategy will employ traditional management accounting practices.

Hypothesis 2 (H2): business units that place a strong emphasis on differentiation strategy will employ SMA practices.

5.6.2 Cost Leadership Strategy and ABC Systems

Chapter 1 and Chapter 2 pointed out that ABC systems offer one way of achieving more accurate product costs. In fact, determining accurate product costs is important for all business units and should not be ignored by those choosing a product differentiation strategy. However, the effects of distorted product costs may not seem as critical for business units competing on product differentiation. This line of reasoning would suggest that business units utilizing a cost leadership strategy are likely to "adopt" ABC systems (Frey and

Gordon, 1999; Chenhall and Langfield-Smith, 1998b). Therefore, the following hypothesis is tested:

Hypothesis 3 (H3): business units that place a strong emphasis on cost leadership strategy will adopt ABC systems.

5.6.3 Differentiation Strategy and AMT

AMT is viewed as a tool that enables business units to increase their information processing capability. Based on this logic, AMT choice can be determined by the information processing requirements resulting from the pursuit of a selected strategy (Kotha and Swamidass, 2000). Given this logic, the information processing capabilities of AMT, along with the production and innovation flexibility, makes it an effective strategic tool for dealing with the "uncertainty" associated with differentiation strategy. Therefore, the following hypothesis is tested:

Hypothesis 4 (H4): business units that place a strong emphasis on differentiation strategy will employ AMT.

5.6.4 AMT and ABC Systems

Chapter 1 and section 5.4.2.3 of this chapter argued that AMT play an important role in emerging ABC. The progressive use of AMT has dramatically raised overhead costs and now exceeds direct costs. Consequently, ABC has emerged as an alternative system to traditional costing systems. Therefore, the following hypothesis is tested:

Hypothesis 5 (H5): business units that have AMT will use ABC systems.

5.6.5 AMT, SMA Practices, and ABC Systems

Traditional management accounting practices which focus on variance analysis, aggregating costs, and accounting for inventory do not effectively identified resources consumed, or help business units manage their resources. They may distort the realities of manufacturing performance with AMT (Bruggeman and Slagmulder, 1995; Kaplan, 1994). As a result, SMA practices, such as ABC systems, life cycle costing, and target costing, seem to be gaining an increasing foothold all over the industrialized world (Granlund and Lukka, 1998).

In this sense, management accounting practices may mediate the effect that competitive strategy and AMT have on ABC systems adoption. In other words, management accounting practices would play the role of a "mediating variable" and thus be dependent on both

competitive strategy and AMT (see Fig. 5.3). Therefore, the following two hypotheses are tested:

Hypothesis 6 (H6): business units that have AMT will use SMA practices.

Hypothesis 7 (H7): business units that have SMA will use ABC systems.

5.6.6 Differentiation Strategy, ABC Systems, AMT, and Business Unit Performance

It should be noted that business units focusing on a product differentiation strategy produce a large number of products in order to respond to a variety of market needs and may have given only limited attention to indirect cost allocation issues prior to adoption of ABC systems (Frey and Gordon, 1999). If this were the case, then business units following a product differentiation strategy may be likely to "gain" more from ABC systems than those pursuing a cost leadership strategy.

Moreover, this study attempts to examine the contingency relationships between business unit's competitive strategy, ABC systems, AMT, and performance. With such a contingency approach, it is assumed that business units may have varying degrees of fit (Gerdin and Greve, 2004). Thus, the study intends to show that a higher degree of fit is associated with higher performance. It claims that high-performing as well as low-performing business units do exist as a result of more or less successful combinations of the study contingent variables. Therefore, the following hypothesis is tested:

Hypothesis 8 (H8): business units that place a strong emphasis on differentiation strategy and have ABC systems and AMT will have higher performance.

In this section, the research hypotheses have been developed. Chapter 8 and Chapter 9 will apply the constructed research contingent variables in statistical analysis to test these hypotheses.

5.7 The Questionnaire Research Methodology

This research adopts a quantitative methodology; thus it is reasonable that sufficient consideration be given to the issues that such a methodology raises. In the previous discussion, it was noted that contingent variables such as ABC systems, competitive strategy, and AMT might affect the business unit performance. Therefore, in order to test this

contingency relationship, the research instrument must be carefully constructed, and in this study the research instrument will be a questionnaire.

If there is no universal management accounting system for all organisations, then it is reasonable to expect different circumstances of ABC systems within different business units. If business units are no different to this general case then it should be expected that ABC systems' circumstances and developments would differ within business units; therefore the questionnaire should explain this. As the questionnaire is developed to test the research hypotheses, the objective of the questionnaire is to collect data for measuring the performance of the UK manufacturing business units.

A cross-sectional survey based on a mail questionnaire could be considered to be the most appropriate research methodology for this study for three reasons:

- **First:** existing empirical research primarily has used a field-study approach that, while providing in-depth analysis, generally does so only on a limited number of business units. Thus, a questionnaire is used as a cost-effective method to complement these studies by collecting information from a broader cross-section of business units (Shields, 1995).
- **Second:** unlike interviews, a mail questionnaire focuses on facts rather than on personal opinions. It also places less pressure on an immediate response and provides the respondents with a feeling of anonymity (Gosselin, 1997).
- **Third:** there is evidence that most contingency-based studies have used cross-sectional survey methods (Chenhall, 2003).

In the light of the above, this research has taken the form of a field study which has included a questionnaire methodology to gather empirical evidence capable of providing an overview of the contingency relationship between ABC systems, competitive strategy, AMT, and the performance of the UK manufacturing business units.

Finally, the issue of levels of analysis is important to theory testing within contingency-based research. Care is required in maintaining consistency between the theory and the unit or level of analysis (Chenhall, 2003). Therefore, this research is directed at the business unit rather than an organisation level for four reasons:

- **First:** the research contingency model is complicated as soon as it moves into a complex, multi-unit organisation in which each unit strives to cope with a different part of the competitive environment (Lawrence and Lorsch, 1967).
- **Second:** most of the studies explore the relationship between MCS and strategic typologies at the business unit level, rather than corporate or functional levels (Govindarajan and Gupta, 1985; Simons, 1987; Govidarajan, 1988; Govindarajan and Fisher, 1990).
- **Third:** the two competitive strategies of cost leadership and differentiation are more likely to be associated with a business unit rather than an organisation (i.e., an organisation often employs one strategy in some business units and another strategy in other business units) (Frey and Gordon, 1999).
- **Fourth:** ABC systems and AMT adoptions have often occurred within specific business unit of an organisation, rather than on an organisation-wide basis (Frey and Gordon, 1999).

5.8 Multivariate Statistical Analysis

It is possible for correlation problems to involve more than two variables. When this happens, the bivariate correlation methodology must be expanded to accommodate the increased number of measures. Thus, multivariate statistical analysis (MSA) is a term often used to refer to this methodology (Martinez-Pons, 1999). It is concerned with data that consist of sets of measurements on a number of individuals or objects. In MSA, the means and variances of the separate measurements (for distributions and for samples) have corresponding relevance. In addition, the measurement and analysis of dependence between variables, between sets of variables, and between variables and sets of variables, are fundamental to MSA (Anderson, 1984).

In this research several independent variables (ABC systems, competitive strategy, and AMT) are used to explain and predict variability in a composite dependent variable (the performance of the UK manufacturing business units). In this sense, the statistical model is viewed as multivariate because Y is composed of multiple measures whose true contributions to the representation of Y are to be tested; it involves multiple independent variables combined through weighted addition into a composite X (Martinez-Pons, 1999).

The application of MSA in social sciences has increased dramatically due to the availability of accessible computer programs that simplify the tedious calculations required. The result is the application of these sophisticated techniques to a wide variety of research problems (Bray and Maxwell, 1985). For instance, Chenhall and Langfield-Smith (1998b) employed cluster analysis to form clusters of organisations, based on their emphasis on strategic priorities and benefits derived from management techniques and management accounting practices. Average organisational performance was calculated for each cluster and used to order clusters.

In fact, five concerns about cluster analysis must be made (Aldenderfer and Blashfield, 1984; Hair et al., 1995):

- **First:** most cluster analysis methods are relatively simple procedures, which in most cases are not supported by an extensive body of statistical reasoning. In other words, they are little more than plausible algorithms, which can be used to create clusters of cases.
- **Second:** different clustering methods can and do generate different solutions to the same data set. While this may be a natural outgrowth of disciplinary specialization, it is nevertheless a source of considerable confusion for both novices and sophisticated users of cluster analysis.
- **Third:** clustering methods are often no more than plausible rules for creating groups; users must be aware of the biases that often accompany the presentation and description of a clustering method.
- **Fourth:** a clustering method will always place objects into groups, and these groups may be radically different in composition when different clustering methods are used.
- **Fifth:** the focus of cluster analysis is on the comparison of objects based on the variate, not estimation of the variate itself empirically. This makes the researcher definition of the variate a critical step in cluster analysis.

Gosselin (1997) used logistic regression to examine the effect of strategic posture and organisational structure on the adoption of general forms of activity management (AM) approaches. The study pointed out that logistic regression was chosen because it is a much stronger test than correlation analysis and chi-square. Moreover, Frey and Gordon (1999) adopted multiple regression analysis to examine which of a cost leadership strategy or a

differentiation strategy provided statistically significant explanations of ABC success in terms of a business unit ROI.

It can be stated that logistic regression and multiple regression are interested in the frequency of correct as opposed to incorrect predictions of the exact value of the dependent variable, in addition to how well the model minimizes errors of prediction. They are more concerned with whether the predictions are correct or incorrect than with how close the predicted values (the predicted conditional probabilities) are to the observed values of the dependent variable. However, one reason for the lack of consensus about indices of predictive efficiency may be the fact that researchers are more often interested in the "goodness-of-fit" of the model than in the accuracy of prediction (Menard, 1995). Especially for theory testing, goodness-of-fit is simply more important than accuracy of prediction, and consequentially other models may be more appropriate than logistic regression and multiple regression.

Moreover, Hair et al. (1995) pointed out that cluster analysis, logistic regression, multiple regression, and other multivariate techniques could examine only a single relationship at a time between the dependent and independent variables. Recently, Chenhall (2003) has argued that these techniques require many decisions in terms of the type of analysis, and, given the complexity of the relationships between variables, interpretation, and theory testing can be difficult. They do, however, provide a way of addressing the criticism that contingency-based research provides only a partial understanding of MCS and its context. In contrast, structural equation modeling (SEM) is a comprehensive statistical approach to testing hypotheses about series of relationships between the dependent and independent variables "simultaneously" (Hoyle, 1995).

SEM is a relatively new and quite advanced technique that allows researcher to test various models concerning the inter-relationships among a set of variables. Based on multiple regression and factor analytic techniques, it allows a researcher to evaluate the importance of each of the independent variables in the model and to test the overall fit of the model to the research data (Pallant, 2001, pp. 91-92). Roughly analogous to doing a confirmatory factor analysis and path analysis at the same time, this form of SEM allows researchers to frame increasingly precise questions about the phenomena in which they are interested (Kelloway, 1998).

This research attempts to identify and investigate a series of contingency relationships simultaneously between ABC systems, competitive strategy, AMT, management accounting practices, and the performance of the UK manufacturing business units. The tests of these contingency relationships available through SEM techniques are both more rigorous and more flexible than are other comparable techniques (Kelloway, 1998).

The research contingency model will be tested using SEM to determine if the pattern of variances and covariances in the data is consistent with the structural model specified in section 5.5. Therefore, the next chapter outlines the basic elements of the SEM approach. Moreover, there is evidence that the SPSS computer program does not have an SEM module (Pallent, 2001, p. 92). LISREL, EQS, and AMOS computer programs have dominated the field in conducting SEM analysis. The data analysis will be undertaken using the AMOS program for statistical reasons further explored in the next chapter.

5.9 Summary and Conclusion

The contingency model presented in this chapter departs from the traditional analysis of fit between ABC systems and critical success factors. Instead, new concepts are introduced to link ABC systems with both competitive strategy and AMT. This research underscores the importance of the contingency relationship between ABC systems, competitive strategy, AMT, and business unit performance in terms of financial and non-financial measures. Moreover, attention should be paid to how adoption of traditional and SMA practices are associated with business unit competitive strategy, AMT, and ABC systems.

Only limited contingency studies have investigated the contingency relationship between ABC systems and competitive strategy. Furthermore, an interesting question is whether the adoption of ABC systems in the UK manufacturing business units is influenced only by the competitive strategy of that particular business unit or also by the AMT of the business unit. Thus, this research would investigate the influence of AMT and determine how this factor has an influence on ABC systems. To date, no research has investigated the "mediating" effect of management accounting practices on the adoption of ABC systems.

It can be stated that, from a methodological point of view, questionnaire research can contribute significantly to insights in the multiple relationships between different external and internal contingent factors, and the performance of the UK manufacturing business units.

Therefore, this research has shown how the initial research aims led to a contingency/functionalist (positivistic) approach to the research. Once within the contingency/functionalist (positivistic) arena, justification is given for the use of the questionnaire as the key research methodology.

SEM is a statistical technique for studying relationships among multivariate data "simultaneously". It is employed to test the research hypotheses. Therefore, the next chapter will discuss the SEM approach as a specific statistical technique that is selected to analyse the research questionnaire using AMOS computer program.

Chapter 6: Structural Equation Modeling (SEM) Statistical Methodology

6.1 Introduction

One of the most difficult parts of the research process for most research students is choosing the correct statistical technique to analyse their data (Pallant, 2001, p. 89). In fact, the choice of a statistical test depends upon three main factors: (1) the research question, (2) the design of the research, and (3) the type of data that has been collected (Kinnear and Gray, 2000).

The previous chapter (section 5.8) indicated that the statistical model for this research is considered as a multivariate one. SEM was mentioned to be the specific statistical technique that would be undertaken on the data that was collected. Therefore, a classification of multivariate techniques is presented. General guidelines for their application are provided. Then, SEM is explained as a statistical methodology. Moreover, several computer programs for conducting SEM are proposed in terms of their assumptions and limitations. The AMOS computer program was selected to analyse the data set.

The rest of the chapter is organised as follows. Section 6.2 classifies the different types of multivariate techniques. Section 6.3 explains SEM as the statistical technique adopted in this research to test the research contingency model. Section 6.4 discusses SEM computer programs. The last section contains the main conclusion.

6.2 Types of Multivariate Techniques

It can be stated that multivariate analysis refers to all statistical methods that analyse multiple measurements on each individual or object under investigation. Generally speaking, any analysis of more than two variables can be considered as multivariate analysis. The purpose of multivariate analysis is to measure, explain, and predict the degree of relationships among variables. Thus, the multivariate character lies in the multiple combinations of variables, not only in the number of variables or observations (Hair et al., 1995). The different techniques of multivariate analysis can be classified into two main groups: (1) dependence and (2) independence techniques.

6.2.1 Dependence Techniques

A dependence technique can be defined as one in which a variable or a set of variables is identified as the dependent variable to be explained or predicted by other variables known as independent variables (Hair et al., 1995, p. 17).

6.2.1.1 Multiple Regression Analysis

Regression analysis is one of the most flexible and widely used techniques of quantitative analysis (Hardy, 1993). Multiple regression is a method of analysing the collective and separate contributions of two or more independent variables to the variation of a dependent variable (Kerlinger and Pedhazuer, 1973; Berry and Feldman, 1985; Jaccard, 1990; Jaccard and Wan, 1996).

With multiple regression, more than one independent variable can be incorporated into an equation. This is useful in two ways (Lewis-Beck, 1990): first, it almost inevitably offers a fuller explanation of the dependent variable, since few phenomena are products of a single cause. Second, the effect of a particular independent variable is made more certain, as the possibility of distorting influences from the other independent variables is removed.

6.2.1.2 Multiple Discriminant Analysis

Discriminant analysis is a technique for combining the independent variables into a single new variable, on which each participant in the study gets a score. This new variable, known as a discriminant function, is constructed in such a way that the participants' scores on it, to the greatest possible extent, separate, or discriminate among those people in the different categories of the criterion variable (Kinnear and Gray, 2000).

If the single dependent variable is dichotomous (e.g., male-female) or multichotomous (e.g., high-medium-low) and therefore nonmetric, the multivariate technique of multiple discriminant analysis (MDA) is appropriate. In other words, discriminant analysis is useful in situations where the total sample can be divided into groups based on a dependent variable characterizing several known classes. The primary objectives of multiple discriminant analysis are to understand group differences and to predict the likelihood that an entity (individual or object) will belong to a particular class or group based on several metric independent variables (Hair et al., 1995, p. 13).

6.2.1.3 Multivariate Analysis of Variance

Multivariate analysis of variance (MANOVA) is a statistical technique that can be used to explore the relationship between several categorical independent variables and two or more metric dependent variables. As such, it represents an extension of univariate analysis of variance (ANOVA) (Bray and Maxwell, 1985; Hair et al., 1995; Pallant, 2001).

MANOVA is useful when the researcher designs an experimental situation (manipulation of several nonmetric treatment variables) to test hypotheses concerning the variance in group responses on two or more metric dependent variables (Bray and Maxwell, 1985; Hair et al., 1995; Pallant, 2001).

6.2.1.4 Analysis of Covariance

Analysis of covariance (ANCOVA) is an extension of analysis of variance that allows the exploration of differences between groups, while statistically controlling for an additional (continuous) variable. This additional variable (called a covariate) is a variable that the researcher suspects may be influencing scores on the dependent variable. Regression procedures can be used to remove the variation in the dependent variable that is due to the covariate, and then performs the normal analysis of variance techniques on the corrected or adjusted scores. By removing the influence of these additional variables, ANCOVA can increase the power of sensitivity of the *F*-test. Consequently, it may increase the likelihood that the researcher will be able to detect differences between the groups. Moreover, ANCOVA can be used as a part of one-way, two-way, and multivariate ANOVA techniques (Pallant, 2001, p. 233).

ANCOVA can be employed when the researcher has a two-group pre-test/post-test design. The scores on the pre-test are treated as a covariate to control for pre-existing differences between the groups. ANCOVA is also handy when the researcher has been unable to randomly assign his subjects to the different groups, but instead has had to use existing groups. As these groups may differ on a number of different attributes, ANCOVA can be used in an attempt to reduce some of these differences (Pallant, 2001, pp. 233-234).

6.2.1.5 Canonical Correlation

Canonical correlation analysis can be viewed as a logical extension of multiple regression analysis. Multiple regression analysis involves a single metric independent variable.

However, with canonical analysis the objective is to correlate several metric dependent variables and several metric independent variables. Moreover, whereas multiple regression involves a single dependent variable, canonical correlation involves multiple dependent variables (Hair et. al., 1995, p. 14).

The underlying principle is to develop a linear combination of each set of variables (both dependent and independent) to maximize the correlation between the two sets. Stated differently, the procedure involves obtaining a set of weights for the dependent and independent variables that provides the maximum simple correlation between the set of dependent variables and the set of independent variables (Hair et al., 1995, p. 14).

6.2.1.6 Logistic Regression Analysis

Logistic regression is a combination of multiple regression and multiple discriminant analysis. This technique is similar to multiple regression analysis in that one or more independent variables are used to predict a single dependent variable. What distinguishes a logistic regression from multiple regression is that the dependent variable is nonmetric, as in discriminant analysis (Hair et. al., 1995; Menard, 1995).

On the other hand, logistic regression is distinguished from discriminant analysis primarily in that it accommodates all types of independent variables (metric and nonmetric) and does not require the assumption of multivariate normality (Hair et al., 1995; Menard, 1995).

6.2.1.7 Conjoint Analysis

Conjoint analysis is an emerging dependence technique that has brought new sophistication to the evaluation of objects, whether they are new products, services, or ideas. The most direct application is in new product or service development, allowing for the evaluation of complex products while maintaining a realistic decision context for the respondent (Hair et. al., 1995, p. 15).

The market researcher is able to assess the importance of attributes and the levels of each attribute while consumers evaluate only a few product profiles, which are combinations of product levels. In addition, when the consumer evaluations are completed, the results of conjoint analysis can also be used in product design simulators, which show customers'

acceptance for any number of product formulations and aid in the design of the optimal product (Hair et al., 1995, p. 15).

6.2.1.8 Structural Equation Modeling

SEM provides the most efficient estimation technique for a series of separate multiple regression equations estimated simultaneously. It is characterized by two basic components (Hoyle, 1995; Hair et al., 1995; Hayduk, 1987):

- **The measurement model:** allows the researcher to use several variables (indicators) for a single independent or dependent variable. In the measurement model the researcher can assess the contribution of each scale item and incorporate how well the scale measures the reliability into the estimation of the relationships between dependent and independent variables. This procedure is similar to performing a factor analysis.
- **The structural model:** is the "path" model, which relates independent variables to dependent variables. In such situations, theory allows the researcher to distinguish which independent variables predict each dependent variable. The models discussed previously, which accommodate multiple dependent variables (MANOVA and canonical correlation), are not appropriate in this situation because they allow only a single relationship between dependent and independent variables.

6.2.2 Independence Techniques

If the researcher is investigating the interrelations, and therefore the interdependence among all the variables, without regard to whether they are dependent or independent variables, several other multivariate methods are appropriate. These methods include the independence techniques.

6.2.2.1 Factor Analysis

There are two main approaches to factor analysis (Long, 1983; Kim and Muller, 1978a, b; Pallant, 2001):

- **Exploratory Factor Analysis:** is often used to gather information about (explore) the inter-relationships among a set of variables. However, the

researcher does not specify the structure of the relationships among the variables in the model. Therefore, the researcher must assume that: (1) all common factors are correlated; (2) all observed variables are directly affected by all common factors; (3) unique factors are uncorrelated with one another; and (4) all observed variables are affected by a unique factor. These assumptions are made regardless of the substantive appropriateness.

- **Confirmatory Factor Analysis:** is a set of techniques used to test (confirm) specific hypotheses or theories concerning the structure underlying a set of variables. Thus, the limitations of the exploratory factor analysis have been overcome by the development of the confirmatory factor analysis. In the confirmatory factor analysis, the researcher imposes substantively motivated constraints. These constraints determine: (1) which pairs of common factors are correlated; (2) which observed variables are affected by which common factors; (3) which observed variables are affected by a unique factor; and (4) which pairs of unique factors are correlated.

6.2.2.2 Cluster Analysis

Cluster analysis is a multivariate statistical procedure that starts with a data set containing information about a sample of entities and attempts to reorganise these entities into homogeneous groups (Aldenderfer and Blashfield, 1984). It usually involves two steps. The first is the measurement of some form of similarity or association between the entities to determine how many groups exist in the sample. The second step is to profile the variables to determine their composition (Hair et al., 1995, p. 16).

Most of the varied uses of cluster analysis can be subsumed under four principal objectives: (1) development of a typology or classification, (2) investigation of useful conceptual schemes for grouping entities, (3) hypothesis generation through data exploration, and (4) hypothesis testing, or the attempt to determine if types defined through other procedures are in fact present in a data set (Aldenderfer and Blashfield, 1984).

6.2.2.3 Multidimensional Scaling

Multidimensional scaling is a set of mathematical techniques that enable a researcher to uncover the hidden structure of databases. It should be noted that these techniques use proximities among any kind of objects as input. A proximity is a number which indicates how similar or how different two objects are (Kruskal and Wish, 1978).

The main output is a spatial representation, consisting of a geometric configuration of points, as on a map. Each point in the configuration corresponds to one of the objects. This configuration reflects the hidden structure in the data, and makes the data much easier to comprehend. The term, reflecting the data structure, means that the larger the dissimilarity (or the smaller the similarity) between the two objects, as shown by their proximity value, the further apart they should be on the spatial map (Kruskal and Wish, 1978).

6.2.2.4 Correspondence Analysis

Correspondence analysis is a recently developed interdependence technique that facilitates both dimensional reduction of object ratings (e.g., products, persons, etc.) on a set of attributes and the perceptual mapping of objects relative to these attributes. Researchers are constantly faced with the need to quantify the qualitative data found in nominal variables. Correspondence analysis differs from the other interdependence techniques in its ability to accommodate both nonmetric data and nonlinear relationships (Hair et al., 1995, pp. 16-17).

In its most basic form, correspondence analysis employs a contingency table, which is the cross-tabulation of two categorical variables. It then transforms the nonmetric data to a metric level and performs dimensional reduction (similar to factor analysis) and perceptual mapping (similar to multidimensional scaling). Therefore, it provides a multivariate representation of interdependence for nonmetric data not possible with other methods (Hair et al., 1995, p. 17).

In sum, multiple regression, factor analysis, discriminant analysis, and the other techniques discussed above all provide the researcher with powerful tools for addressing a wide range of managerial and theoretical questions. However, except for SEM, they all share one common limitation: each technique can examine only a single relationship at a time. Even the techniques allowing for multiple dependent variables, such as MANOVA and canonical analysis, still represent only a single relationship between the dependent and independent variables (Hair et al., 1995, p. 617).

SEM has been used in almost every conceivable field of study, the reasons for its attractiveness are twofold: (1) it provides a straightforward method of dealing with multiple relationships simultaneously while providing statistical efficiency, (2) it essentially offers social scientists the ability to perform path-analytic modeling, and (3) its ability to assess the relationships comprehensively has provided a transition from exploratory to confirmatory analysis. This transition corresponds to greater efforts in all fields of study towards developing a more systematic and holistic view of problems. Such efforts require the ability to test a series of relationships constituting a large-scale model, a set of fundamental principles, or even an entire theory. These are the tasks for which SEM is well suited (Hair et al., 1995; Hoyle, 1999).

6.3 Structural Equation Modeling Statistical Technique

SEM is a statistical methodology that takes a hypothesis testing (i.e., confirmatory) approach to the multivariate analysis of a structural theory bearing on some phenomenon (Byrne, 1994; Bentler and Chou, 1987). Precisely speaking, it is used to evaluate a substantive theory with empirical data through a hypothesized model (Hoyle, 1995). It attempts to specify, estimate, and test causal relationships underlying observable variables (Matsueda and Bielby, 1986). Advances in covariance structure analysis have made SEM one of the most popular multivariate statistical methodologies for data analysis (Dunn et al., 1993). Therefore, it has been used by biologists, economists, educational researchers, marketing researchers, medical researchers, and a variety of social and behavioural scientists (Raykov and Marcoulides, 2000).

SEM refers to general statistical procedures for multi-equation systems. It is particularly useful when one dependent variable becomes an independent variable in subsequent dependence relationships. This set of relationships, each with dependent and independent variables, is the basis of SEM. One way to view SEM is an interrelated system of regression equations. The basic formulation of SEM in equational form is (Hair et al., 1995; Bollen, 1998):

$$Y_1 = X_{11} + X_{12} + X_{13} + \ldots\ldots + X_{1n}$$
$$Y_2 = X_{21} + X_{22} + X_{23} + \ldots\ldots + X_{2n}$$
$$Y_m = X_{m1} + X_{m2} + X_{m3} + \ldots\ldots + X_{mn}$$

(metric) (metric, nonmetric)

It should be noted that, SEM conveys two important aspects of the procedure: (a) that the causal processes under study are represented by a series of structural (i.e., regression) equations, and (b) that these structural equations can be modeled pictorially to enable a clearer conceptualisation of the theory under study. The hypothesized model can then be tested statistically in a simultaneous analysis of the entire system of variables to determine the extent to which it is consistent with the data. If goodness-of-fit is adequate, the model argues for the plausibility of postulated relations among variables, if it is inadequate, the tenability of such relations is rejected (Byrne, 1994; Bagozzi, 1980).

The following three types of commonly used structural equation models are contained in SEM (Long, 1983; Long, 1985; Dunn et al., 1993; Kelloway, 1998; Raykov and Marcoulides, 2000):

- **The confirmatory factor analysis model:** is both more rigorous and more parsimonious than the more traditional techniques of exploratory factor analysis. Its ability to test specific structures suggested by substantive theory gives it a major advantage over the exploratory factor analysis. Each construct included in the model is usually measured by its own set of observed indicators. In other words, with a confirmatory factor analysis model, particular observed variables will be assumed to be indicators or, equivalently, will load on particular factors, in contrast to the exploratory factor analysis approach, where all observed variables are considered to load on all factors. In a confirmatory factor analysis model no specific directional relationships are assumed between the constructs.
- **The path analysis model:** is most useful in depicting hypothesised relations because there is a set of rules that allows translation of the path diagram into a series of structural equations. A special characteristic of the path analysis model is that it is an approach to modeling explanatory relationships between observed variables (it does not contain latent variables). The path analysis model is worthy of discussion within the general SEM framework because, although it only focuses on observed variables, it is an important part of the historical development of SEM and uses the same underlying idea of model fitting and testing as any

other SEM model. In the SEM framework, fit models can easily be conceptualised within the path analysis tradition. This is because the path analysis model can be viewed as a special case of SEM.

- **The structural regression model:** resembles the confirmatory factor analysis model, except that it also postulates specific explanatory relationships (latent regressions) among constructs. The model can be used to test or disconfirm proposed theories about explanatory relationships among the various latent variables under investigation. Thus, once the constructs have been assessed, the structural regression model can be used to test the plausibility of hypothetical assertions about their explanatory relationships. Moreover, the structural regression model can be viewed as an extension of the path analysis model except that, instead of being conceived in terms of only observed variables, the model also includes latent variables.

The primary advantage that SEM has over first-generation techniques such as multiple regression, discriminant analysis, or factor analysis is the greater flexibility that a researcher has for the interplay of theory and data. Overall, SEM provides researchers with the flexibility to perform the following (Bollen, 1987; Hoyle, 1995; Hoyle, 1999; Byrne, 1994; Hair et al., 1995; Raykov and Marcoulides, 2000; Shields et al., 2000):

- **First:** informative and complete communication of SEM results is a challenging but essential aspect of the SEM approach. A primary form of communicating SEM hypotheses and results is the path diagram. A path diagram is a pictorial representation of SEM. The three primary components of a path diagram are rectangles, ellipses, and arrows.

  Rectangles are used to indicate observed variables, which may be either indicators of latent variables in the measurement model or independent or dependent variables in the structural model. Ellipses are used to indicate latent variables, independent and dependent variables as well as errors of prediction in the structural model and errors of measurement in the measurement model. Arrows are used to indicate association and are of two sorts. Straight arrows point in one direction and indicate direction of prediction, from predictor to outcome. Curved arrows point in two directions and indicate nondirectional

association (i.e., correlation). Therefore, SEM is often described as a statistical means of testing causal hypotheses from correlational data.

- **Second:** SEM usually takes into account potential errors of measurement in all variables. This is achieved by including an explicit error term for each fallible measure, whether it is an explanatory or predicted variable. In contrast, traditional regression analysis effectively ignores potential measurement errors in all the explanatory (independent) variables included in a model. As a result, regression estimates can be misleading and may potentially lead to incorrect substantive conclusions. The impact of measurement error (and the corresponding lowered reliability) can be shown from an expression of the regression coefficient as:

$$\beta_{y.x} = \beta_s \times \rho_x$$

Where $\beta_{y.x}$ is the regression coefficient, β_s is the structural coefficient, and ρ_x is the reliability of the predictor variable. Because all dependence relationships are based on the correlation (and resulting regression coefficient) between variables, it is hoped to strengthen the correlations used in the dependence models and make them more accurate estimates of the structural coefficients by accounting for correlations attributable to any number of measurement problems.

- **Third:** SEM takes a confirmatory rather than an exploratory approach to the data analysis. Once a theory has been developed about some phenomena of interest, it can be tested against empirical data. This process of testing is often called the confirmatory mode of SEM applications. By demanding that the pattern of intervariable relations be specified a priori, SEM lends itself well to the analysis of data for inferential purposes. In contrast, most other multivariate techniques are essentially descriptive in nature (e.g., exploratory factor analysis), so that hypothesis testing is difficult, if not impossible.
- **Fourth:** the use of SEM requires formal specification of a model to be estimated and tested. Unlike ANOVA, which, as typically used, evaluates main effect and interaction hypotheses by default, and multiple regression analysis, which permits specification only of direct effects on a single outcome, SEM offers no default model specification and places relatively few limits on the types of relations that can be specified. A frequently cited advantage of that characteristic of SEM is that it requires researchers to think carefully about their data and to venture hypotheses regarding each variable.

In the light of the above, advances in SEM have made it possible for researchers to simultaneously examine measures and theory. Such multivariate technique can be thought of as superior to more traditional techniques (e.g., factor analysis, multidimensional scaling) (Hulland, 1999). In sum, second-generation multivariate techniques such as SEM involve generalisation and extensions of first-generation procedures.

6.4 Computer Programs for SEM

To date, numerous computer programs are available for conducting SEM analysis. LISREL, EQS, and AMOS have dominated the field. Researchers must use these programs appropriately. However, researchers using causal modeling approaches such as LISREL, EQS, AMOS, and PLS must understand their underlying assumptions and limitations.

6.4.1 LISREL and EQS Programs

Although LISREL and EQS programs both address the same issues related to SEM, they do so sometimes in different ways. Therefore, the purpose of this sub-section is to demonstrate a few of the dual approaches to the analysis of covariance structures. It describes the two conceptually different approaches taken by LISREL and EQS programs in addressing the issue of non-normal data with small sample size.

High dimensional non-normal data with small sample sizes are very common, and large sample theory, on which almost all modeling statistics are based, cannot be invoked for model evaluation with test statistics (Bentler and Yuan, 1999). SEM programs such as LISREL and EQS use covariance-based procedures with the objective of obtaining optimal parameter accuracy. The level of theoretical/substantive knowledge that the researcher brings to the study is a major factor, inasmuch as any given model becomes the basis for explaining the covariances among all the indicators. To obtain consistent parameter estimates, the empirical conditions of the data require a multivariate normal distribution (Hoyle, 1999).

Therefore, LISREL, in dealing with data that are non-normal, involves a two-step process strategy (Hoyle, 1995): first, using PRELS (preliminary analyses for LISREL are performed as a companion package), the researcher recasts the data into an asymptotic matrix form. Second, LISREL analyses are then based on this matrix using weighted least square (WLS) estimation. One major limitation associated with this treatment of non-normality has been its excessively demanding sample size requirement.

Satorra and Bentler (1988) argued that it may be more appropriate to correct the test statistic rather than using a different mode of estimation. They developed the SCALED χ^2 statistic, which incorporates a scaling correction for the χ^2 statistic when distribution assumptions are violated; its computation takes into account the model, the estimation method, and the sample Kurtosis values. Then, EQS uses an estimation method that assumes the data are multivariate normal, but bases evaluation of model fit on a test statistic that has been corrected to take non-normality into account. This is the approach taken by the EQS program in the treatment of non-normal data with small sample sizes.

6.4.2 AMOS Program

AMOS has two features that make it stand out in terms of SEM packages: its bootstrapping capabilities and its treatment of missing data (Kornbort, 2000). First, AMOS contains a range of features to make bootstrap analysis a relatively simple task to carry out. Bootstrapping is automatically carried out, and bootstrap confidence intervals are calculated, using either percentiles or bias corrected percentiles. The second feature of AMOS is its ability to deal with missing data. Most programs deal with missing data using listwise deletion, pairwise deletion, or some sort of substitution (either with means, or predicted values via regression or imputation). AMOS uses a full information maximum likelihood (FIML) procedure. This technique provides consistent and unbiased parameter estimates under conditions of missing data, even when the missing data are not missing at random.

Overall, AMOS is an excellent program, both user-friendly and technically advanced. It will meet most needs that researchers using SEM are likely to encounter, and makes applying these techniques a lesser task, especially for those just starting out with SEM (Kornbrot, 2000).

6.4.3 PLS Program

PLS is developed as a counterpart to SEM analysis. It can be viewed as complementary to SEM because its main objective is prediction (rather than structural relationships). The focus of PLS, under predictor specification, is on the variance of dependent variables, and no assumptions are made regarding the joint distribution of the indicators or the independence of sample cases (Hoyle, 1999, p. 336). In other words, the focus is shifted from assessing the significance of parameter estimates (i.e., structural paths) to that of predictive validity. Therefore, the corresponding structural path estimates are underestimated. In fact, the

superiority of LISREL, EQS, and AMOS over PLS concerns the ability to estimate the underlying population parameters (i.e., structural paths) (Chin, 1995; Tobias, 1997).

Moreover, PLS should not be viewed as simply a distribution-free alternative to SEM. Rather, it represents a different approach to empirical modeling - a descriptive, prediction-oriented one (Hoyle, 1999, p. 336). Because its focus is on prediction, not explanation (e.g., theory testing), PLS is a limited information estimation procedure. An appropriate sample size tends to be much smaller than that needed for a full information procedure such as LISREL, EQS, and AMOS (Chin, 1995; Dijkstra, 1983).

Generally speaking, LISREL, EQS, and AMOS are capable and represent the state of the art in software for SEM, but the choice between them may be guided by some of the following considerations (Kline, 1998b):

- AMOS is perhaps the most user friendly of the three and in this way would be especially well suited for newcomers to SEM. It has special estimation procedures for incomplete data. Moreover, it has methods for non-normal data, but the standard method is maximum likelihood (ML). It is compatible with SPSS, so no special data handling is required.
- EQS has quite extensive capabilities to manage raw data, which may lend it favour for someone who wishes to use a single software package for both data preparation and analysis.
- Experienced users of SEM may prefer LISREL, which has some capabilities for the analysis of more complicated models, while relative newcomers to SEM may find LISREL less easy to use than either EQS or AMOS.

In the light of Kline's (1998b) recommendations about using LISREL, EQS, or AMOS, in addition to the previous features that were indicated in section 6.4.2 about AMOS, the AMOS computer program was selected to analyse the collected data.

6.5 Summary and Conclusion

It can be stated that the SEM approach avoids many of the problems associated with other multivariate techniques. It is a more comprehensive and flexible approach to research design and data analysis than any other single statistical model in standard use by social and behavioural scientists. Although, there are research hypotheses that can be efficiently and

completely tested by other multivariate techniques, the SEM approach provides a means of testing more complex and specific hypotheses than can be tested by those other methods (Hoyle, 1995).

The primary goal of this chapter was to provide a description of an alternative technique. It provided a brief survey of the basic concepts and issues associated with the SEM approach and highlighted similarities and differences between SEM and other multivariate techniques. It can be claimed that a statistical methodology using SEM is appropriate to the present study. SEM is mainly adopted because the technique is the most suitable to test the research hypotheses. Moreover, data analysis will be undertaken by using the AMOS computer program.

Chapter 7: Research Questionnaire, Measures, and Data Set

7.1 Introduction

This chapter begins by highlighting the types of data that can be collected using a questionnaire and how a decision is made regarding whether a mail questionnaire is an appropriate means of collecting data. It also focuses on developing the content of the questionnaire.

In this chapter the design of the questionnaire is discussed in detail. In designing the questionnaire, the researcher was guided by the tendencies discussed in the literature review. Moreover, the basic structure of the questionnaire is that each variable in this study is measured through a number of questions to be answered by the respondents. Then, the chapter elaborates on the data set of the study.

The rest of the chapter is organised as follows. Section 7.2 discusses the different reasons relating to choosing a mail questionnaire as the most practical instrument for collecting data. Section 7.3 develops the different measures of the study variables. Section 7.4 introduces and summarises the study data set. The last section contains the main conclusion.

7.2 Questionnaire Instrument

Mail questionnaires are one of the most widely approaches used in the social science to empirically study the characteristics and interrelations of sociological and psychological variables. Their impact on research in accounting and related disciplines (e.g., management accounting) has been substantial (Roberts, 1999).

Mail questionnaires, like any other method, have their advocates and critics (Vaus, 1996). There are four advantages of using mail questionnaires (Bourque and Fielder, 1995; Munn and Drever, 1990; Patten, 1998): first, the greatest advantage of mail questionnaires is their lower cost compared to other methods (e.g., in-person and telephone interviews). Given the same length questionnaire and same objective, a completed questionnaire administrated by mail costs approximately 50% less than one administered by telephone and 75% less than one administered by personal interview. Second, mail questionnaires allow for wider

geographical coverage compared to other methods (e.g., personal or face-to-face interviewing). Third, unlike almost all other methods of data collection, it can be assumed that when a questionnaire is sent through the mail, all respondents receive it simultaneously. Fourth, the previous three advantages of using mail questionnaires allow surveyors to study a larger sample of respondents.

However, one of the greatest and most studied limitations to mail questionnaires is their low response rate (probably less than 20%) (Bourque and Fielder, 1995; Patten, 1998). Moreover, mail questionnaires provide little or no opportunity for flexibility in following up on issues. They also do not allow the opportunity to correct any misunderstanding by respondents or answer any queries that the respondent may have (Vaus, 1996; Zikmund, 1991). To overcome or minimize the previous limitations, a pilot study and other steps have been carried out by the researcher (details of which are in sub-sections 7.2.1, 7.2.2, 7.2.3, and 7.2.4).

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

- **Likert-types:** this approach is widely used in social science research to indicate the strength of agreement or disagreement (Jackson, 1995) and is here employed to measure attitudinal issues, for example, asking the respondents to rate the degree of use of each type of management accounting practices. Current thinking suggests that 5-to 7-point scales are adequate for the majority of surveys that use ordered responses (Fink, 1995a, p. 53). All the likert-questions were recorded on a 7-point type scale.
- **Multiple-choice:** multiple-choice answers are those where the respondent is asked a closed question and selects his or her answer from a list of predetermined responses or categories. As a general guide, approximately six predetermined responses or categories are usually sufficient (Hussey and Hussey, 1997, p. 168). This type was chosen because the study requires specific information needing yes or no responses, or an answer from one of four, five, or six choices. However, some questions have the space for the respondent to add any answer not listed.

Most of the questions were designed as a closed form. In general, closed questions are considered more efficient and reliable than open questions for obtaining information from respondents (Fink, 1995a, p. 31). Closed questions are, however, more difficult to design than open ones because the answers or response choices must be known in advance. But the results lend themselves more readily to statistical analysis and interpretation, and this is particularly important in large surveys, because of the number of responses and respondents. Also, because the respondent expectations are more clearly spelled out in closed questions, the answers have a better chance of being more reliable or consistent over time (Fink, 1995c).

It is always useful before creating new questions to search for questions that have been used by other studies (Sudman and Bradburn, 1982; Converse and Presser, 1986; Bourque and Fielder, 1995; Vaus, 1996). There are multiple advantages to such a strategy (Bourque and Fielder, 1995, p. 32): first, such questions are almost always closed ended. Thus, the selection of possible answer categories has already been worked out and tested in prior studies. Second, instructions have been developed and tested. Third, using questions exactly as they were used in another study allows the data collected in the study to be compared to the data collected in those prior studies.

Existing questions, however, are unlikely to cover satisfactorily all the research questions of a study. Therefore, the questionnaire consists of some questions that have been used before and new ones developed particularly for the study.

Instructions are important in any questionnaire, but they are particularly important in a mail questionnaire, where there is no interviewer to help the respondent understand the questions or what is to be done in completing the questionnaire (Bourque and Fielder, 1995). Therefore, different kinds of instructions about filling out the questionnaire were used (e.g., please see attached glossary of terms for definitions, please note that your total should be 100%, please describe briefly, circle one, tick appropriate box, please specify, if you do not use ABC please skip to question 17, and tick one).

The questionnaire was divided into two main sections. The first section requested information on the contingent variables included in the study: business unit's competitive strategy, ABC systems, AMT, management accounting practices, and performance. The second asked participants to provide general information such as respondents' positions and age.

7.2.1 Population and sample

Business unit size has probably been the most tested variable in studies on ABC adoption. Thus, two dimensions of a business unit size were considered: total assets and number of employees. The target population in this study was a sample of the UK's population of manufacturing business units with total assets of a minimum of £10 million and number of employees a minimum of 300 employees.

The initial focus of this research is on the manufacturing business units rather than service and retailing business units for four reasons (Garrison, 1991; Chenhall, 2003):

- **First:** it is noteworthy that most contingency-based MCS research has involved large manufacturing business units.
- **Second:** it can be stated that the contingent factors of this study are more likely to be adopted by manufacturing business units than service and retailing business units.
- **Third:** manufacturing business units are more likely to have product diversity and production process complexity than service and retailing business units. According to the ABC literature, these two manufacturing issues have been shown to be important determinants of the need for re-examining cost allocation procedures.
- **Fourth:** the central focus of management accounting has been on manufacturing costs and activities. The reason is probably traceable to the complexity of manufacturing operations and to the need for carefully developed costs for pricing and other decisions. Therefore, ABC is now coming into use in many manufacturing business units, which are attempting to gain better control over their costs and to provide management with more usable cost data.

In the light of the above, a sample of the UK's manufacturing business units was chosen from the "FAME" database (Financial Analysis Made Easy). These business units satisfied two criteria:

- **First:** the digits of their primary SIC UK industry codes (15-36), which indicated that they operate in the manufacturing sector (see Table 7.1).

Table 7.1 The SIC UK codes included in the sample

SIC UK code	Type of industry
15	Manufacture of food products and beverages.
16	Manufacture of tobacco products.
17	Manufacture of textiles.
18	Manufacture of wearing apparel; dressing and dyeing of fur.
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear.
20	Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials.
21	Manufacture of pulp, paper and paper products; publishing and printing.
22	Publishing, printing and reproduction of recorded media.
23	Manufacture of coke, refined petroleum products and nuclear fuel.
24	Manufacture of chemicals and chemical products.
25	Manufacture of rubber and plastic products.
26	Manufacture of other non-metallic mineral products.
27	Manufacture of basic metals.
28	Manufacture of fabricated metal products, except machinery and equipment
29	Manufacture of machinery and equipment not elsewhere classified.
30	Manufacture of office machinery and computers.
31	Manufacture of electrical machinery and apparatus not elsewhere classified.
32	Manufacture of radio, television and communication equipment and apparatus.
33	Manufacture of medical, precision and optical instruments, watches and clocks.
34	Manufacture of motor vehicles, trailers and semi-trailers.
35	Manufacture of other transport equipment.
36	Manufacture of furniture; manufacturing not elsewhere classified.

Source: FAME database

- **Second:** they are large business units. Growth in size has enabled business units to improve efficiency, providing opportunities for specialization (Chenhall, 2003). Thus, it is reasonable to assume that they are more likely to have invested in ABC systems and AMT.

The population of the UK manufacturing business units with total assets of at least £10 million and 300 employees amounts to 904 business units. The names and addresses of the business units were extracted from the FAME database through the following four steps sequentially (see Table 7.2):

- **Step 1:** the companies were chosen according to their primary SIC UK industry codes (15-36). This step resulted in 108,226 companies.
- **Step 2:** to minimize the number of companies, only companies with a minimum of 300 employees were chosen. This resulted in 3,179 companies.
- **Step 3:** to restrict the number of companies, only companies with a minimum total assets of £10 million were chosen. This resulted in 2,984 companies.
- **Step 4:** independent business units were selected to be the targeted companies. Moreover, the questionnaire covering letter (see Appendix B) included a request to pass the questionnaire onto one business unit in cases where the company had more than one business unit. This resulted in 904 companies. This number was judged to be of a reasonable sample size.

Table 7.2 Steps for selecting companies to be included in the sample

Step	Criterion used	No. of companies
1	SIC UK primary industry code (15-36)	108,226
2	Minimum number of 300 employees	3,179
3	Minimum total assets of £10 million	2,984
4	Independent companies	904

7.2.2 Pilot study

Pilot testing is a necessary and important part of questionnaire development (Litwin, 1995). The first draft of a questionnaire is rarely perfect and ready to administer. Therefore, it should be pretested or pilot tested (Bourque and Fielder, 1995, p. 79). A pilot test is an opportunity to try out a questionnaire well before it is made final (Fink, 1995c, p. 86).

One purpose of the pilot study was to test the questionnaire from the viewpoint of understanding it. Another purpose of the pilot study was to discover the potential response rate. Thus, 75 mail questionnaires were sent to a cross-section of the overall population. The packet mailed to the 75 respondents contained a cover letter, the first draft of the questionnaire, and a self-addressed, stamped envelope for returning the completed questionnaire.

Having received only thirteen responses out of the 75 mailed questionnaires, it was felt that, compare to other studies (Gosselin, 1997; Chenhall and Langfield-Smith, 1998b; Frey and Gordon, 1999), a large sample size could increase the response rate.

In fact, the pilot study provided the researcher with valuable information, and convinced him to change aspects of the questionnaire and the administrative procedures. Moreover, it helped him to estimate how much the data collection would cost in time and money.

7.2.3 Questionnaire, respondents, and response rate

The questionnaire was developed during June 2002-December 2002 and involved study of the literature and a pilot study in order to ensure that the final version was not misunderstood and was of manageable length.

It has been suggested that mail questionnaires should be no longer than 12 pages; in general, most range between 4 and 12 pages (Bourque and Fielder, 1995, p. 94). The questionnaire employed in this study consisted of seven pages including a glossary of terms.

The questionnaire had six parts. The first part consisted of 6 questions about the business unit competitive strategy (cost leadership or differentiation). The second part consisted of 2 questions about management accounting practices (traditional and strategic). The third part consisted of 8 questions about business unit's cost structure and costing system. The fourth part consisted of 4 questions about AMT. The fifth part consisted of 3 questions about the business unit performance (financial and non-financial). The final part consisted of one question about the respondent (see Appendix A).

All business units located in the sample received the final version of the questionnaire. The questionnaire was mailed with a cover letter (see Appendix B) describing the purpose of the study and assuring complete confidentiality, with a self-addressed, freepost envelope. The cover letter was addressed to the management accountant of the business unit.

The questionnaire was sent at the beginning of January 2003. To increase the response rate, a reminder was mailed six weeks after the first mail out. The questionnaire with a reminder letter (see Appendix C) and a return envelope were included in the reminder mail out. By the end of March 2003, 194 questionnaires were returned (21.5%, 194 / 904).

However, 80 of those were returned uncompleted, 38 of them because the company policy was not to respond to surveys, 16 because the questionnaire was not relevant to the company, 16 because the company address was no longer valid, 6 because lack of time, and 4 because the company was in liquidation.

Thus the final response rate was 13.8% (114 completed questionnaires / 824). Two completed questionnaires were judged as not valid to the analysis mainly due to missing data on business unit performance. Hence, 112 usable completed questionnaires were used in the analysis giving a net usable response rate of 13.6% (112 / 824).

This figure is comparable with that achieved in previous surveys in MCS research. In Sim and Killough's (1998) study, the questionnaire was sent to the directors of 1500 manufacturing firms. In total, a response rate of 6.2% was achieved. Widener and Selto (1999) surveyed a random sample of 600 firms with more than 500 employees. The overall response rate was 14%. The recent contingency-based research of MCS by Widener (2004) achieved a 13.4% response rate.

This figure is also comparable with that achieved in previous surveys of competitive strategy, ABC systems, and management accounting practices. In Luther and Longden's (2001) study, the questionnaire was sent to the management accountants of 581 companies in the UK. A response rate of 13.3% was achieved. Robinson and Pearce's (1988) questionnaire survey of 609 manufacturing companies achieved a response rate of 16%. Moreover, the recent survey-based research of ABC system in US manufacturing companies by Ittner et al. (2002) achieved a 11% response rate by postal questionnaire.

Statistically speaking, a sample size of less than 100 cases could be considered too small to undertake SEM. With such a sample size, almost any type of SEM analysis may be untenable. However, between 100 and 200 cases – a medium sample size – is considered sufficient (Kline, 1998a, p. 12). The 112 usable completed questionnaires provide a sample size, which is large enough to undertake the structural equation analysis.

7.2.4 Response and non-response bias analysis

In order to assess response bias, a research precedent is to compare the profiles of early and late respondents (Venkatraman, 1989; Oppenheim, 1992). Therefore, the first 25 responses received were compared to the last 25 responses. A Chi-square test was conducted to see if there was any response bias between business units that answered early and business units that answered late. No evidence of significant response bias was found.

Non-response bias is a potential problem in any survey. A comparison of the composition of the 112 responding business units with the composition of the 904 target business units found

no reason to expect bias towards any particular industry. Further, a Chi-square test confirmed that there are no statistically significant differences between respondents and non-respondents in terms of employment and total assets.

7.3 Measurement of Variables

The variable is a central idea in quantitative research. Simply defined, a variable is a concept that varies. In fact, the language of quantitative research is a language of variables and causal relationships among variables (Neuman, 1997).

In quantitative research, the process of measurement starts after a researcher has determined the research variables and units of analysis. When developing measures, the researcher is not primarily concerned with whether a variable is independent or dependent in a hypothesis; rather, the main concern is to develop measures that will yield precise, accurate findings. A quantitative measurement process involves taking a concept, then developing a measure to observe it empirically. The process begins with concepts and ends with specific, concrete indicators (Neuman, 1997).

After the research variables have been constructed (Chapter 5 section 5.4), the researcher is ready to begin the task of measurement. This section is concerned with the types of measures developed in the questionnaire for this study. Each variable studied in the study was measured by a number of concrete questions to be answered by the selected respondents.

7.3.1 Business unit competitive strategy

As was indicated before, the information requested in the questionnaire concerned several areas. The first section was designed to determine the extent to which a business unit follows a cost leadership strategy as opposed to a differentiation strategy. Therefore, this study distinguishes between two main kinds of strategic priorities, as referred to in Porter's (1980, 1985) cost leadership and differentiation generic types. The study hypotheses require specifying whether a business unit is following a cost leadership strategy or a differentiation strategy.

Van der Stade (2000) pointed out that respondents were asked to indicate the percentage of their business unit's current sales accounted for by either of these strategies. However, in this study the respondents were not asked to indicate directly whether they followed a cost

leadership or differentiation strategy. The study is concerned with assessing whether they actually took actions that were consistent with such strategies rather than merely claiming to follow one strategy or the other.

Therefore, six action-oriented questions in the questionnaire (see Appendix A, questions 1, 2, 3, 4, 5, and 6) were asked to extract these two kinds of strategies. The items were derived from an instrument used by Frey and Gordon (1999). Each question was rated on a 7-point likert scale ranging from "strongly disagree" to "strongly agree".

7.3.2 Management accounting practices

It seems likely that business units characterized by cost leadership orientations are more associated with traditional management accounting practices, focusing on cost control, specific operating objectives and budgets, and rigid budget controls, as compared with differentiation business units, which focus on strategies with a broad scope MCS for planning purposes, and customisation strategies. Thus, business units characterized by differentiation orientations are associated with SMA practices (Chenhall, 2003).

As was mentioned in Chapter 5 (section 5.5), the study attempts to relate management accounting practices (traditional and strategic) to business unit competitive strategy (cost leadership and differentiation). Moreover, it aims to identify the existence and extent of usage of a group of management accounting practices.

Obviously, it is not possible to review the use of all management accounting practices in one study. Thus, the researcher selected practices that could be capable of providing an overview of current management accounting practices employed in the UK. It has been decided that the selected management accounting practices used in this study should include both traditional and strategic practices. The selected practices have been widely used in studies reported in the literature (e.g., Shank and Govindarajan, 1993; Guilding et al., 2000).

Two questions were designed to examine the relationship, if any, between the use of management accounting practices and business unit competitive strategy:

- **First:** respondents were asked to identify the extent to which their business unit emphasises six techniques of cost control or cost management: the role of standard costs in assessing performance, the importance of such concepts as flexible budgeting for manufacturing cost control, the perceived importance of

meeting budgets, the importance of marketing cost analysis, the importance of product cost as an input to pricing decisions, and the importance of competitor cost analysis. The items were derived from a measure developed by Shank and Govindarajan (1993). Responses to this question were recorded on a 7-point likert scale ranging from "extremely low" to "extremely high" (see Appendix A, question 7).

- **Second:** respondents were asked to identify the extent to which their business unit uses nine techniques of management accounting: competitive position monitoring, customer profitability analysis, life cycle costing, quality costing, strategic costing, strategic pricing, target costing, value chain analysis, and activity-based costing (ABC). A glossary of terms for definitions was attached (see Appendix A). The items were derived from a measure developed by Guilding et al. (2000). Responses to this question were recorded on a 7-point likert scale ranging from "not used at all" to "extensively used" (see Appendix A, question 8).

7.3.3 Adoption levels of ABC systems

The main objective in surveys on ABC diffusion has been to describe the adoption of ABC and to explain the reasons for its adoption or rejection. In terms of level of adoption, Krumwiede (1998) based on a survey of US manufacturing organisations, tested ten levels of ABC adoption, according to ABC was not considered, was being considered, was considered then rejected, was approved for implementation, was being analysed, was getting acceptance, was implemented then abandoned, was accepted, became a routine system, and became an integrated system. Gosselin (1997) divides activity management practices into three levels: activity analysis, activity cost analysis, and ABC.

In this study, Gosselin's (1997) model is expanded to four levels. These four levels, as was indicated in Chapter 5 (section 5.4.2.1) are: activity analysis (AA), activity cost analysis (ACA), activity-based costing (ABC), and activity-based cost management (ABCM).

In order to help respondents differentiate ABC from other traditional (volume-driven) costing systems, respondents were first asked to provide the percentages of their total manufacturing costs from purchased components or raw materials, direct labour, and overheads in the last financial year (see Appendix A, question 9). This item was derived from a measure developed by Frey and Gordon (1999).

Second, respondents were then asked to provide information about overhead allocation methods utilized, including volume drivers (e.g., direct labour hours, machine hours, and material amount) and ABC drivers (e.g., machine set-up, material handling, stock related, quality related, and administration and management related) in the last financial year (see Appendix A, question 10).

Finally, to differentiate between the four levels of ABC systems, respondents were asked four separate, though interrelated, yes or no questions. These four questions are designed to identify the four levels of ABC systems (AA, ACA, ABC, and ABCM) respectively (see Appendix A, questions 11, 12, 13, and 16). Moreover, respondents were asked, if they used a full ABC system, and to identify when they began to use it (see Appendix A, question 15).

Besides measuring the adoption levels of ABC systems, another purpose of the research questionnaire was to collect data on the reasons why non-adopting business units did not adopt the method. Five reasons, taken from the management accounting literature (see, for example, Turney, 1990), were given in the questionnaire as follows (see Appendix A, question 14): the current cost system gives satisfaction, the ABC system is not well suited for the business unit, the ABC system is too complex to implement and/or utilize, the advantage conferred by ABC system is negligible, and the ABC system implementation costs too much.

7.3.4 Advanced manufacturing technology (AMT)

It can be stated that business units producing highly specialized, differentiated, complex products are likely to employ complex production processes and have a greater adoption of AMT. Also, a need for flexible responses to specific customers increases interdependencies across the value chain, involving reciprocal interactions with customers, suppliers, and functional units such as marketing, production, purchasing and research and development. It might be expected that these types of technologies would require controls to encourage flexible responses, high levels of open communication within the work force and systems to manage the interdependencies. Traditional manufacturing systems would not seem to suit these circumstances (Chenhall, 2003; Drury, 1990).

Respondents were first asked three multiple-choice questions to describe their manufacturing process and identify their production processes and product complexity (see Appendix A, questions 17, 18, and 19). The items were derived from a measure developed by Swenson (1995). Each respondent was asked to identify the extent to which his or her business unit

uses the six techniques of AMT taken from the recent management accounting literature (see, for example, Anthony and Govindarajan, 1998): computer-aided design (CAD), computer-aided manufacturing (CAM), numerically controlled machines, robots, automated materials handling systems, and flexible manufacturing systems (FMS). Respondents were asked to rate the usage of each technique on a 7-point likert scale, ranging from "not used at all" to "extensively used" (see Appendix A, question 20).

7.3.5 Business unit performance

The broad MCS included performance targets related to non-financial manufacturing indicators, actual performance on those targets, organisational financial indicators, and industry and organisational trends on overall performance. Customer focused manufacturing, together with AMT, have been associated with non-financial measures (Perera et al., 1997). Moreover, it is noteworthy that there are findings related to the extent to which associations between usefulness of non-financial performance measures and AMT are related to enhanced performance (Chenhall, 1997).

Therefore, the fifth part of the questionnaire was designed to measure the impact of the research contingent variables on business unit performance. Based upon three seminal papers by Govendarajan (1984), Abernethy and Lillis (1995), and Van der Stede (2000), financial and non-financial business unit performance were measured as follows:

- **First:** respondents were asked to rate their overall business unit performance (relative to the industry average) on a 7-point scale ranging from "well below average" to "well above average" (see Appendix A, question 21).
- **Second:** respondents were asked which of the following best described their business unit performance in the last financial year: (a) losing money; (b) about break-even; (c) profitable, but less so than most of the direct competitors; (d) profitable, about the same as the direct competitors; and (e) more profitable than most of the direct competitors (see Appendix A, question 22).
- **Third:** respondents were asked to rate their business unit performance (relative to competitors) over the last three years. Six performance dimensions on a 7-point likert type scale, ranging from "unsatisfactory" to "outstanding", were used. The six dimensions are: return on investment (ROI), sales growth rate, new product development, on-time delivery performance record, number of customer complaints, and incidences of product defects (see Appendix A, question 23).

7.3.6 Respondent information

The final part of the questionnaire collected information regarding the individual completing the questionnaire. The questionnaire requested information about the person completing the form, asking for the respondent's age, job title, number of years in his or her job, number of years with the business unit, and his or her highest degree or qualification (see Appendix A, question 24).

Next, respondents were given instructions for returning the questionnaire. Stamped self-addressed envelops are often lost. Respondents who have lost the envelope have no way of knowing how to return the completed questionnaires. Therefore, the return address was provided on the questionnaire itself. Moreover, respondents were also provided with the researcher's phone number and e-mail to answer any questions about the questionnaire. Finally, respondents were thanked in advance for their kind participation in the study.

It was desirable to have assigned a unique identification number to each business unit in the sample population prior to mailing. This number was printed on the last page of the questionnaire. In fact, the major reason for assigning identification numbers before mailing was that the researcher would be able to keep track of who had responded by logging the returns against a master list of the respondents who had been targeted. Knowing who had not responded allowed him to focus his follow-up efforts on that group of respondents only. This accounts for significant savings in time and cost.

Throughout the questionnaire, the researcher intended to use terms that would be well understood by most respondents, though perhaps unfamiliar to some. For the benefit of those respondents, a glossary of terms was provided at the back of the questionnaire (see Appendix A).

7.4 Description of the Data set

7.4.1 Industry classifications

The business units in the study were in industries as varied as food and beverages, machinery and equipment, plastic and paper products, electrical products, clothes and footwear, furniture, electronic products, tobacco products, building materials, publishing and printing, and carpets (see Table 7.3). Because of the broad representation of the types of industries, the study findings should have a high degree of generality.

Table 7.3 Industry classifications

Type of industry	No. of Companies	Percent (%)
- Food and beverages	21	18.8
- Machinery and equipment	17	15.2
- Plastic and paper products	12	10.7
- Electrical products	9	8.0
- Clothes and footwear	8	7.1
- Furniture	8	7.1
- Electronic products	6	5.4
- Tobacco products	5	4.5
- Building materials	5	4.5
- Publishing and printing	5	4.5
- Carpets	3	2.7
- Other industries	13	11.5
Total Sample	112	100

7.4.2 Competitive strategy

To allocate business units to Porter's (1980, 1985) strategic typology the following procedures were adopted:

- The use of each strategy was identified by considering the business unit response to a set of 3 questions. The set of questions for cost leadership strategy includes Q.1, Q.2, and Q.5a. The set of questions for differentiation strategy includes Q.3, Q.4, and Q. 5b (see Appendix A, questions 1, 2, 3, 4, and 5).
- As indicated in section 7.3.1, all variables were measured on a 7-point likert scale, and to capture disagreement cases (-3 to –1), uncertainty or undecided (0), and agreement (+1 to +3). The responses were coded 1-7 as follows: 1 = strongly disagree, 2 = moderately disagree, 3 = slightly disagree, 4 = neither agree nor disagree, 5 = slightly agree, 6 = moderately agree, 7 = strongly agree. The point of uncertainty or undecided was coded '4'. The middle alternative (point 4) would represent a position somewhere near an indifference point between being for or against a particular view. In other words, respondents who do not feel strongly about the issues are most susceptible to the effect of the middle alternative (point 4) (Fiske, 1982; Oppenheim, 1992).
- Therefore, for each question from the two sets, if the response was from [1 to 4], a zero mark was given, otherwise 1 point was allocated. Consequently, the maximum mark a business unit could obtain for each set was 3.

- If the number of marks in set 1 (cost leadership) was greater than that in set 2 (differentiation), the business unit was considered to be using a cost leadership strategy. The opposite is also true.
- However, if the number of marks was equal in both sets, the business unit was considered to be using both a cost leadership and a differentiation strategy simultaneously.

In the light of the above procedures, the proportion of business units falling into the three kinds of strategy is shown in Table 7.4.

Table 7.4 The respondents' competitive strategy

Competitive strategy	Frequency	Percent (%)
- Cost Leadership	44	39.3
- Differentiation	42	37.5
- Cost Leadership x Differentiation	26	23.2
Total sample	112	100

From Table 7.4, it is clear that 39.3% of business units (n = 44) compete mainly by placing considerable emphasis on reaping cost advantages from all sources, to become the lowest cost producers in their industry. However, 37.5% of business units (n = 42) compete by being innovators and seeking to maintain brand identification rather than competing mainly on price. Customers buy the products of these innovative business units because of the value of their unique characteristics. For these business units, the keys to success are continual introduction of high-performance products, timely delivery, and flexibility to adapt to customer preferences, as they gain experience with new products. Therefore, producing at low cost is not important because the products are sold at high gross margins over their manufacturing costs. Price is determined by value to the customer, not by cost of manufacturing. Cost is also of vital importance to differentiation strategies because a differentiator must maintain cost proximity to competitors. Unless the resulting price premium exceeds the cost of differentiating, a differentiator will fail to achieve superior performance (Johnson and Kaplan, 1987).

The study found empirical evidence that 23.2% of business units (n = 26) emphasise both cost leadership and differentiation strategy simultaneously. Such business units pursue all cost reduction opportunities without sacrificing differentiation. Porter (1985) pointed out that,

if a business unit could achieve cost leadership and differentiation simultaneously, the rewards are great, because the benefits are additive, as differentiation leads to premium prices at the same time that cost leadership implies lower costs.

There are three "temporary" conditions under which a business unit could simultaneously achieve both cost leadership and differentiation (Porter, 1985, pp. 19-20): (1) competitors are stuck in the middle, (2) cost is strongly affected by share or interrelationships, and (3) a business unit pioneers a major innovation. Therefore, such a business unit should be prepared to choose what its ultimate competitive strategy will be and resolve the tradeoffs accordingly.

7.4.3 Management accounting practices

Business units facing strong competition (whether price or quality competition) are more likely to develop their business strategy to maintain their competitive position. Thus, the use of management accounting practices is a major component in the derivation of business unit competitive strategy. The use of traditional management accounting practices is expected to help business units choosing cost leadership to identify their costs and therefore set compatible prices. However, the use of SMA practices will help business unit emphasising differentiation to improve the quality of their products.

From the available set of 15 management accounting practices (see Appendix A, questions 7 and 8), there were 4 considered to be traditional management accounting practices (role of standard product costs in assessing performance, importance of such concepts as flexible budgeting for manufacturing cost control, perceived importance of meeting budgets, and importance of product cost as an input to pricing decisions) while the remaining ones were considered to be SMA practices.

As indicated in section 7.3.2, respondents were asked to identify the extent to which their business unit used eleven techniques of SMA practices. The selected SMA practices used in this study were based on Guilding et al. (2000), whose list included ABC. This may introduce a potential bias into the results if ABC was included in two variables in the study contingency model. However, as will be explained in Chapter 9, section 9.3.1.2, the SEM statistical analysis excludes ABC from the SMA practices thus removing the problem of bias that could be introduced.

To determine the exact type of management accounting practices used by each business unit, the same method of competitive strategy marking was applied when considering the response to each management accounting practice (see Table 7.5 and Table 7.6).

Table 7.5 Traditional management accounting practices

Practice	Used		Not Used	
	Frequency	Percent (%)	Frequency	Percent (%)
- Role of standard product costs in assessing performance	71	63.4	41	36.6
- Importance of such concepts as flexible budgeting for manufacturing cost control	37	33.0	75	67.0
- Perceived importance of meeting budgets	94	83.9	18	16.1
- Importance of product cost as an input to pricing decisions	95	84.8	17	15.2

Table 7.6 SMA practices

Practice	Used		Not Used	
	Frequency	Percent (%)	Frequency	Percent (%)
- Importance of marketing cost analysis	43	38.4	69	61.6
- Importance of competitor cost analysis	48	42.9	64	57.1
- Competitive position monitoring	41	36.6	71	63.4
- Customer profitability analysis	65	58.0	47	42.0
- Life cycle costing	15	13.4	97	86.6
- Quality costing	42	37.5	70	62.5
- Strategic costing	36	32.1	76	67.9
- Strategic pricing	58	51.8	54	48.2
- Target costing	42	37.5	70	62.5
- Value chain analysis	31	27.7	81	72.3
- Activity-based costing (ABC)	18	16.0	94	84.0

Therefore, the maximum mark that can be obtained for traditional management accounting practices is 4 while that of the SMA practices is 11. For traditional management accounting practices, if the business unit scored 3 or 4 marks out of 4 then it was considered to be using traditional management accounting practices and 1 mark was awarded. Otherwise a zero mark was given. Regarding SMA practices, if the score was 6 or more out of 11 then the business unit was considered to be using SMA practices and 1 mark was awarded. Otherwise zero mark was given.

Hence, if one type scored one and the other zero, the business unit was classified as using the type with score one. However, if the two types had the same score, the business unit was considered to be using SMA practices. This resulted in 49 cases (43.8%) that were classified as using traditional management accounting practices and 63 cases (56.2%) that were considered as using SMA practices (see Table 7.7).

Table 7.7 The respondents' management accounting practices

Management accounting practices	Frequency	Percent (%)
- Traditional management accounting practices	49	43.8
- SMA practices	63	56.2
Total sample	112	100

7.4.4 Adoption levels of ABC systems

This section focuses on an illustration of the seven different methods found in the data set for dealing with overhead costs allocation. Some business units are experimenting with traditional costing systems and others have gone further. 64.3% of the business units had not considered adoption of ABC systems. These business units indicated that they still use volume-based methods for overhead costs allocation. They are split into two methods: those who had a single volume-based method and those who had a multiple volume-based method.

On the other hand, of the business units that considered ABC systems, all are carried out a partial or full adoption. 35.7% of respondents adopted five levels of the ABC systems: AA, ACA, multiple volume/activities-based method, ABC, and ABCM. The proportion of respondents falling into the seven methods is shown in Table 7.8. In the following sub-sections, these costing methods will be explained.

Table 7.8 Adoption levels of ABC systems

ABC adoption level	Frequency	Percent (%)
Traditional costing systems:		
- Single volume-based method	45	40.2
- Multiple volume-based method	22	19.6
- Missing	5	4.5
Activity-based costing levels:		
- Activity analysis (AA)	1	0.9
- Activity cost analysis (ACA)	21	18.8
- Multiple volume/activities-based method	9	8.0
- Activity-based costing (ABC) and Activity-based cost management (ABCM)	9	8.0
Total sample	112	100

7.4.4.1 Traditional Costing Systems

7.4.4.1.1 Single Volume-Based Method

The study reported that 40.2% of business units (n = 45) used a single volume-based driver in order to allocate their overhead costs to products. Direct labour hours were the most frequently used method (31 business units). Some business units (9 cases) used machine hours instead of direct labour hours to allocate overhead costs to products.

Moreover, 5 business units were reported to use other single volume-drivers, such as material amount, cost per 1000 units produced, and cost per m^3 produced, in order to allocate overhead costs to products.

7.4.4.1.2 Multiple Volume-Based Method

The study indicated that 19.6% of business units (n = 22) were using several volume-based drivers simultaneously in a new attempt to improve traditional costing systems. In these circumstances more than one volume-related cost driver will be required to allocate overhead costs to products.

7.4.4.2 Activity-Based Costing Levels

7.4.4.2.1 Activity Analysis (AA)

Just one of the respondents (0.9%) used AA and did not go further. AA attempts to decompose a business unit into elemental activities that are easy to manage. Then, the explicit management of activities gives a business unit a better insight into how resources are

employed and whether the activity contributes to the achievement of the business unit objectives. Therefore, if the AA does not reflect the reality of the business unit, it will be impossible to construct a viable ABC system. It should be noted that the resources (factors of production) used to support the execution of an activity are not assigned during the AA level (Brimson, 1991).

7.4.4.2.2 Activity Cost Analysis (ACA)

In fact, the role of management accounting is not simply to deliver cost data, but to provide a service that empowers business units to take the best decisions in the light of current conditions (Nanni et al., 1992). From this perspective, some business units have decided not to actually install a full ABC system, since the vast majority of the benefits, they believe, are to be found in the ACA level. The study reported that 21 cases (18.8%) used ACA.

7.4.4.2.3 Multiple Volume/Activities-Based Method

Some business units use both volume and activities-based allocation methods simultaneously. The method applied to 9 cases (8.0%) in the study. The advocates of multiple systems contend that one costing system is not adequate to satisfy the several purposes of inventory evaluation and determination of cost of goods sold: cost control, budgetary control, profit planning, and cost analysis (Kaplan, 1988; Scarbrough et al., 1991).

The multiple volume/activities-based method includes not only traditional volume-related measures for tracing costs to products, such as direct labour, machine hours, and materials quantities, but also measures that count machine set-up inspections and materials handling orders.

7.4.4.2.4 Activity-Based Costing (ABC)

The study indicated that 9 cases (8.0%) in the sample had implemented a full ABC system. This result is indicative of little growth in the popularity of ABC in the UK's manufacturing business units and is consistent with the results of two surveys of the UK's largest companies undertaken in 1994 and 1999 by Innes and Mitchell (1995) and Innes et al. (2000). These two surveys indicate that, although 36 manufacturing companies claimed to be using ABC in 1994, only 12 manufacturing companies were using ABC in 1999.

Therefore, the study attempted to collect data on the reasons why the UK manufacturing business units do not adopt a full ABC system. As stated in section 7.3.3, five reasons were given in the questionnaire, the results being shown in Table 7.9. The three most cited reasons are that the current cost system gives satisfaction (58.9%), the ABC system is too complex to implement and/or utilize (19.6%), and the advantage conferred by the ABC system is negligible (16.0%). Surprisingly, the ABC system is not well suited to some business units (8.9%) and ABC system implementation costs too much (4.5%), according to non-appliers. Other reasons (8.9%) mostly cited include: the ABC system is not understood, time is not available to implement the ABC system, the ABC system may not give the right results, and the business unit is not experienced and does not have the knowledge to make system assessments.

Table 7.9 Reasons given for not applying a full ABC system

Reason	Frequency	Percent (%) of non-appliers
- The current cost system gives satisfaction	66	58.9
- The ABC system is too complex to implement and/or utilize	22	19.6
- The advantage conferred by ABC system is negligible	18	16.0
- The ABC system is not well suited for the business unit	10	8.9
- ABC system implementation costs too much	5	4.5
- Other reasons	10	8.9

Moreover, respondents were asked to identify when they had begun to use a full ABC system. Table 7.10 gives the timing of full ABC system adoption.

Table 7.10 The timing of a full ABC system adoption

Year	Number of business units	Percent (%) of ABC users
1990	1	11.1
1993	1	11.1
1994	2	22.3
1998	2	22.3
2000	1	11.1
2001	1	11.1
2002	1	11.0
Total	9	100

7.4.4.2.5 Activity-Based Cost Management (ABCM)

ABC provides rich sources of information for managing a business unit's activities. The next level in ABC systems is to improve the efficiency of activities by using its information. Therefore, a key question in the questionnaire asked respondents to identify the purposes for which ABC had been applied. These purposes included: assisting process management, assisting strategic cost analysis (such as product rationalisation), assisting value chain analysis, assisting quality management, assisting just-in-time management, and undertaking customer profitability analysis. The study reported that the same 9 business units (8.0%) that had applied a full ABC system initially chose between two or three possible purposes for using ABC information. Table 7.11 provides more detailed data on the different purposes for which ABC was being used.

Table 7.11 ABC applications

Purpose	Frequency
- To assist strategic cost analysis	8
- To assist process management	6
- To assist quality management	5
- To undertake customer profitability analysis	4
- To assist value chain analysis	3
- To assist just-in-time management	3
- Other applications (Product evaluation)	1

In the light of the above discussion, the business units that were surveyed in the study can be classified into three main categories: first, business units that were still using traditional costing systems for overhead cost allocation. Second, business units that used basic forms of activity analysis. This category contains all business units that had adopted AA and ACA. Third, business units that used advanced forms of ABC systems. This category includes those who considered ABC in terms of partial or full adoption. Therefore, multiple volume/activity-based method, ABC, and ABCM were involved. The proportion of respondents falling into each category is shown in Table 7.12.

Table 7.12 Traditional and activity-based categories

Category	Frequency	Percent (%)
- Traditional costing systems	72	64.3
- Basic activity analysis	22	19.7
- Advanced forms of ABC systems	18	16.0
Total sample	112	100

7.4.5 Advanced manufacturing technology (AMT)

As indicated in sub-section 7.3.4, respondents were required to identify their manufacturing processes and categorize them as job shop, traditional batch production, continuous batch flow (e.g., MRP, MPP), or JIT (see Appendix A, question 17). There were 19, 38, 39 and 16 cases for job shop, traditional batch production, continuous batch flow (e.g., MRP, MPP) and JIT respectively. The proportion of respondents falling into these four categories of manufacturing process is shown in Table 7.13. Moreover, Table 7.14 shows the respondents' production processes and product complexity.

Table 7.13 The respondents' manufacturing process characteristics

Manufacturing processes	Frequency	Percent (%)
- Job shop	19	17.0
- Traditional batch production	38	33.9
- Continuous batch flow (MRP, MPP)	39	34.8
- Just-in-time (JIT)	16	14.3
Total sample	112	100

Table 7.14 Production processes and product complexity

Complexity	Production processes		Products	
	Frequency	Percent (%)	Frequency	Percent (%)
- Not at all	6	5.4	8	7.1
- Slight	54	48.2	51	45.5
- Significant	39	34.8	38	33.9
- Extreme	12	10.7	14	12.5
- Missing	1	0.9	1	0.9
Total sample	112	100	112	100

To determine the exact level (high or low) of AMT used by each business unit, the same method of competitive strategy and management accounting practice marking was applied when considering the response to each AMT types (see Table 7.15).

Table 7.15 AMT types

AMT type	Used		Not Used	
	Frequency	Percent (%)	Frequency	Percent (%)
- Computer-aided design (CAD)	68	60.7	44	39.3
- Computer-aided manufacturing (CAM)	39	34.8	73	65.2
- Numerically controlled machines	47	42.0	65	58.0
- Robots	15	13.4	97	86.6
- Automated materials handling systems	37	33.0	75	67.0
- Flexible manufacturing systems (FMS)	23	20.5	89	79.5

The set of sub-questions for AMT includes six types. Therefore, the maximum marks that can be obtained was 6. If the business unit scored 4 or more marks out of 6, then it was considered as having a high AMT level. However, if the score was 1, 2, or 3 marks the business unit was considered as having a low AMT level. The proportion of business units falling into the two levels of AMT is shown in Table 7.16.

Table 7.16 The respondents' AMT level

AMT level	Frequency	Percent (%)
- High AMT	44	39.3
- Low AMT	68	60.7
Total sample	112	100

7.4.6 Business unit performance

To assess the business unit performance, a "summing technique" of Q.21, Q.22, and Q.23 was used. A score of 39 points was chosen as being the acceptable threshold to consider a business unit as having a higher performance, as follows:

- The business unit economic performance is classified as: losing money, about break-even, profitable but less so than most direct competitors, profitable about the same as direct competitors, and more profitable than most direct competitors, and ratings of 1, 2, 3, 4, and 5 were allocated respectively.

- Rank 5 in Q.21 and Q.23 was considered as being the minimum score to consider the business unit as having higher performance. However, for Q.22, the rate of 4 (profitable, about the same as my direct competitors) was taken as the minimum level.
- Then the score of 39 is obtained by summing 5 + 4 + 30 (because Q.23 has 6 sub-questions).
- Consequently, if the business unit scored ≥ 39 it was considered as having a higher performance rating. This could introduce bias into the results particularly of the phenomenon of apparent ABC/M failure to improve performance. Such scoring system made it seem that those companies that adopted ABC/M had a lower performance rating. However, from the economic theory point of view, it is expected that business units that adopt the differentiation strategy and invest in ABC/M, AMT, and SMA practices should have a higher performance compared to their competitors. Therefore, the scoring system of ≥ 39 was a very suitable choice. Another relevant factor in this was that the questionnaires of business units that adopted ABC/M showed that they had in fact a lower performance rating regardless of the choice of scoring system of ≥ 39.

The proportion of business units falling into the two categories of performance is shown in Table 7.17.

Table 7.17 The respondents' performance

Performance level	Frequency	Percent (%)
- Higher performance	31	27.7
- Lower performance	81	72.3
Total sample	112	100

7.4.7 Respondent information

On average, the respondents were 42 years old, had worked in their jobs for an average of 7 years, and had held employed in their business units for an average of 8.3 years. The majority of respondents filled positions with titles such as financial director (25.0%), financial controller (25.0%), management accountant (17.0%), accountant (10.7%), and financial manager (3.6%). Therefore, it can be concluded that the survey respondents did possess the knowledge required to answer the questions appropriately.

Regarding the respondents' actual qualifications, the majority of respondents had qualifications in management and financial accounting such as ACMA (15.2%), CIMA (15.2%), ACA (12.5%), CA (10.7%), FCA (8.0%), and FCMA (8.0%). Thus, it can be concluded that experienced and highly qualified respondents completed the questionnaire.

7.5 Summary and Conclusion

The central objective of this chapter has been to indicate that the questionnaire instrument is a crucial element in maximizing the validity of research data obtained by a question-asking process. Therefore, this chapter has indicated three main issues: first, how the respondents were motivated, through the questionnaire design, to be "good respondents" and to provide the information that they were asked for. Second, the processes of the measures developed were explained. Third, the data set of the study was introduced and summarised, which allows to perform any of the statistical analysis provided in Chapter 8 and Chapter 9.

Chapter 8: Preliminary Statistical Analysis

8.1 Introduction

This chapter provides an initial analysis of the questionnaire data. The analysis comprises chi-square (cross tabulation) tests, exploratory factor analysis, and logistic regression. This preliminary statistical analysis is performed before progressing to the more rigorous statistical technique (SEM) in the next chapter.

Chi-square tests identify whether there were any statistically significant differences between the study contingent variables. However, this alone would not test the specific hypotheses of this study. Therefore, both exploratory factor analysis and logistic regression were used to test the hypotheses.

The rest of the chapter is organised as follows. Section 8.2 outlines the research null hypotheses. Sections 8.3, 8.4, and 8.5 describe the three statistical methods and analysis (chi-square, exploratory factor analysis, and logistic regression) undertaken to test the hypotheses. The last section contains the main conclusion.

8.2 Testing the Research Hypotheses

Generally, the testing of hypotheses is in two parts, the *null hypothesis (H_0)*, which states that the two variables are independent of one another, and the *alternative hypothesis (H_1)*, which states that they are associated with one another. The null hypothesis is always stated first (Hussey and Hussey, 1997; Fink, 1995b). The objective is to test whether there is enough evidence to be able to confidently reject the null hypothesis in favour of the alternative hypothesis. To do this, if the probability (*p*-value) of the study data is low, then the null hypothesis should be rejected. Commonly, the null hypothesis is rejected if the *p*-value is 0.05 or less.

As indicated in Chapter 5 (section 5.6), the contingency model of this research developed a total of eight hypotheses about the way that the various model dimensions can be expected to affect each other. These hypotheses are related to the objectives of the study and pertinent to the literature review. Therefore, these hypotheses can be stated in the null form as follows:

H1: There is no relationship between cost leadership strategy and traditional management accounting practices.

H2: There is no relationship between differentiation strategy and SMA practices.

H3: There is no relationship between cost leadership strategy and ABC systems.

H4: There is no relationship between differentiation strategy and AMT.

H5: There is no relationship between AMT and ABC systems.

H6: There is no relationship between AMT and SMA practices.

H7: There is no relationship SMA practices and ABC systems.

H8: There is no relationship between differentiation strategy, ABC systems and AMT, and higher performance.

8.3 Chi-Square (cross tabulation)

Statistically speaking, there are two different types of techniques (Pallant, 2001, p. 255):

- **Parametric tests (e.g., t-test):** make assumptions about the population that the sample has been drawn from. This often includes assumptions about the shape of the population distribution (e.g., normally distributed).
- **Non-parametric techniques (e.g., chi-square test):** do not make assumptions about the underlying population distribution (this is why they are sometimes referred to as distribution-free tests). They are ideal for use when data is measured on categorical (nominal) and ranked (ordinal) scales. They are also useful with a very small sample, and when data does not meet the assumptions of the parametric techniques.

There are two types of chi-square tests; both involve categorical data (Hussey and Hussey, 1997; Pallant, 2001):

- **The chi-square test for independence:** is used to determine whether two categorical variables are related. It compares the frequency of cases found in the various categories of one variable across the different categories of another variable. It determines whether there are any statistically significant differences between the actual (observed) frequencies and hypothesised (expected) frequencies, in other words, whether the differences are due to some underlying, universal difference, or merely to chance.
- **The chi-square for goodness-of-fit:** explores the proportion of cases that fall into the various categories of a single variable, and compares these with hypothesised values. This technique is not presented here, but will be in the next chapter.

This study identified four contingent factors (competitive strategy, ABC systems, AMT, and management accounting practices) at the strategic business unit level. A set of indicators that behave as expected in terms of both statistical and theoretical criteria has been distilled. Therefore, a complete discussion of the relationships among the contingent factors of the study, as well as between each factor and business unit performance is provided below.

Chi-square tests were used to determine the significance of differences ($p \leq 0.05$) in the scores of individual relationships between the study contingent factors. Several interesting and significant results can be discerned from the results summarized in Table 8.1. Some relationships are statistically significant at p-values ≤ 0.05. All of these results are interpreted below.

Table 8.1: A summary of chi-square results

Substantive relationship	Value	df	Sig.
- Strategy & Performance	6.046	2	**0.049**
- Management accounting practices & Performance	0.057	1	0.811
- ABC systems & Performance	7.161	2	**0.028**
- AMT & Performance	0.620	1	0.431
- Strategy & AMT	0.512	2	0.774
- Strategy & Management accounting practices	2.423	2	0.298
- Strategy & ABC systems	8.968	4	0.062
- AMT & Management accounting practices	0.238	1	0.626
- AMT & ABC systems	2.778	2	0.249
- Management accounting practices & ABC systems	3.497	2	0.174

The chi-square test was used in order to investigate the relationships, if any, between business unit performance and the contingent factors of the study (competitive strategy, ABC systems, AMT, and management accounting practices). From Table 8.1, it is clear that business unit competitive strategy, which reflects the market share seeking behaviour of business units, is significantly related to its performance ($p = 0.049$). Similarly, ABC systems have been found to have a significant relationship with business unit performance ($p = 0.028$). However, the rest of the study contingent factors (AMT and management accounting practices) were not statistically significant ($p > 0.05$).

Hypotheses 1 and 2 predicted a positive relationship between business unit competitive strategy (cost leadership and differentiation) and the use of management accounting practices (traditional and strategic). More specifically, Hypothesis 1 predicted a positive relationship between cost leadership strategy and the use of traditional management accounting practices; however, Hypothesis 2 predicted a positive relationship between differentiation strategy and the use of SMA practices. The results of the chi-square test in Table 8.1 indicate that such a relationship is not significant ($p = 0.298$).

Hypothesis 3 predicted a positive relationship between competitive strategy (cost leadership) and the adoption of ABC systems. Such a relationship seems to be marginally significant, since the chi-square test indicates the *p*-value for this relationship to be 0.062.

Since the study attempts to consider the role of AMT as an important dimension of the organisational context, therefore, the study contingency model focuses on AMT by investigating its link with business unit competitive strategy, ABC systems, and management accounting practices. Accordingly, Hypotheses 4, 5, and 6 predicted positive relationships between AMT and differentiation strategy, ABC systems and SMA practices respectively. However, the results of the chi-square test in Table 8.1 indicate that these relationships are not significant ($p > 0.05$).

Hypothesis 7 predicted a positive relationship between SMA practices and the adoption of ABC systems. However, the chi-square test indicates that the relationship between management accounting practices and the use of ABC systems is not significant, since the *p*-value for this relationship is 0.174.

Generally speaking, although most of the relationships were not significant ($p > 0.05$); two relationships were significant at or beyond the 0.05 level. Thus, up to this point, only a very weak support for the study hypotheses has been achieved. However, the chi-square test is sometimes of limited usefulness. Statistically speaking, there are four main limitations to the chi-square test that can be summarised as follows (Utts, 1996):

First: statistical significance depends heavily on sample size. If the sample is small, there must be a large difference between categories for the result to be statistically significant. Therefore, a very strong relationship will not necessarily achieve statistical significance if the sample is small. However, if the sample is very large, then even small unimportant differences will appear as statistically significant.

Second: another common limitation of the chi-square test, which can lead to an illegitimate correlation, is the combining of two or more groups when they should actually be considered separately. The variables of each group may actually fall very close to a straight line, but when the groups are examined together, the individual relationships may be masked. As a result, it will appear that there is very little correlation between the two variables. This problem is known as a variation of "Simpson's Paradox" for count data.

Third: the chi square test tells only if an association between two variables exists, not the direction or strength of the relationship.

Fourth: the test is unreliable if sparse data in some cells means that the expected frequency is less than 5.

In the light of the previous limitations of the chi-square test, another statistical technique should be used. Therefore, logistic regression is employed to test the research hypotheses in section 8.5.

8.4 Exploratory Factor Analysis

Generally speaking, after a model has been chosen for the construction of a measuring instrument and the instrument has been constructed, it is necessary to inquire whether the instrument is useful scientifically. This is usually spoken of as determining the reliability and validity of an instrument (Nunnally, 1978, p. 86). Therefore, the internal consistency (reliability) of the measures was assessed using Cronbach's alpha, while tests for construct validity used exploratory factor analysis.

Coefficient alpha provides a good estimate of reliability in most situations, since the major source of measurement error is because of the sampling of the content (Cronbach, 1951; Nunnally, 1978). The coefficient alpha's for the study measures were sufficient and indicate adequate levels of internal consistency. Details of the number of questions and items used for each variable and the Cronbach's alpha scores are shown in Table 8.2. All of the Cronbach's alpha values were above the generally accepted minimum criterion level of 0.60 (Nunnally, 1978).

Table 8.2: A summary of the study measures reliability (Cronbach's alpha)

Variable	Number of questions	Number of items	Cronbach's alpha
- Competitive strategy	5	6	0.65
- Management accounting practices	2	15	0.79
- ABC systems	4	10	0.85
- AMT	1	6	0.63
- Business unit performance	3	8	0.76

As illustrated previously in Chapter 6 (section 6.2.2.1), the conceptual basis for factor analysis may be a set of hypotheses developed by the researcher. In this case, it is said that one performs hypothesis-testing, or confirmatory, factor analysis (this later term is employed in the next chapter). In contrast, the method of analysis might be guided by simply an open question about the number and kinds of factors which might be derivable from a collection of variables. This is conducted in this section.

Data were collected to measure variables specified within the study hypotheses: business unit's competitive strategy, management accounting practices, ABC systems, AMT, and the performance of the UK's manufacturing business units. A factor analysis of the responses was conducted to establish meaningful patterns in the data and for grouping the study contingent variables into factors (discussed in detail in sub-sections 8.4.1, 8.4.2, 8.4.3, 8.4.4, and 8.4.5).

While care was taken to include relevant questionnaire items, it was necessary, given the exploratory nature of the research, to examine the extent to which these items were measuring the constructs of concern to the study. Therefore, items were factor analysed. Varimax rotation was selected to generate the factors and identify the underlying dimensions of the constructs. The most commonly used orthogonal approach is the varimax method, which attempts to minimise the number of variables that have high loading on each factor (Pallant, 2001). In fact, it is a good general approach that simplifies the interpretation of factors (Field, 2000).

Once a factor structure has been found, it is important to decide which variables make up which factors. Typically, researchers take a loading of an absolute value of more than 0.3 to be important. However, the significance of a factor loading will depend on the sample size (Field, 2000). It has been recommended that for a sample size of 100 a loading of 0.512 can be considered significant (Stevens, 1992).

As the sample size of this study was 112, a loading of an absolute value of ≥ 0.512 on single factors was considered to be important. This means that only loadings ≥ 0.512 will be displayed, making the output easier to interpret. An eigenvalue ≥ 1.0 is used as a default value to determine the important factors.

8.4.1 Business unit competitive strategy

Exploratory factor analysis was conducted in order to establish discriminant validity for competitive strategy measures (Q.1, Q.2, Q.3, Q.4, Q.5a and b, and Q.6a, b, and c) and constructs. Using the varimax (orthogonal) rotation method resulted in a two-factor model, which explained 67.779% of the variance, one stressing the cost leadership strategy and the other stressing the differentiation strategy.

These inter-item correlations and alpha values are shown in Table 8.3. The three items loaded in factor 1 include: Q.1, Q.2, and Q.5 a. On the other hand, the three items loaded in factor 2 include: Q.3, Q.4, and Q.5b.

Table 8.3: Business unit competitive strategy construct validity

Item	Loading factor 1	Loading factor 2
- Cost leadership:		
Q.1: One of our most important objectives is to be the lowest cost producer in our industry.	0.839	
Q.2: We place considerable emphasis on reaping cost advantages from all sources.	0.768	
Q.5a: We invest in technology to develop low-cost products.	0.819	
- Differentiation Strategy:		
Q.3: We seek to maintain brand identification rather than compete mainly on price.		0.725
Q.4: We seek to be unique in our industry, and find that buyers are willing to pay a premium price for that uniqueness.		0.859
Q.5b: We invest in technology to develop unique products.		0.820

8.4.2 Management accounting practices

The measures for management accounting practices (see Appendix A, questions 7 and 8) were adapted from prior research, as discussed earlier in Chapter 7 (section 7.3.2), and are examined here for construct validity using the same technique as that used for competitive strategy. Factor analysis generated five constructs for management accounting practices, which explained 59.4% of the variance. Based on the items that exhibited loadings greater or equal to 0.512, the results of the factor analysis for traditional and SMA practices are presented in Table 8.4.

All the five management accounting practices that loaded on factor 1 (life cycle costing, strategic costing, target costing, value chain analysis, and activity-based costing (ABC)) can be classified as SMA practices. Moreover, factor 5 includes just one item that can be considered as traditional management accounting practices: the role of standard product costs in assessing performance.

In contrast to a single process dimension, presented earlier (factors 1 and 5), the analysis of management accounting practices resulted in three separate factors, including both traditional and SMA practices (see Table 8.4). More specifically, there were two practices (importance of such concepts as flexible budgeting for manufacturing cost control and competitive

position monitoring) that loaded on factor 2, three practices (importance of marketing cost analysis, importance of product cost as an input to pricing decisions, and importance of competitor cost analysis) that loaded on factor 3, and two practices (perceived importance of meeting budgets and quality costing) that loaded on factor 4.

Table 8.4: Management accounting practices construct validity

Item	Loading factor 1	Loading factor 2	Loading factor 3	Loading factor 4	Loading factor 5
- Role of standard product costs in assessing performance.					0.863
- Importance of such concepts as flexible budgeting for manufacturing cost control.		0.661			
- Perceived importance of meeting budgets.				0.842	
- Importance of marketing cost analysis.			0.566		
- Importance of product cost as an input to pricing decisions.			0.725		
- Importance of competitor cost analysis.			0.574		
- Competitive position monitoring.		0.803			
- Life cycle costing.	0.655				
- Quality costing.				0.525	
- Strategic costing.	0.722				
- Target costing.	0.622				
- Value chain analysis.	0.518				
- Activity-based costing (ABC).	0.623				

8.4.3 ABC systems

A separate principal components analysis was conducted for developing a measurement model for ABC systems. Factor analysis resulted in three factors for ABC systems, which explained 79.942% of the variance, factor 1 stressing the advanced forms of ABC systems (ABC, ABCM), factor 2 stressing the basic activity analysis (AA, ACA), factor 3 stressing only ABCM. Details of the items included in each factor and the loadings are provided in Table 8.5.

Table 8.5: ABC systems construct validity

Item	Loading factor 1	Loading factor 2	Loading factor3
AA: Has your business unit adopted activity management by undertaking an analysis of the activities carried out to convert materials, labour, and other resources into outputs?		0.976	
ACA: Has your business unit identified the cost drivers for each activity?		0.975	
ABC: Has your business unit adopted a full ABC system to cost its products?	0.666		
ABCM: Has your business unit used the ABC system for any of the following purposes?			
• To assist process management.	0.886		
• To assist strategic cost analysis.	0.656		0.601
• To assist value chain analysis.	0.792		
• To assist quality management.	0.813		
• To assist just-in time management.	0.855		
• To undertake customer profitability analysis.	0.745		
• Other.			0.901

8.4.4 AMT

A principal factor analysis of the AMT items based on varimax rotation was carried out. From a scree test, two factors with eigenvalues greater than 1.0 emerged. Based on the items that exhibited loadings greater or equal to 0.512, the two factors are represented in Table 8.6. Together, the two factors accounted for 57.027% of the variance.

The four AMT items that loaded on factor 1 include: numerically controlled machines, robots, automated materials handling systems, and flexible manufacturing systems (FMS). The other two AMT items, computer-aided design (CAD) and computer-aided manufacturing (CAM), were loaded on factor 2.

Table 8.6: AMT construct validity

Item	Loading factor 1	Loading factor 2
- Computer-aided design (CAD).		0.885
- Computer-aided manufacturing (CAM).		0.769
- Numerically controlled machines.	0.596	
- Robots.	0.611	
- Automated materials handling systems.	0.855	
- Flexible manufacturing systems (FMS).	0.574	

8.4.5 Business unit performance

To identify imbedded factors, the eight performance related items (Q.21, Q.22, and Q.23 a, b, c, d, e, and f) were factor analysed using a principal factor analysis with varimax rotation. Two factors resulted from this analysis, one stressing the financial performance and the other stressing the non-financial performance. Together, these factors explained 58.288% of the variance in the data (see Table 8.7).

The four financial performance items that loaded on factor 1 include: Q.21, Q.22, and Q. 23 a, and b). The three non-financial performance items that loaded on factor 2 include: Q.23 d, e, and f.

Table 8.7: Business unit performance construct validity

Item	Loading factor 1	Loading factor 2
Q.21: Please rate the overall performance of your business unit relative to the industry average.	0.670	
Q.22: Which of the following terms best describes your business unit economic performance in the last financial year for which you have data available?	0.819	
Q.23: For each measure below please rate your business unit performance relative to competitors over the last three years:		
a. Return on investment (ROI).	0.872	
b. Sales growth rate.	0.726	
d. On time delivery performance record.		0.631
e. Number of customer complaints.		0.883
f. Incidences of product defects.		0.851

It should be noted that exploratory factor analysis is employed to identify the latent factors that explain the correlations among the study variables. In other words, the correlations between a set of variables occur because they share latent factors. Because these latent variables are unobservable, their measurements are obtained indirectly by linking the study unobserved variables (competitive strategy, ABC systems, AMT, management accounting practices, and business unit performance) to those that are observed (the questionnaire items). In fact, exploratory factor analysis allowed the condensing of a large set of variables or the scaling down of items to more meaningful numbers of dimensions or factors. It summarised the underlying patterns of correlation and identified the groups of closely related items in the study.

8.5 Logistic Regression Analysis

In this section, logistic regression is employed to test the research hypotheses. It was chosen because it is a much stronger test than the chi-square test. Moreover, as was mentioned in Chapter 6 (section 6.2.1.6) logistic regression is a multiple regression but with an outcome variable that is a categorical dichotomy and predictor variables that are continuous or categorical; the model can be written as follows (Field, 2000, pp. 163-165):

$P(Y) = 1 / 1 + e^{-z}$

Where:

$P(Y)$ = the probability of Y occurring

e = the base of natural logarithms

$z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \varepsilon_i$

$\beta_0, \beta_1, \beta_2, \ldots, \beta_n$ = coefficients estimated from the data

$X_1, X_2, \ldots, X_n$ = the independent variables

ε_i = the residual

One of the great benefits of logistic regression is its ability to accept categorical predictors. There are many methods in which categorical predictors can be treated. The deviation method will be used on all the categorical variables of this study. The deviation method attempts to compare the effect of each category (apart from the reference category, which can be the first or last) with the overall effect of all of the categories (Field, 2000).

Precisely speaking, logistic regression is performed in this study because it is similar to regression, with its straightforward statistical tests, its ability to incorporate many

sophisticated relationships and interactions between variables of interest, and its wide range of diagnostics.

In order to test the study null hypotheses, four logistic regression models are postulated and tested. Each model has a distinct rationale. This section goes on to presents the logistic regression results relating to the null hypotheses testing.

8.5.1 Logistic Regression: Model 1

The first model predicts that business unit performance will correlate positively with ABC systems, competitive strategy, AMT, and management accounting practices. In other words, in this model the relationship between business unit performance and the contingent factors of the study will be investigated. Therefore, the dependent variable was business unit performance and the independent variables were ABC systems, competitive strategy, AMT, and management accounting practices.

Logit (NEWPERF3) = f (NEWABC1, STRATEGY, NEWAMT, MAP)

Where:

NEWPERF3 = Business unit performance

NEWABC1 = ABC systems

STRATEGY = Competitive strategy

NEWAMT = Advanced manufacturing technology

MAP = Management accounting practices

The empirical findings of this model show that the use of ABC systems is associated with higher performance at the business unit level (p = 0.035). This association appears to be driven primarily by the group of business units following AA (level 1) and ACA (level 2) as contrasted to the group following traditional costing systems, ABC (level 3) and ABCM (level 4). The summary output of the logistic regression of this model is presented in Table 8.8. According to these results, Null Hypothesis 8 should be partially rejected only for the use of ABC systems.

Table 8.8: Logistic regression results for Model 1

Dependent Variable	Independent Variables	Sig.
NEWPERF3	NEWABC1	**0.035**
	STRATEGY	0.062
	NEWAMT	0.674
	MAP	0.882

Moreover, the results of Model 1 in Table 8.9 indicate a significant and positive relationship between the basic activity analysis (AA, ACA) and business unit performance (β = 0.928, p = 0.011). However, an examination of Model 1 indicates that both traditional costing systems and the advanced forms of ABC systems (ABC, ABCM) are not significant (p = 0.433 and 0.134 respectively) and have a negative relationships between them and business unit performance (β = - 0.246 and - 0.681 respectively).

Table 8.9: Sub-items of Model 1 results

Item	β	Sig.
• Traditional costing systems	- 0.246	0.433
• Basic activity analysis (AA, ACA)	**0.928**	**0.011**
• Advanced forms of ABC systems (ABC, ABCM)	- 0.681	0.134

Therefore, the logistic regression equation for Model 1 can be postulated as follows:

$$\text{Log } (P / 1\text{-}P) = -0.928 - 0.246 \times \text{Traditional costing systems} + 0.928 \times \text{Basic activity analysis} - 0.681 \times \text{Advanced forms of ABC systems} + \varepsilon$$

8.5.2 Logistic Regression: Model 2

The relationship between ABC systems and business unit performance can be expected to be more positive when ABC systems are used interactively with a particular type of competitive strategy (cost leadership or differentiation), AMT (low or high), and management accounting practices (traditional or strategic). Therefore, Model 2 explores six expected interactions between ABC systems, competitive strategy, AMT and management accounting practices, and the impact of these interactions on business unit performance.

Logit (NEWPERF3) = f (NEWABC1, STRATEGY, NEWAMT, MAP, STRATEGY * NEWAMT, STRATEGY * MAP, STRATEGY * NEWABC1, NEWAMT * MAP, NEWAMT * NEWABC1, NEWABC1 * MAP)

Like Model 1, the findings of this model show that the use of ABC systems is associated with higher performance at the business unit level ($p = 0.020$). Moreover, the interaction between business unit competitive strategy and AMT was found to be significant ($p = 0.014$) (see Table 8.10).

Table 8.10: Logistic regression results for Model 2

Dependent Variable	Independent Variables	Sig.
NEWPERF3	NEWABC1	**0.020**
	STRATEGY	0.132
	NEWAMT	0.633
	MAP	0.751
	STRATEGY * NEWAMT	**0.014**
	STRATEGY * MAP	0.100
	STRATEGY * NEWABC1	0.088
	NEWAMT * MAP	0.368
	NEWAMT * NEWABC1	0.473
	NEWABC1 * MAP	0.411

As can be seen in Table 8.11, a couple of results emerge from this model. First, the same relationship between the basic activity analysis (AA, ACA) and business unit performance still seems to be significant and positive. However, the relationship has become stronger and more positive ($\beta = 1.061$, $p = 0.007$) than in Model 1 ($\beta = 0.928$, $p = 0.011$). According to this result, Null Hypothesis 8 should be partially rejected only for the use of ABC systems.

A second finding from this model is that the AMT level tends to align with competitive strategy in a comprehensible and predictable manner. This finding suggests the interactive nature of the fit between competitive strategy and AMT. AMT's fit with competitive strategy is a significant predictor of business unit performance ($p = 0.014$). Moreover, this interaction appears to be driven primarily by the group of business units having both Low AMT * Cost leadership ($\beta = 0.736$, $p = 0.019$) and High AMT * Differentiation ($\beta = 0.887$, $p = 0.010$). However, the results show significant and negative effects for the interaction term in both Low AMT * Differentiation ($\beta = - 0.887$, $p = 0.010$) and High AMT * Cost leadership ($\beta = - 0.736$, $p = 0.019$).

Therefore, Null Hypothesis 8 should be partially rejected for the use of AMT in the business units following differentiation strategy. Taken together, these results reject Null Hypothesis 8. Moreover, Null Hypothesis 4 should be rejected.

Table 8.11: Sub-items of Model 2 results

Item	β	Sig.
• Traditional costing systems	- 0.366	0.273
• Basic activity analysis (AA, ACA)	**1.061**	**0.007**
• Advanced forms of ABC systems (ABC, ABCM)	- 0.694	0.140
• Low AMT * Cost leadership	**0.736**	**0.019**
• Low AMT * Differentiation	- 0.887	0.010
• Low AMT * Cost leadership x Differentiation	0.151	0.668
• High AMT * Cost leadership	- 0.736	0.019
• High AMT * Differentiation	**0.887**	**0.010**
• High AMT * Cost leadership x Differentiation	- 0.151	0.668

Therefore, the logistic regression equation for Model 2 can be written as follows:

Log (P / 1-P) = – 0.939 – 0.366 × Traditional costing systems + 1.061 × Basic activity analysis – 0.694 × Advanced forms of ABC systems + 0.736 × Low AMT * Cost leadership – 0.887 × Low AMT * Differentiation + 0.151 × Low AMT * (Cost leadership X Differentiation) – 0.736 × High AMT * Cost leadership + 0.887 × High AMT * Differentiation – 0.151 × High AMT * (Cost leadership X Differentiation) + ε

8.5.3 Logistic Regression: Model 3

In Model 3, further analysis was undertaking to examine the relationship between the adoption of ABC systems and each of the business unit's competitive strategy, AMT, and management accounting practices.

Logit (NEWABC) = f (STRATEGY, NEWAMT, MAP, STRATEGY * NEWAMT, STRATEGY * MAP, MAP * NEWAMT)

This model indicates that there is a significant relationship between both competitive strategy (p = 0.008) and management accounting practices (p = 0.024) and the adoption of ABC systems. The summary output of the logistic regression of this model is presented in Table 8.12.

Table 8.12: Logistic regression results for Model 3

Dependent Variable	Independent Variables	Sig.
NEWABC	STRATEGY	**0.008**
	NEWAMT	0.280
	MAP	**0.024**
	STRATEGY * NEWAMT	0.212
	STRATEGY * MAP	0.513
	NEWAMT * MAP	0.345

As is indicated in Table 8.13, among business units that adopt ABC systems, it was found that cost leadership business units are more associated with the adoption of ABC systems ($\beta = 0.641$, $p = 0.026$) in comparison to differentiation ($\beta = -0.945$, $p = 0.003$) and mixed (cost leadership x differentiation) ($\beta = 0.305$, $p = 0.341$) strategies. Accordingly, Null Hypothesis 3 should be rejected.

Moreover, the model indicates that SMA practices are positively associated with the adoption of ABC systems ($\beta = 0.500$, $p = 0.024$). However, business units with traditional management accounting practices are less likely to adopt ABC systems ($\beta = -0.500$, $p = 0.024$). Therefore, Null Hypothesis 7 should be rejected.

Regarding the relationship between AMT and the use of ABC systems, Table 8.12 indicates that there is no relationship between them ($p = 0.280$). Thus, Null Hypothesis 5 should be accepted.

Table 8.13: Sub-items of Model 3 results

Item	β	Sig.
• Cost leadership	**0.641**	**0.026**
• Differentiation	-0.945	0.003
• Cost leadership x Differentiation	0.305	0.341
• Traditional management accounting practices	-0.500	0.024
• SMA practices	**0.500**	**0.024**

Therefore, the logistic regression equation for Model 3 can be written as follows:

$$\text{Log } (P / 1\text{-}P) = -0.714 + 0.641 \times \text{Cost leadership} - 0.945 \times \text{Differentiation} + 0.305 \times (\text{Cost leadership X Differentiation}) - 0.500 \times \text{Traditional management accounting practices} + 0.500 \times \text{SMA practices} + \varepsilon$$

8.5.4 Logistic Regression: Model 4

Model 4 investigates the relationship between competitive strategy and AMT, and the use of management accounting practices.

Logit (MAP) = f (STRATEGY, NEWAMT, STRATEGY * NEWAMT)

This model indicates that there is no relationship between competitive strategy (p = 0.298) and AMT (p = 0.626), and the use of management accounting practices (see Table 8.14). Therefore, Null Hypotheses 1, 2, and 6 should be accepted.

Table 8.14: Logistic regression results for Model 4

Dependent Variable	Independent Variables	Sig.
MAP	STRATEGY	0.298
	NEWAMT	0.626
	STRATEGY * NEWAMT	0.343

It should be indicated that, the logistic regression models above (Models 1, 2, 3, and 4) are based on the entire sample (112 UK manufacturing business units). Importantly, three out of the four logistic regression models are statistically significant. The results of the logistic regression models are presented in Table 8.15 below as follows:

- In Model 1, business unit performance is the dependent variable, and ABC systems, competitive strategy, AMT and management accounting practices are the independent variables. The chi-square for the overall model was 6.713 with two degrees of freedom and a p-value of 0.035.
- In Model 2, business unit performance is the dependent variable and the same independent variables for the previous model along with six expected interactions between them are the independent variables. The chi-square for the overall model was 16.234 with four degrees of freedom and a p-value of 0.003.
- In Model 3, the adoption of ABC systems is the dependent variable, and competitive strategy, AMT, management accounting practices, and three expected interactions between them are the independent variables. The chi-square for the overall model was 14.134, with three degrees of freedom and a p-value of 0.003.
- In Model 4, the adoption of management accounting practices is the dependent variable, and competitive strategy, AMT, and the expected interactions between them are the independent variables. This model was not significant (p = 0.187).

Table 8.15: Summary view of different logistic regression models

Model	- 2 log likelihood	Cox & Snell R Squared	Nagelkerke R Squared	Chi-square	df	Sig.
1	125.423	0.058	0.084	6.713	2	**0.035**
2	115.902	0.135	0.195	16.234	4	**0.003**
3	131.860	0.119	0.163	14.134	3	**0.003**
4	-	-	-	-	-	0.187

Up to this point, the results of the various statistical analyses and tests indicate that some hypotheses in this study are supported while others are rejected. A summary of the findings relating to the study hypotheses is shown in Table 8.16.

Table 8.16: Summary of hypotheses testing

Hypothesis	Support / Reject
H1: Business units that place a strong emphasis on cost leadership strategy will employ traditional management accounting practices.	Rejected
H2: Business units that place a strong emphasis on differentiation strategy will employ SMA practices.	Rejected
H3: Business units that place a strong emphasis on cost leadership strategy will adopt ABC systems.	Supported
H4: Business units that place a strong emphasis on differentiation strategy will employ AMT.	Supported
H5: Business units that have AMT will use ABC systems.	Rejected
H6: Business units that have AMT will use SMA practices.	Rejected
H7: Business units that have SMA practices will use ABC systems.	Supported
H8: Business units that place a strong emphasis on differentiation strategy and have ABC systems and AMT will have higher performance.	Supported

In the light of the above a modified contingency model, according to the statistical results that have been achieved in this chapter, is presented in Fig. 8.1. These findings will be discussed in more detail in Chapter 10.

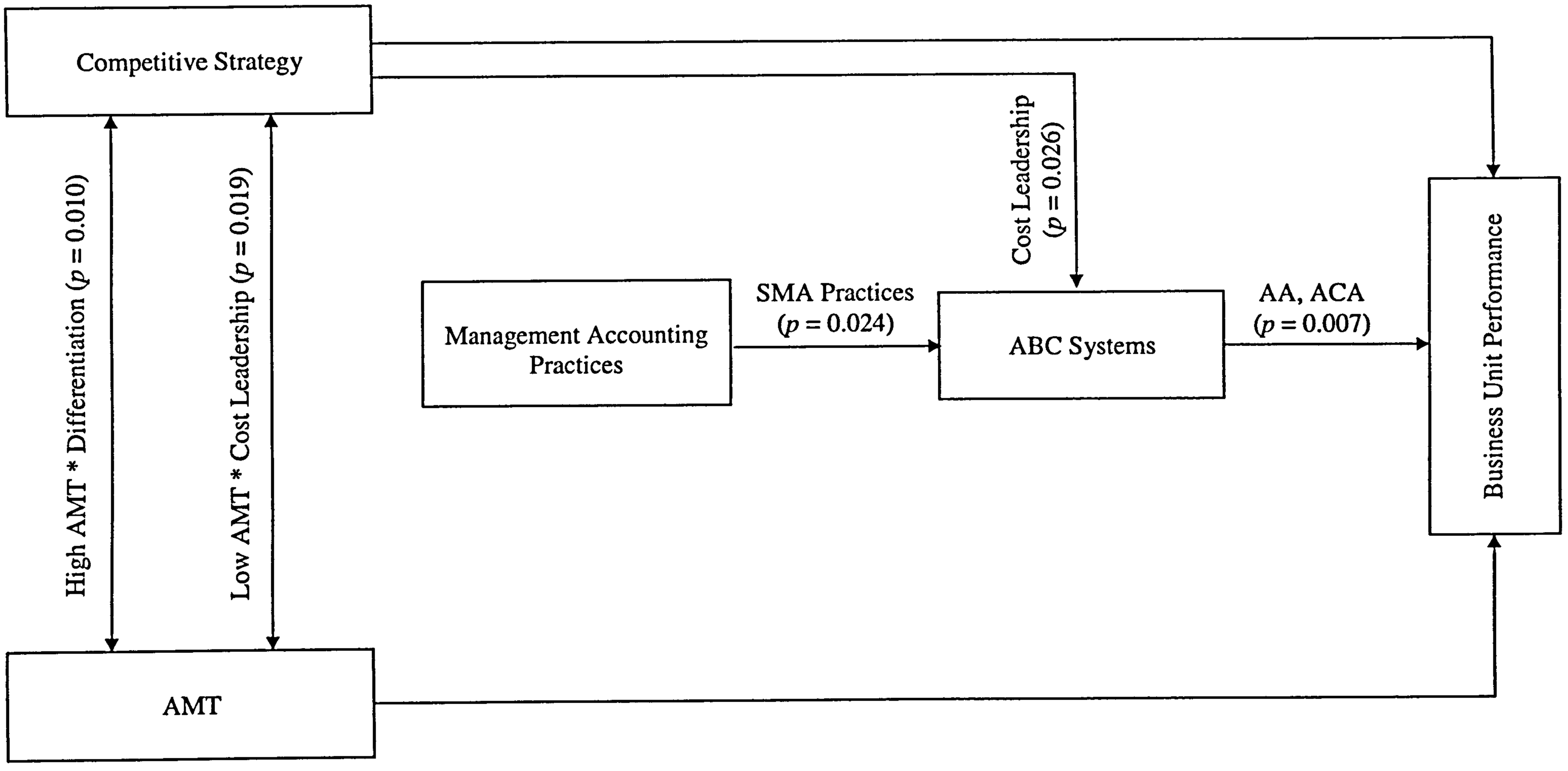

Fig. 8.1 Results of the contingency model (non-significant relationships not shown)

8.6 Summary and Conclusion

The central aim of this chapter was to obtain a picture of how the contingent factors of this study are related to each other. Not only does this provide a useful picture to guide the SEM analysis that would be conducted in the next chapter, but it often provides crucial information that is required at this stage of the statistical analysis.

Chi-square tests identified whether there were any significant differences between the variables of interest in the study. Then, internal consistency (reliability) of the measures was assessed using Cronbach's alpha. Moreover, tests for construct validity were conducted using exploratory factor analysis. The varimax method was selected to generate the factors and identify the underlying dimensions of the constructs. Finally, logistic regression analysis was undertaken to test the null hypotheses.

Now that the significant relationships have been identified, the attention shifts to ascertaining the overall fit of the research contingency model. Unfortunately, the statistical techniques used in this chapter do not facilitate an overall model containing all the contingent relationships hypothesized in the research hypotheses "simultaneously". In other words, such statistical techniques could not provide simultaneous tests of measurement reliability and structural relations. They are particularly un-useful when a dependent variable in one relationship becomes an independent variable in another relationship. A further limiting assumption of these techniques is that all constructs are free of measurement error. This suggests that SEM analysis should be undertaken in the next chapter.

Chapter 9: SEM Statistical Analysis

9.1 Introduction

This chapter constitutes the second phase of the empirical analysis building on the results obtained in Chapter 8. The preliminary statistical analysis carried out in Chapter 8 provided valuable insights into the characteristics of the data to hand. This chapter brings the empirical analysis to completion. The results in Chapter 8 provided the direction required for the argument pursued in this study. This chapter takes the argument to its conclusion and sums up the analysis carried out so far in a single all-encompassing model.

The study has considered the contingent factors that may affect the adoption and success of ABC systems, and it is expected that the adoption of such contingent factors along with ABC systems can provide more explanation of performance variation. Precisely speaking, the major goal of this chapter is to examine whether or not the adoption of ABC systems, differentiation strategy, AMT, and SMA practices explains differences in performance in the UK manufacturing business units.

The rest of the chapter is organised as follows. Section 9.2 establishes two theoretical models for ABC systems. Section 9.3 conducts a two-step SEM approach. The last section contains the main conclusion.

9.2 Theoretical Models for ABC Systems

Chapter 8 provided empirical evidence that performance would be associated with the patterns of ABC used by the adopters. It has been discovered that business unit performance is likely to be higher in situations with AA (level 1) and ACA (level 2), than in situations with ABC (level 3) and ABCM (level 4). Therefore, this chapter extends this finding and uses SEM statistical analysis to provide a more holistic approach (a macro-view) of ABC systems, thus shifting the focus of the study from the significance of individual regression models to a broad look at the contingency model. The macro examination of influences of ABC systems would explain the micro phenomena of ABC adoption and success. Consequently, this chapter provides a more complete explanation and investigation.

SEM is recognised in this study as a general approach for integrating the theory-construction phase of research with the empirical and hypothesis-testing stages. In this respect, it can be used (1) as a measurement tool to develop scales and indices and to measure reliability, (2) as a procedure for examining many forms of construct validity, and (3) as a methodology for testing hypotheses. In other words, SEM provides a useful methodology for assessing two basic components of theory because it is (1) a means for assessing the adequacy with which the constructs have been measured and (2) a mechanism for investigating the hypothesised relationships between constructs (Rodgers, 1991).

The basic approach to performing SEM analysis is that the researcher first specifies a model based on theory, and then determines how to measure constructs, collect data, and input the data into an SEM software program. The program fits the data to the specified model and produces the results, which include overall model fit statistics and parameter estimates.

In developing theoretical models to study the various relationships between the four levels of ABC systems (AA, ACA, ABC, and ABCM) and the three contingent variables (differentiation strategy, AMT, and SMA practices), two groups of hypotheses are extracted from the main research hypotheses. Then, two contingency models of ABC systems are formulated as a framework. The first model contains business units that have adopted ABC/M. The second model contains business units that have adopted AA/ACA. As indicated in Fig. 9.1 and Fig. 9.2, each model would offer a different perspective for understanding the four levels of ABC systems.

Since ABC systems are linked to the performance of the UK manufacturing business units (see Fig.9.1 and Fig. 9.2), these two models focus mainly on the evaluation of AA/ACA and ABC/M from the contingency theory point of view, attempting to transform ABC research from the adoption stage to the subsequent and vitally important evaluation stage. Considerably less attention, however, has been paid to the vital evaluation stage in which the insights from ABC systems are expected to increase the performance of the adopters.

AA/ACA methods have been contrasted with ABC/M methods which, it is claimed, enhance performance, since they more accurately reflect a firm underlying resource consumption patterns. There is, however, no empirical evidence in the management accounting literature to support this claim. Therefore, this study aims to initiate such an inquiry. More insights

tend to be gained by studying the nature of the hypothesised relationships and components of these two models.

9.2.1 Theoretical ABC/M Model and Hypotheses

The first group of hypotheses investigates the contingent relationships between ABC/M and differentiation strategy, AMT, SMA practices, and business unit performance as follows:

H1: Business units that place a strong emphasis on differentiation strategy will employ AMT.

H2: Business units that place a strong emphasis on differentiation strategy will employ SMA practices.

H3: Business units that have AMT will use SMA practices.

H4: Business units that have SMA practices will use ABC/M.

H5: Business units that have AMT will use ABC/M.

H6: Business units that have ABC/M will have higher performance.

9.2.2 Theoretical AA/ACA Model and Hypotheses

The second group of hypotheses investigates the contingent relationships between AA/ACA and differentiation strategy, AMT, SMA practices, and business unit performance as follows:

H1: Business units that place a strong emphasis on differentiation strategy will employ AMT.

H2: Business units that place a strong emphasis on differentiation strategy will employ SMA practices.

H3: Business units that have AMT will use SMA practices.

H4: Business units that have SMA practices will use AA/ACA.

H5: Business units that have AMT will use AA/ACA.

H6: Business units that have AA/ACA will have higher performance.

The hypotheses pertaining to the relationships suggested in the theoretical models (see Fig. 9.1 and Fig. 9.2) are drawn from studies in the literature on contingency-based research. Each path in Fig. 9.1 and Fig. 9.2 is labelled with the associated hypothesis, and all were discussed in Chapter 5 (sections 5.4 and 5.6).

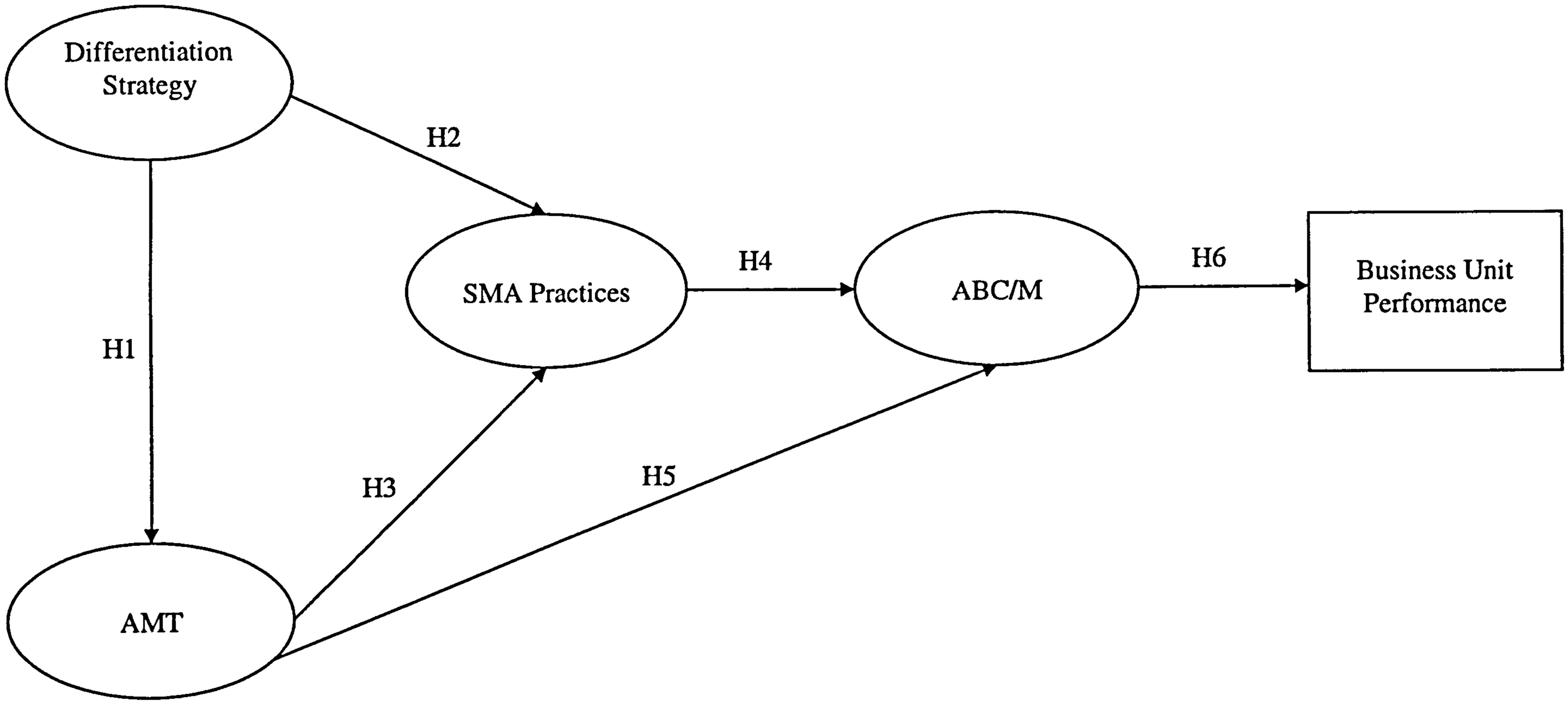

Fig. 9.1 Theoretical ABC/M model and hypotheses

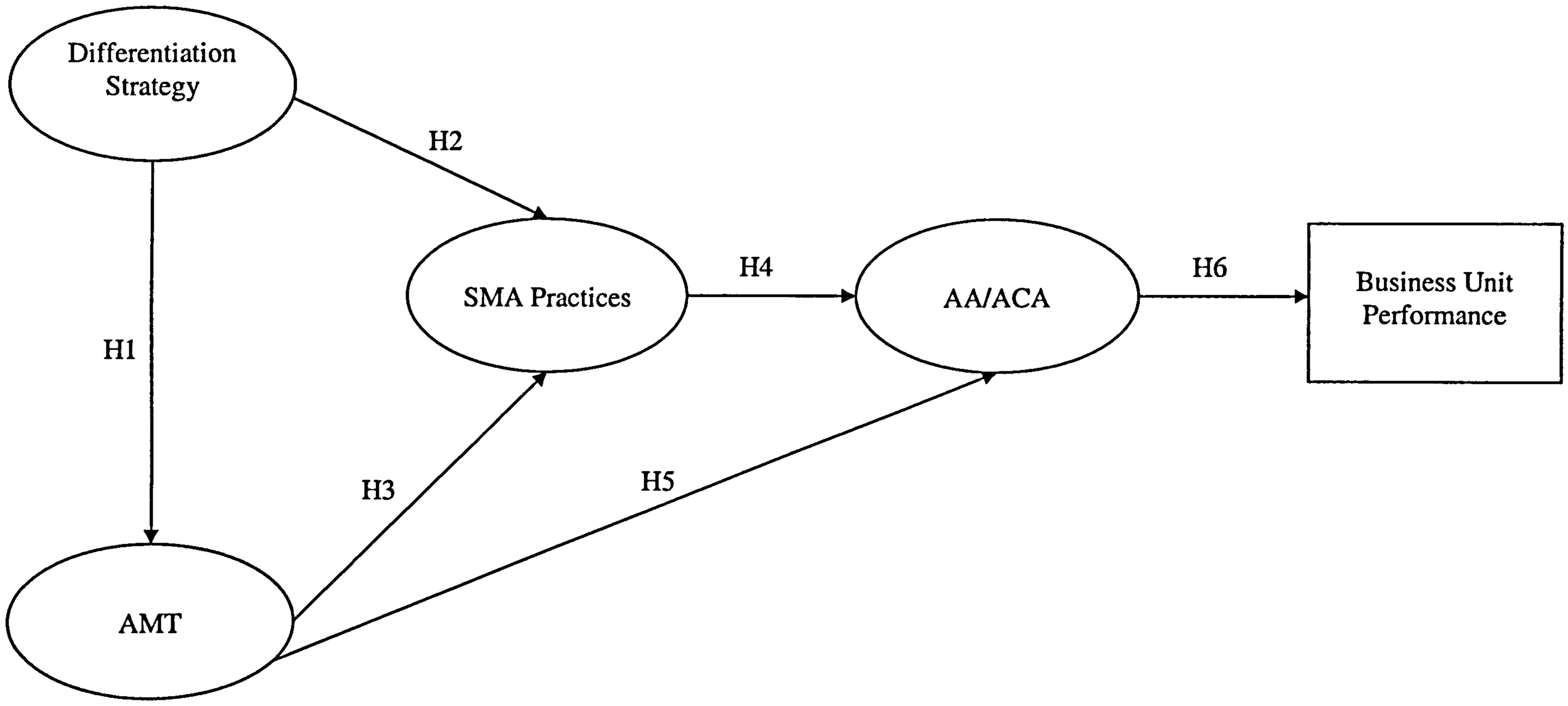

Fig. 9.2 Theoretical AA/ACA model and hypotheses

9.3 A Two-Step SEM Approach

As indicated in Chapter 6 (section 6.3), SEM is a combination of confirmatory factor analysis (CFA) and path analysis. Statistically speaking, it is a healthy scientific trend when earlier exploratory factor analysis gradually produces enough evidence that confirmatory methods of factor analysis can be employed to neatly test hypotheses about groupings of variables (Nunnally, 1978). In other words, it should be noted that before implementing CFA, it is important to assess whether or not there is appropriate data for factor analysis. Therefore, the two main approaches to factor analysis have been employed. Exploratory factor analysis was used in the early stage to explore the inter-relationships among the study contingent variables. Then, CFA was conducted to test the study hypotheses using SEM.

The first step when performing exploratory factor analysis is to assess the suitability of the data for factor analysis (Pallant, 2001; Tabachnick and Fidell, 1996). Thus, two statistical measures are generated by SPSS 10.1 software to help assess the factorability of the data. First, the KMO value ranges from 0 to 1, with 0.60 suggested as the minimum value for a good factor analysis. Second, the Bartlett's test of sphericity should be significant ($p \leq 0.05$) for the factor analysis to be appropriate.

In the light of the above, the suitability of the study data for factor analysis was assessed. The KMO value was 0.602 and the Bartlett's test of sphericity reached statistical significance ($p = 0.000$). Therefore, CFA was assessed to be appropriate for this study.

The study estimates that the structural equation model follows the two-stage procedure recommended by Anderson and Gerbing (1988). The first stage involves estimation of the measurement model using CFA. This stage tests whether or not the variables selected to measure each construct exhibit sufficient convergent and discriminant validity. Once a good measurement model is established, the second stage tests the structural (theoretical) model.

The two-step approach has a number of comparative strengths that allow meaningful inferences to be made (Anderson and Gerbing, 1988). First, it allows tests of the significance for all pattern coefficients. Second, the two-step approach allows an assessment of whether any structural model would give acceptable fit. Third, one can make an asymptotically independent test of the substantive or theoretical model of interest. Fourth, the two-step

approach provides a particularly useful framework for formal comparisons of the substantive model of interest with the next most likely theoretical alternatives.

Before turning to SEM statistical analysis, it is worthwhile to indicate that assessing the overall "goodness-of-fit" for SEM is not as straightforward as with other multivariate dependence techniques. SEM has a number of goodness-of-fit measures that fall into three types (Hair et al., 1995, pp. 640-641): (1) absolute fit measures, (2) incremental fit measures, and (3) parsimonious fit measures. The absolute fit measures assess only the overall model fit (both measurement and structural models collectively), with no adjustment for the degree of "over-fitting" that might occur. The incremental fit measures compare the proposed model to a comparison model, most often referred to as the null model. Finally, the parsimonious fit measures "adjust" the measures of fit to provide a comparison between models with differing numbers of estimated coefficients, the purpose being to determine the amount of fit achieved by each estimated coefficient.

In the light of the above, it can be stated that there is no single measure of goodness-of-fit for SEM. Therefore, it is good practice to include a range of fit indices. It is suggested to employ one or more measures from each class. The application of multiple measures will enable a consensus across types of measures concerning the acceptability of the proposed model (Hair et al., 1995, p. 641).

The AMOS 5.0 software (Arbuckle, 2003) was employed to test the measurement models and the structural equation models. AMOS provides the overall chi-square (χ^2) value, together with its degrees of freedom (df), and probability (p) value. However, this information is intended only as a quick overview of model fit. The findings of well-fitting hypothesized models, where the χ^2 value approximates the df, have proven to be unrealistic in most SEM empirical research, which can lead to rejections of the model even when the fit is reasonable. Therefore, researchers have addressed the χ^2 limitations by developing goodness-of-fit indexes that take a more pragmatic approach to the evaluation process (Byrne, 2001; Fornell and Larcker, 1981). Indeed, AMOS provides a large array of model fit statistics. All are designed to test or describe overall model fit.

Because of the various indexes of model fit provided by the AMOS program, models evaluation throughout this chapter is limited to that summarized in Table 9.1. The criteria were chosen on the basis of (a) their variant approaches to the assessment of model fit and

(b) their support in the literature as important indexes of fit that should be reported (Hair et al., 1995; Hoyle, 1995; Byrne, 2001). This selection, of course, in no way implies that the remaining criteria are unimportant. Rather, it addresses the need for users to select a subset of goodness-of-fit indexes from the generous quantity provided by the AMOS program. These selected indexes of fit are presented in Table 9.1 (Hair et al., 1995; Hoyle, 1995; Byrne, 2001; Hu and Bentler, 1999; Mulaik et al., 1989).

Table 9.1: Indexes of Overall Model Fit

Index	Description	Recommended value
(1) Measures of absolute fit:		
- Chi-square ratio (χ^2)	This represents the lack of fit resulting from over-identified restrictions placed on a model. It should be accompanied by df and *p*-value.	It is recommended that the 0.05 or less significance level indicates good fit.
- Goodness-of-fit index (GFI)	Indexes the relative amount of the observed variances and covariances accounted for by a model; analogous to R^2 commonly used to summarise results of multiple regression analysis. It represents the overall degree of fit (the squared residuals from prediction compared with the actual data).	Range from zero (poor fit) to 1.00 (perfect fit). Higher values indicate better fit, but no absolute threshold levels for acceptability have been established.
(2) Incremental fit measures:		
- Comparative fit index (CFI)	Indexes the relative reduction in lack of fit as estimated by the non-central χ^2 of a target model. It overcomes liabilities of the popular and intuitive but problematic normed fit index by replacing the central with the non-central χ^2.	Range from zero (poor fit) to 1.00 (perfect fit). A value of 0.90 or greater was originally considered representative of well-fitting model.
- Normed fit index (NFI)	One of the more popular measures is the NFI. It is a relative comparison of the proposed model to the null model. In other words, NFI depends on comparisons of lack of fit between models in a nested sequence of models.	Range from zero (poor fit) to 1.00 (perfect fit). A commonly recommended value is 0.90 or greater.

(3) Parsimonious fit measures:		
- Normed chi-square (χ^2/df)	Represents that the χ^2 be adjusted by the df to assess model fit for various models. This measure enables assessment of inappropriate models that are not yet truly representative of the observed data and thus need improvement. In other words, it provides information on the relative efficiency of competing models in accounting for the data.	It is recommended to be less than 3.0 to indicate a reasonable fit.
- Akaike's information criterion (AIC)	This is a comparative measure between models with different numbers of constructs. It addresses the issue of parsimony in the assessment of model fit; as such, statistical goodness-of-fit and number of estimated parameters are taken into account.	Smaller values represent a better fit of the hypothesized model. It should be ≤ for the saturated model.

It should be noted that there is no single answer to the question about what is good fit. The more criteria listed above that a model satisfies, the better is its fit. To use the descriptor "good" about fit would require, at minimum, favourable values of the fit indexes. Therefore, it would seem advisable to apply terms with more neutral connotations instead ("adequate", "satisfactory", "acceptable", etc.) (Kline, 1998a, p. 131).

9.3.1 The Measurement Models

In SEM, there are two major types of variables: observed, or indicator variables, and latent variables. Latent variables are variables that are not directly observed or measured (e.g., business unit performance); they must be observed or measured indirectly (e.g., financial and non-financial measures), hence, inferred. CFA reflects measurement models in which observed variables define constructs or latent variables (Hair et al., 1995; Hoyle, 1995). Moreover, in SEM, CFA, rather than exploratory factor analysis, is used, as the identification of the factors is specified by theory, not by the data (Hair et al., 1995).

Measurement error can be defined as that portion of an observed variable that is measuring something other than what the latent variable is hypothesized to measure. It serves as a measure of reliability (Schumacker and Lomax, 1996, p. 81).

Measurement errors in any kind of data, including survey research data, can have profound effects on statistical relationships. Some kinds of measurement errors make bivariate relationships appear too weak. The effects of measurement errors on multivariate relationships can be great, and also complex. Under certain combinations of errors, an observed relationship can be wrong in both direction and magnitude. However, if one has information about the validity and error composition of the measure being analysed, more informed judgements can be made about the underlying relationships that are of primary interest (Andrews, 1984; Ittner and Larcker, 2001).

Therefore, measurement models should be defined for both independent and dependent latent variables. The measurement models involve specifying which observed variables define a construct and reflect the extent to which the observed variables are assessing the latent variables in terms of reliability and validity (Schumacker and Lomax, 1996).

In the light of the above, measurement models (the first step) can be considered a vital advantage to SEM. When relationships among factors are examined (the second step), the relationships are free of measurement error because the error has been estimated and removed, leaving only common variance (Tabachnick and Fidell, 1996). If the measurement models do not obtain satisfactory fit, there is no point in proceeding to test the structural model until proper measurement of the latent variables is achieved (Hoyle, 1995).

Consequently, prior to evaluating the structural equation model (step 2), the validity of the measurement models was examined by CFA before testing the full latent variable model. The measurement model for each factor was estimated separately. After estimating the measurement model for all factors without constraining the covariance matrix of the factors, the SEM for factors together with the measurement models would be estimated. At each step, whether or not the model fitted, the data was assessed. This assessment of the model was done by examining a number of goodness-of-fit statistics (see Table 9.1). It should be noted that all SEM models that have been tested within step 1 (the measurement models) and step 2 (the structural equation models) are built up from all the data available from the full list of 112 business units rather than a subset of cases.

9.3.1.1 Measurement model for differentiation strategy

The CFA structure in Fig. 9.3 comprises one latent variable (differentiation strategy) measured by three observed variables (q.3, q.4, and q.5b), the reliability of which is influenced by a random measurement error, as indicated by the associated error terms (err1, err2, and err3). CFA was carried out to examine the fit of the three measured variables into the latent variable. To examine the relationship between the measured variables, paths were set from each measured variable to differentiation strategy. The descriptive statistics and correlation matrix for all items included in the model are provided in Appendix D Table 1 and Table 2, respectively.

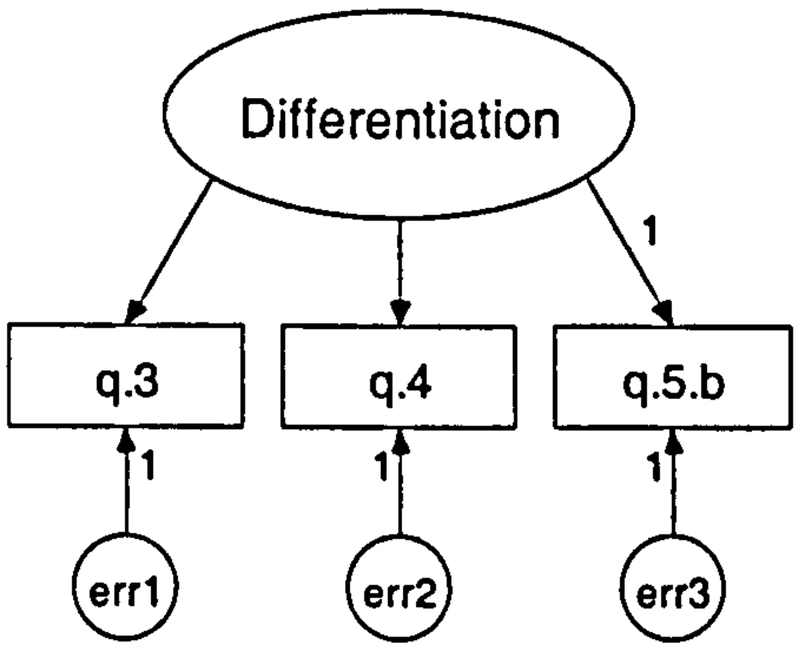

Fig. 9.3 Measurement model for differentiation strategy

The fit of this model was perfect, $\chi^2 = 0.000$ (df = 0), GFI = 1.000, CFI = 1.000, NFI = 1.000, AIC = 12.000 (saturated model = 12.000). Since the model has a zero degree of freedom, it should fit the data perfectly and chi-square should be zero. Consequently, the ratio of χ^2/df cannot be computed.

Given the perfect fit and the appropriateness of this measurement model, neither of its measured variables has been removed. Moreover, additional analysis in section 9.3.2 will examine the relationship between this and other latent variables. Reliability for the three differentiation strategy sub-dimensions (q.3, q.4, and q.5.b) was assessed with Cronbach's (1951) alpha. The alpha score is 0.73 for the differentiation strategy measurement model. This value was above the generally accepted minimum criterion level of 0.60 (Nunnally, 1978).

9.3.1.2 Measurement model for SMA practices

The measurement model in Fig. 9.4 comprises one latent variable measured by eleven observed variables, the reliability of which is influenced by random measurement error, as indicated by the associated error terms. CFA was conducted to examine the fit of the eleven measured variables (q.7.d, q.7.f, q.8.a, q.8.b, q.8.c, q.8.d, q.8.e, q.8.f, q.8.g, q.8.h, and q.8.i) into the latent variable (SMA practices). To examine the relationship between the measured variables, paths were set from each measured variable to SMA practices. The descriptive statistics and correlation matrix for all items included in the model are provided in Appendix D Table 3 and Table 4 respectively.

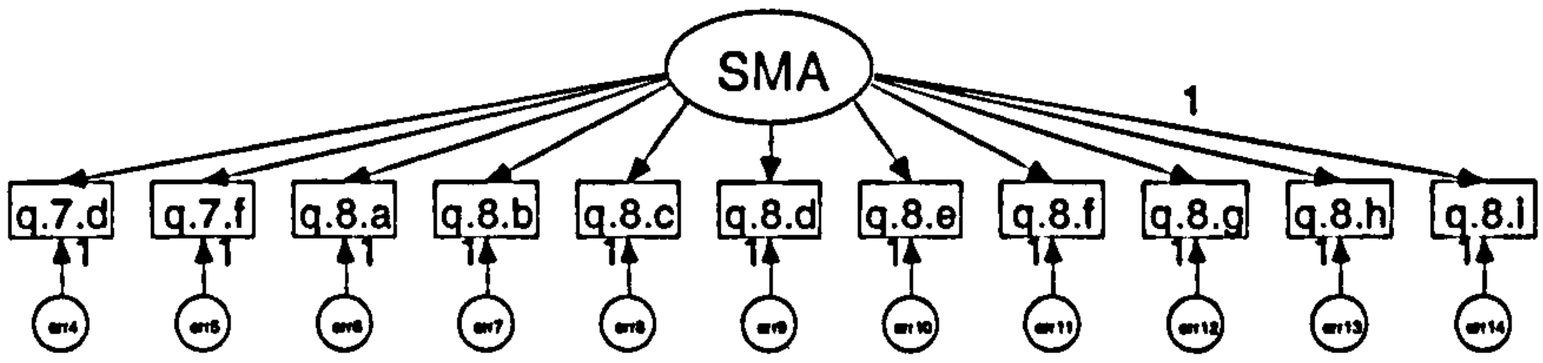

Fig 9.4 Measurement model for SMA practices

In reviewing the various indices of model fit in terms of their recommended values (see Table 9.1), it can be stated that they are consistent in their reflection of an ill-fitting model ($\chi^2 = 58.675$ and NFI = 0.784). It is apparent that some modification in specification is needed in order to determine a model that better represents the sample data. Therefore, a number of items were deleted as part of the development of measurement models.

As recommended by Joreskog and Sorbom (1989), only one item was removed at a time. In this respect, Loehlin (1987) points out that the "standardized regression coefficients" are particularly useful when comparisons are to be made across different variables. Consequently, the modification of the SMA practices measurement model went through five steps (see Table 9.2). First, q.8.b was dropped because of its lowest standardized regression coefficient. Then, the model was reassessed, but NFI was below 0.90. In the second step, q.7.d was dropped and the model was reassessed, but NFI was 0.846. In the third step, q.8.a was dropped and the model was reassessed again; however NFI was 0.875. In the fourth step, q.7.f was dropped and the model was reassessed, but NFI was still below 0.90. In the fifth step, q.8.i was dropped and the model was reassessed again, and NFI was 0.907. At this point, all fit indices were better than the recommended criteria. It should be noted that the

measurement model for SMA practices excludes ABC (q.8.i) from the SMA latent variable thus removing the problem of bias discussed previously in Chapter 7, section 7.4.3.

The final SMA practices measurement model includes six SMA practices (q.8.c, q.8.d, q.8.e, q.8.f, q.8.g, and q.8.h). Reliability for the six SMA sub-dimensions was assessed with Cronbach's (1951) alpha. The alpha score is 0.77 for the final SMA practices measurement model. This value was above the generally accepted minimum criterion level of 0.60 (Nunnally, 1978).

Table 9.2: SMA practices measurement model modification process

Fit Indices	Initial model	After removing q.8.b (step 1)	After removing q.7.d (step 2)	After removing q.8.a (step 3)	After removing q.7.f (step 4)	After removing q.8.i (step 5)
(1) Measures of absolute fit:						
• χ^2	58.675	41.979	36.511	26.897	25.166	15.412
• GFI	0.916	0.933	0.934	0.947	0.944	0.956
(2) Incremental fit measures:						
• CFI	0.932	0.966	0.953	0.963	0.935	0.957
• NFI	0.784	0.834	0.846	0.875	0.870	0.907
(3) Parsimonious fit measures:						
• χ^2/df	1.3	1.2	1.4	1.3	1.8	1.7
• AIC (Saturated model)	102.675 (132.000)	81.979 (110.000)	72.511 (90.000)	58.897 (72.000)	53.166 (56.000)	39.412 (42.000)

9.3.1.3 Measurement model for ABC systems

9.3.1.3.1 Measurement model for ABC/M

The CFA structure in Fig. 9.5 comprises one latent variable (ABC/M) measured by eight observed variables (q.13, q.16.a, q.16.b, q.16.c, q.16.d, q.16.e, q.16.f, and q.16.g), the reliability of which is influenced by random measurement error, as indicated by the associated error terms. CFA was undertaken to examine the fit of the eight measured variables into the latent variable. To examine the relationship between the measured variables, paths were set from each measured variable to ABC/M. The descriptive statistics and correlation matrix for all items included in the model are provided in Appendix D Table 5 and Table 6, respectively.

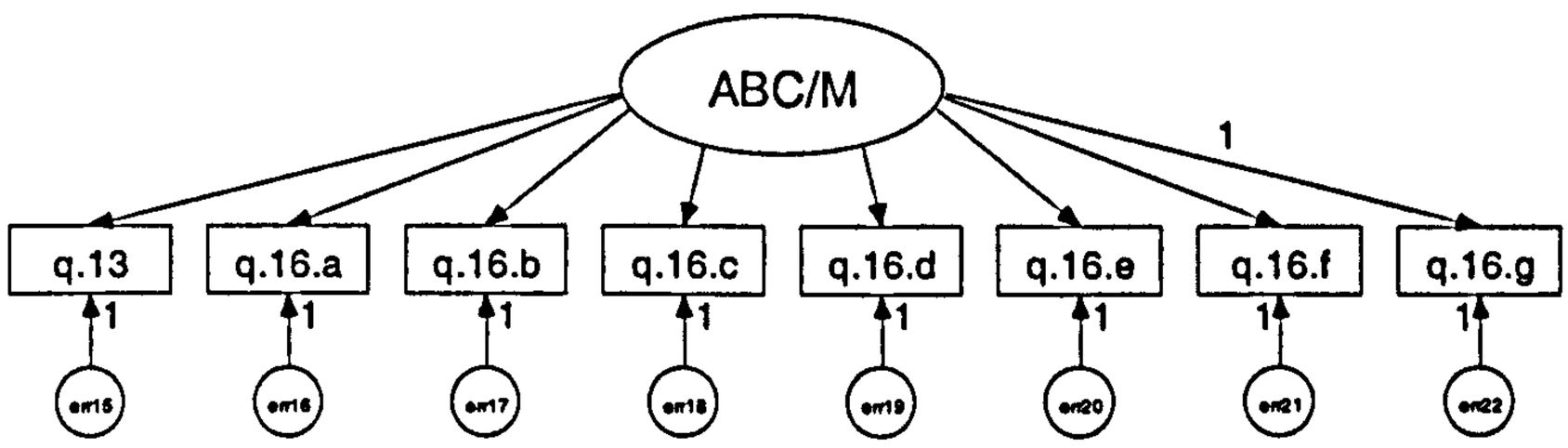

Fig. 9.5 Measurement model for ABC/M

The initial ABC/M model, shown in Fig. 9.5, had values of $\chi^2 = 342.868$ (df = 20, $p = 0.000$), GFI = 0.683, CFI = 0.592, NFI = 0.582, χ^2/df = 17.1, and AIC = 374.868 (saturated model = 72.000). These values are below the recommended minimum levels, indicating that further modification may be required to improve key model fit statistics.

The modification of the ABC/M measurement model was conducted in five steps (see Table 9.3). First, q.16.g was removed from the initial model because of its lowest standardized regression coefficient. The model was reassessed, but the fit indices were indicative of a very poor fit: $\chi^2 = 211.115$ (df = 14, $p = 0.000$), GFI = 0.716, CFI = 0.704, NFI = 0.693, χ^2/df = 15.1, and AIC = 239.115 (saturated model = 56.000). Second, q.16.c was removed and the model was reassessed, the fit indices were below the recommended criteria: $\chi^2 = 165.510$ (df = 9, $p = 0.000$), GFI = 0.737, CFI = 0.722, NFI = 0.714, χ^2/df = 18.39, and AIC = 189.510 (saturated model = 42.000).

Third, q.16.e was removed and the model was assessed again. A review of the various fit indices for this model showed substantial improvement over the initial model. However, the GFI, CFI, and NFI values of 0.908, 0.936, and 0.924, respectively, were adequate at best. There was some evidence of misfit in the model. For example, the χ^2/df and AIC values of 5.9 and 49.387 (saturated model = 30.000), respectively, were below the recommended levels. Fourth, q.16.f was removed and the model was assessed. The GFI, CFI, and NFI fit indices were still improving over the previous step (GFI = 0.933, CFI = 0.955, and NFI = 0.950). However, values of χ^2/df = 7.8 and AIC = 31.547 (saturated model = 20.000) were indicative of a poor fit. Finally, q.16.d was removed, at this step, all fit indices were above the recommended criteria: χ^2 = 0.000 (df = 0), GFI = 1.000, CFI = 1.000, NFI = 1.000, and AIC = 12.000 (saturated model = 12.000), indicating a perfect model fit. Since the model has a zero degree of freedom, it should fit the data perfectly and chi-square should be zero. Consequently, the ratio of χ^2/df cannot be calculated.

The final ABC/M measurement model includes three observed variables (q.13, q.16.a, and q.16.b). Reliability for the three ABC/M sub-dimensions was assessed with Cronbach's (1951) alpha. The alpha score is 0.90 for the final ABC/M measurement model. This value was above the generally accepted minimum criterion level of 0.60 (Nunnally, 1978).

Table 9.3: ABC/M measurement model modification process

Fit indices	Initial model	After removing q.16.g (step 1)	After removing q.16.c (step 2)	After removing q.16.e (step 3)	After removing q.16.f (step 4)	After removing q.16.d (step 5)
(1) Measures of absolute fit:						
• χ^2	342.868	211.115	165.510	29.387	15.547	0.000
• GFI	0.683	0.716	0.737	0.908	0.933	1.000
(2) Incremental fit measures:						
• CFI	0.592	0.704	0.722	0.936	0.955	1.000
• NFI	0.582	0.693	0.714	0.924	0.950	1.000
(3) Parsimonious fit measures:						
• χ^2/df	17.1	15.1	18.4	5.9	7.8	-
• AIC (Saturated model)	347.868 (72.000)	239.115 (56.000)	189.510 (42.000)	49.387 (30.000)	31.547 (20.000)	12.000 (12.000)

9.3.1.3.2 Measurement model for AA/ACA

As indicated in Chapter 7 (section 7.3.3), respondents were asked two questions (q.11 and q.12) in order to help them differentiate AA from ACA. The descriptive statistics and correlation matrix for them are provided in Appendix D Table 7 and Table 8, respectively.

Schumacker and Lomax (1996) point out that, in using a single observed variable to assess a latent variable, it should be assumed that no measurement error is associated with the measurement of the latent variable. In other words, it is assumed that the latent variable is perfectly measured by the single observed variable.

Moreover, reliability has to be concerned with the ability of a measure to be consistent. If only a single measure of a latent variable is used and it is not very reliable, then the latent variable is not assessed very well. However, if the reliability of a single observed measure of a latent variable is assessed very well, then there is evidence to include the latent variable in the structural model (Schmacker and Lomax, 1996). Therefore, reliability for the two AA/ACA sub-dimensions (q.11 and q.12) was assessed with Cronbach's (1951) alpha. The alpha score was 0.99. This value was above the generally accepted minimum criterion level of 0.60 (Nunnally, 1978).

It should be noted that answering q.11 and q.12 does not necessarily imply the business unit uses AA/ACA, only because these two questions are positively answered by the adopters of ABC/M. Therefore, for analysis purposes, to restrict the analysis to a structural equation model of AA/ACA only (step 2), business units using ABC/M were given zero credit for q.11 and q.12. This ensures that the structural equation model of AA/ACA includes business units applying AA/ACA/ only.

9.3.1.4 Measurement model for AMT

The measurement model in Fig. 9.6 comprises one latent variable measured by six observed variables, the reliability of which is influenced by random measurement error, as indicated by the associated error terms. CFA was conducted to examine the fit of the six measured variables (q.20.a, q.20.b, q.20.c, q.20.d, q.20.e, and q.20.f) into the latent variable (AMT). To examine the relationship between the measured variables, paths were set from each measured variable to AMT. The descriptive statistics and correlation matrix for all items included in the model are provided in Appendix D Table 9 and Table 10, respectively.

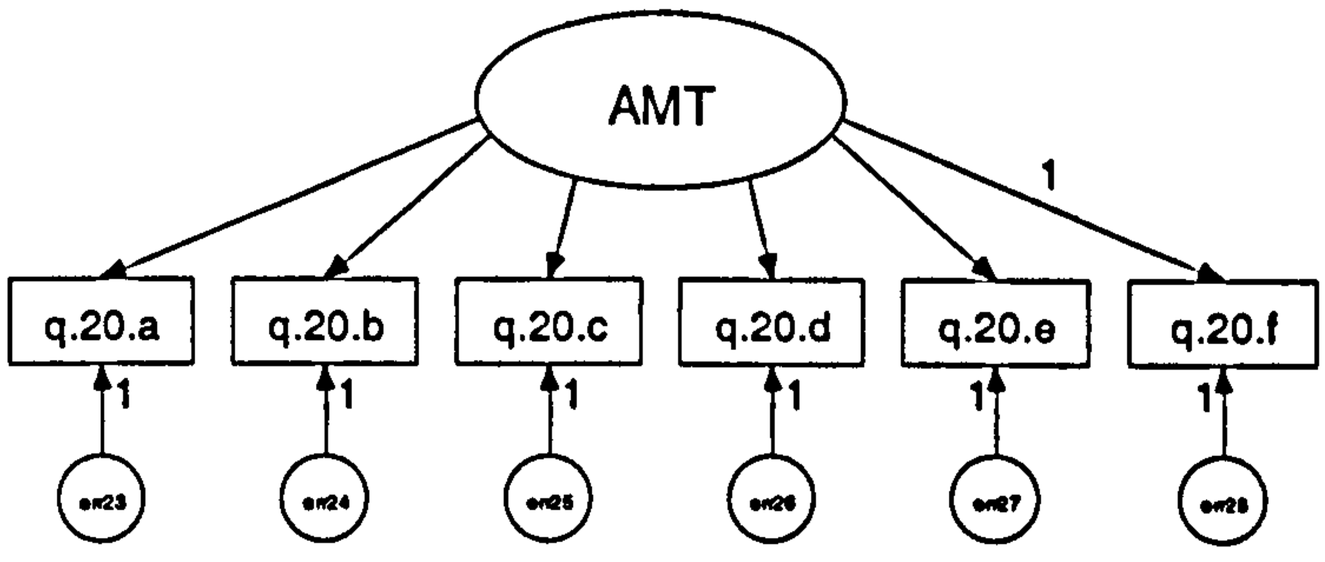

Fig. 9.6 Measurement model for AMT

In reviewing the various indices of model fit in terms of their recommended criteria, it can be indicated that they are consistent in their reflection of a poor fit of the initial model: $\chi^2 = 39.844$ (df = 9, $p = 0.000$), CFI = 0.641, NFI = 0.605, χ^2/df = 4.4, and AIC = 63.844 (saturated model = 42.000). Consequently, further modification was required to improve the model fit statistics.

The modification of the AMT measurement model went through only two steps (see Table 9.4). First, q.20.a was dropped because of its lowest standardized regression coefficient. The various fit indices for this model were improved over the initial model. In particular, note the improved GFI value of 0.970 (vs.0.896), CFI value of 0.920 (vs. 0.641), and χ^2/df value of 1.9 (vs. 4.4), but NFI was below 0.90. In the second step, q.20.b was dropped and the model was reassessed. At this point, all fit indices were above the recommended values: $\chi^2 = 2.987$, GFI = 0.987, CFI = 0.977, NFI = 0.940, χ^2/df = 1.5, and AIC = 18.987 (saturated model = 20.000), which indicate a good model fit.

The final AMT measurement model includes four observed variables (q.20.c, q.20.d, q.20.e, and q.20.f). Reliability for the four AMT sub-dimensions was assessed with Cronbach's (1951) alpha. The alpha score is 0.61 for the final AMT measurement model. This value was above the generally accepted minimum criterion level of 0.60 (Nunnally, 1978).

Table 9.4: AMT measurement model modification process

Fit indices	Initial model	After removing q.20.a (step 1)	After removing q.20.b (step 2)
(1) Measures of absolute fit:			
• χ^2	39.844	9.466	2.987
• GFI	0.896	0.970	0.987
(2) Incremental fit measures:			
• CFI	0.641	0.920	0.977
• NFI	0.605	0.856	0.940
(3) Parsimonious fit measures:			
• χ^2/df	4.4	1.9	1.5
• AIC (Saturated model)	63.844 (42.000)	29.466 (30.000)	18.987 (20.000)

9.3.1.5 Measurement model for performance

The CFA structure in Fig. 9.7 comprises one latent variable (performance) measured by eight observed variables (q.21, q.22, q.23.a, q.23.b, q.23.c, q.23.d, q.23.e, and q.23.f), the reliability of which is influenced by random measurement error, as indicated by the associated error terms. CFA was conducted to examine the fit of the eight measured variables into the latent variable. To examine the relationship between the measured variables, paths were set from each measured variable to performance. The descriptive statistics and correlation matrix for all items included in the model are provided in Appendix D Table 11 and Table 12, respectively.

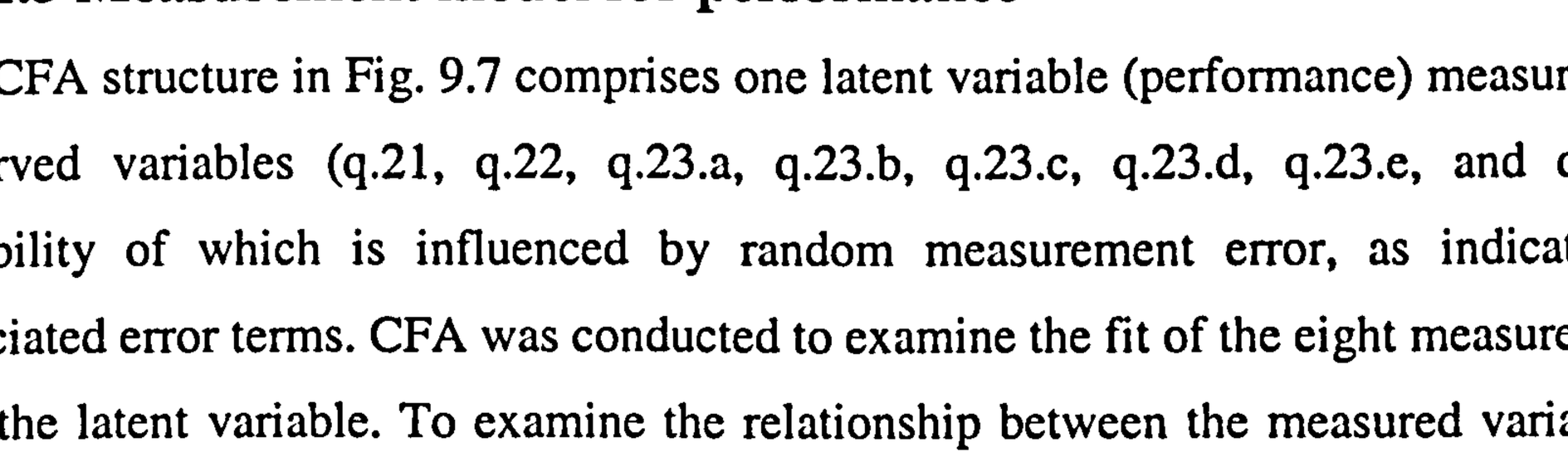

Fig. 9.7 Measurement model for performance

The initial performance model, shown in Fig. 9.7, had values of χ^2 = 103.988 (df = 20, p = 0.000), CFI = 0.666, NFI = 0.628, χ^2/df = 5.2, and AIC = 135.988 (saturated model = 72.000). These values are below the recommended minimum levels, indicating that further modification may be required to improve key model fit statistics.

The modification of the performance measurement model went through five steps (see Table 9.5). In the first step, q.23.e was deleted because of its lowest standardized regression coefficient. The model was reassessed, but the fit indices were indicative of a poor fit: CFI = 0.891, NFI = 0.834, and AIC = 62.090 (saturated model = 56.000). Second, q.23.f was deleted, but both NFI and AIC were below the recommended criteria: NFI = 0.871 and AIC = 48.407 (saturated model = 42.000). In the third step, q.23.d was deleted, however, AIC value (32.274) was more than for the saturated model (30.000).

In the fourth step, q.23.c was deleted and the model was reassessed, but AIC value (27.083) was still more than for the saturated model (20.000). In the fifth step, q.21 was deleted and the model was reassessed again, and AIC value (12.000) was equal for the saturated model (12.000). At this point, all fit indices were above the recommended criteria: χ^2 = 0.000, GFI = 1.000, CFI = 1.000, NFI = 1.000, and AIC = 12.000 (saturated model = 12.000), indicating a perfect model fit. Since the model has a zero degree of freedom, it should fit the data perfectly and chi-square should be zero. Thus, the ratio of χ^2/df cannot be computed.

The final performance measurement model includes three observed variables (q.22, q.23.a, and q.23.b). Reliability for the three performance sub-dimensions was assessed with Cronbach's (1951) alpha. The alpha score was 0.80 for the final performance measurement model. This value was above the accepted minimum criterion level of 0.60 (Nunnally, 1978).

At this point, formulation of measurement models for each variable involved in the structural equation model (step 2) was made, using AMOS 5.0, to undertake CFA for each set of items. CFA is used to test the uni-dimensionality of each of the five multi-item constructs: differentiation strategy, SMA practices, ABC systems, AMT, and business unit performance. Details of fit indices for each model are shown in Table 9.6. All the fit indices for each model were better than the recommended criteria, indicating that there is no evidence of a lack of uni-dimensionality. Table 9.7 lists the descriptive statistics for the final variables in the study. With such satisfactory measurement models, the second step of SEM, the evaluation of the structural model, can proceed in the following sub-section.

Table 9.5: Performance measurement model modification process

Fit Indices	Initial model	After removing q.23.e (step 1)	After removing q.23.f (step 2)	After removing q.23.d (step 3)	After removing q.23.c (step 4)	After removing q.21 (step 5)
(1) Measures of absolute fit:						
• χ^2	103.988	34.099	24.407	12.274	11.083	0.000
• GFI	0.817	0.917	0.930	0.956	0.950	1.000
(2) Incremental fit measures:						
• CFI	0.666	0.891	0.912	0.955	0.940	1.000
• NFI	0.628	0.834	0.871	0.929	0.930	1.000
(3) Parsimonious fit measures:						
• χ^2/df	5.2	2.4	2.7	2.5	5.5	-
• AIC (Saturated model)	135.988 (72.000)	62.090 (56.000)	48.407 (42.000)	32.274 (30.000)	27.083 (20.000)	12.000 (12.000)

Table 9.6: Final model fit for measurement models

Variable	Measurement of absolute fit		Incremental fit measures		Parsimonious fit measures	
	χ^2	GFI	CFI	NFI	χ^2/df	AIC (Saturated model)
- Differentiation strategy	0.000	1.000	1.000	1.000	-	12.000 (12.000)
- SMA practices	15.412	0.956	0.957	0.907	1.7	39.412 (42.000)
- ABC/M	0.000	1.000	1.000	1.000	-	12.000 (12.000)
- AMT	2.987	0.987	0.977	0.940	1.5	18.987 (20.000)
- Performance	0.000	1.000	1.000	1.000	-	12.000 (12.000)

Table 9.7: Descriptive statistics for the final variables

Variable	Theoretical range		Actual range		Mean	S.D.	Cronbach's alpha
	Min.	Max.	Min.	Max.			
- Differentiation Strategy	1	7	1.33	7	4.81	1.61	0.73
- SMA practices	1	7	1	5.83	3.57	1.63	0.77
- ABC/M	0	1	0	1	0.08	0.26	0.90
- AA/ACA	0	1	0	1	0.19	0.39	0.99
- AMT	1	7	1	6.25	3.03	1.84	0.61
- Performance	1	19	3	18	4.11	1.23	0.80

9.3.2 The Structural Equation Model

The structural equation model establishes the relationships between latent variables. In the structural equation model, both the independent and dependent latent-variable measurement models are used. An important point to emphasize is that the relationships among the latent variables are subject to substantive theory (Schumacker and Lomax, 1996, pp. 69-73). The focal point in analysing the structural equation model is the extent to which the hypothesized model "fits" or, in other words, adequately describes the sample data. Therefore, if the fit indexes indicate acceptable overall fit of a specified model, then the focus moves to specific elements of fit (Hoyle, 1995).

In contrast to measurement models, which comprise only a measurement component, the full structural equation model encompasses both the measurement models and the structural model. Accordingly, the full model embodies a system of variables, whereby latent factors are regressed on other factors as dictated by theory, as well as on the appropriate observed measures. In other words, in the full SEM model, certain latent variables are connected by one way arrows, the directionality of which reflects hypotheses bearing on the causal structure of variables in the model. It should be noted that the prediction of each of the first-order factors from the second-order factor is presumed not to be without error. Therefore, a residual error term is associated with each of the lower level factors (Byrne, 2001).

Turning first to the structural part of the models, it can be stated that a latent dependent variable has at least one direct line or arrow leading into it from another latent variable. However, any latent variable that is not influenced by any other latent variable in the model is known as a latent independent variable (Schumacker and Lomax, 1996).

As shown in Fig. 9.8 and Fig. 9.9, there are five latent variables; the only latent independent variable (differentiation strategy) is linked to the other two dependent variables (AMT and SMA practices) by two regression paths, as indicated by the unidirectional arrows. Because the variables AMT, SMA practices, ABC systems (ABC/M or AA/ACA), and business unit performance have one-way arrows pointing at them, they are easily identified as latent dependent variables in the model. Residual errors associated with the regression of AMT on differentiation strategy, the regression of SMA practices on both differentiation strategy and AMT, the regression of ABC systems (ABC/M or AA/ACA) on SMA practices and AMT, and the regression of business unit performance on ABC systems (ABC/M or AA/ACA), are captured by the disturbance terms RES1, RES2, RES3, and RES4 respectively.

The AMOS 5.0 software program, with its default maximum likelihood estimation (MLE) technique, was used to estimate the structural equation models depicted in Fig. 9.8 and Fig. 9.9. MLE was found to provide valid results with sample sizes as small as 50, but a sample this small is not recommended. It is generally accepted that the minimum sample size to ensure appropriate use of MLE is 100 (Hair et al., 1995, p. 637).

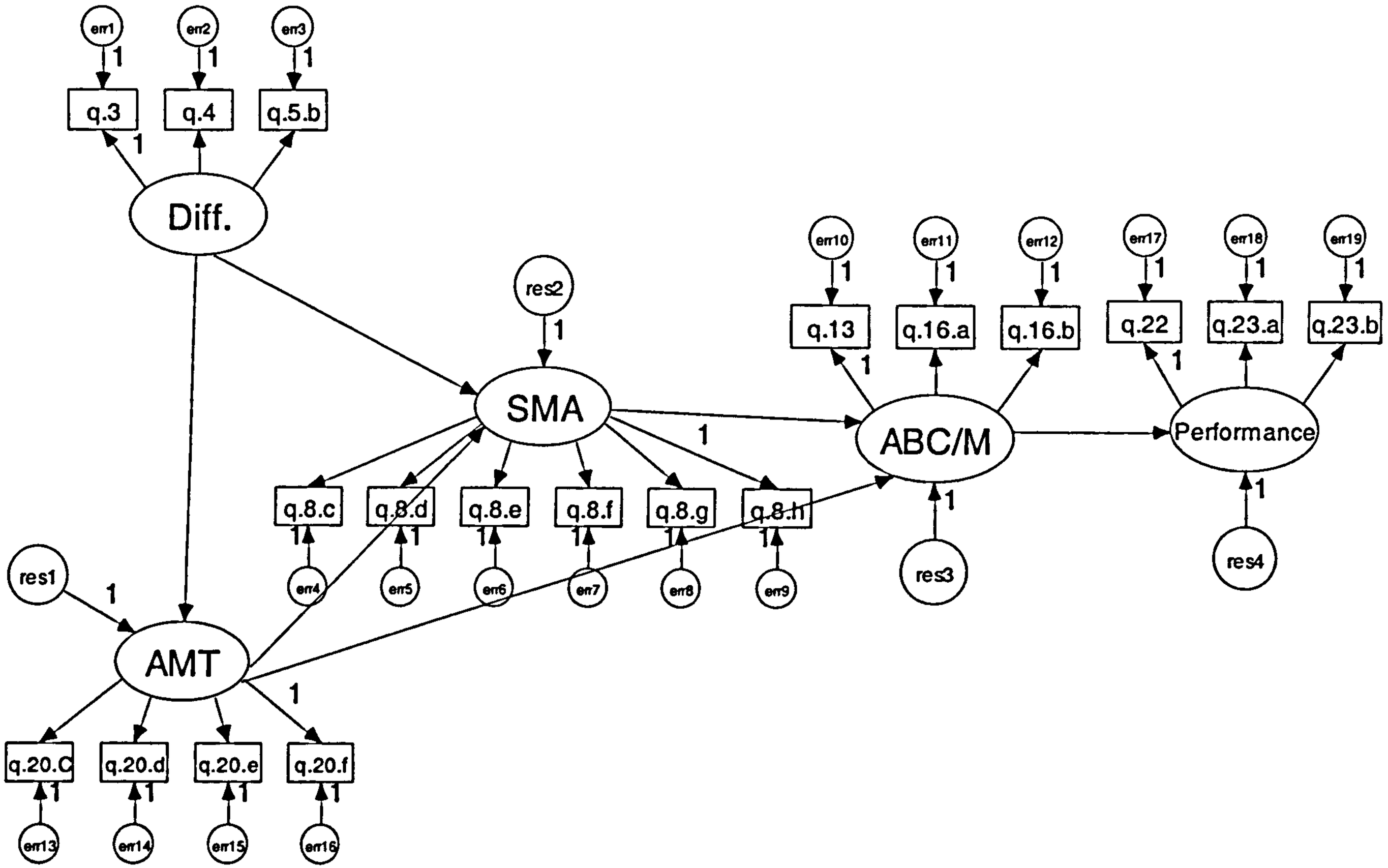

Fig. 9.8 The structural equation model of ABC/M

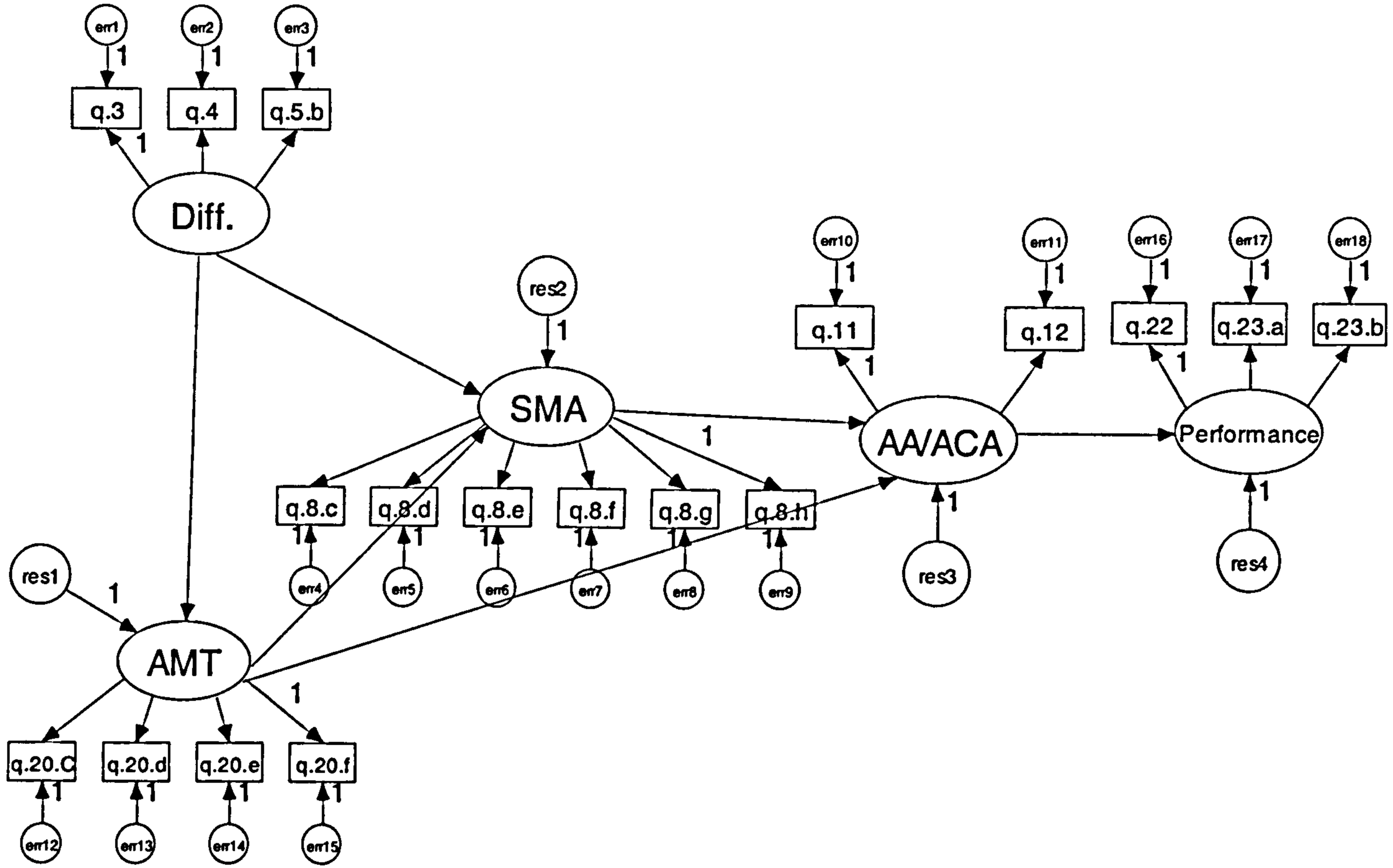

Fig. 9.9 The structural equation model of AA/ACA

9.3.2.1 Results of the ABC/M structural model

Analysis of the structural ABC/M model (see Fig. 9.8) indicated an acceptable model fit for a number of fit indices. All fit indices were either within or close to acceptable levels (see Table 9.8): $\chi^2 = 200.692$, df = 146, $p = 0.002$, GFI = 0.844, CFI = 0.917, NFI = 0.757, χ^2/df = 1.38, and AIC = 288.692 (saturated model = 380.000), indicating an adequate model fit. Regarding NFI, the incremental index of fit (IFI) and the Tucker-Lewis index (TLI) were developed to address the issues of parsimony and sample size, which were known to be associated with the NFI. The yield values range from zero (poor fit) to 1.00 (perfect fit), with a value of 0.90 being indicative of good fit. As such, its computation is basically the same as the NFI, except that degrees of freedom are taken into account (Byrne, 2001; Marsh et al., 1988). Therefore, it is not surprising to find that IFI = 0.920 and TLI = 0.902 are consistent with that of the CFI in reflecting a good fit model.

Table 9.8: ABC/M model fit indices

Fit indices	Value
(1) Measures of absolute fit:	
• χ^2	200.692
• GFI	0.844
(2) Incremental fit measures:	
• CFI	0.917
• NFI	0.757
• IFI	0.920
• TLI	0.902
(3) Parsimonious fit measures:	
• χ^2/df	1.38
• AIC (Saturated model)	288.692 (380.000)

The significance of the path coefficients in ABC/M model show that H2, H3, and H4 are supported. However, the insignificant path coefficients in the model indicate that H1, H5, and H6 are rejected (see Table 9.9 and Table 9.10). The findings show that the use of AMT is not associated with differentiation strategy ($\beta = 0.068$, $p = 0.632$). Accordingly, H1 is rejected. Moreover, the results of the ABC/M model indicate that both differentiation strategy and AMT are significant ($p = 0.080$ and 0.082 respectively) and have a positive relationship between them and the use of SMA practices ($\beta = 0.224$ and 0.248 respectively). Therefore, H2 and H3 are supported.

The model indicates that SMA practices are positively associated with the adoption of ABC/M ($\beta = 0.223$, $p = 0.064$). However, no significant relationship was found between AMT and the adoption of ABC/M ($\beta = 0.160$, $p = 0.212$). Consequently, H4 should be supported and H5 should be rejected. Finally, an examination of the model indicates that the use of ABC/M is significant but has a negative effect on business unit performance ($\beta = -0.237$, $p = 0.032$). Thus, H6 should be rejected. The results of the ABC/M structural model are presented in Fig. 9.10.

Table 9.9: ABC/M structural equation model

Path	β	Sig.
Differentiation strategy – AMT	0.068	0.632
Differentiation strategy – SMA practices	**0.224**	**0.080**
AMT – SMA practices	**0.248**	**0.082**
SMA practices – ABC/M	**0.223**	**0.064**
AMT – ABC/M	0.160	0.212
ABC/M – Performance	**- 0.237**	**0.032**

Table 9.10: Summary of hypotheses testing for ABC/M model

Hypothesis	Support/Reject
H1: Business units that place a strong emphasis on differentiation strategy will employ AMT.	Rejected
H2: Business units that place a strong emphasis on differentiation strategy will employ SMA practices.	Supported
H3: Business units that have AMT will use SMA practices.	Supported
H4: Business units that have SMA practices will use ABC/M.	Supported
H5: Business units that have AMT will use ABC/M.	Rejected
H6: Business units that have ABC/M will have higher performance.	Rejected

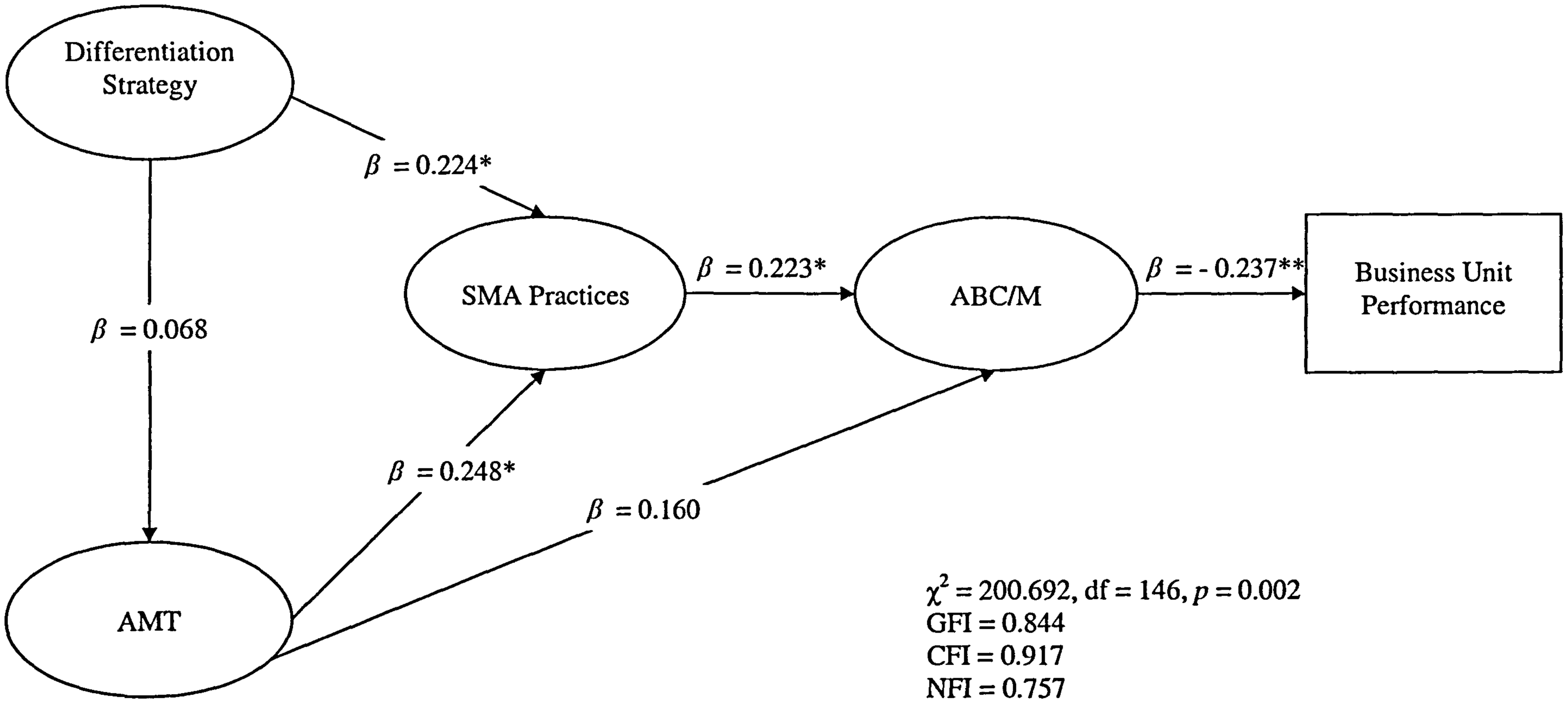

Fig. 9.10 The results of the ABC/M structural model

9.3.2.2 Results of the AA/ACA structural model

The results for the structural AA/ACA model (see Fig. 9.9) indicate an acceptable model fit for a number of fit indices. All fit indices were either within or close to acceptable levels (see Table 9.11): χ^2 = 174.203, df = 129, p = 0.005, GFI = 0.859, CFI = 0.940, NFI = 0.808, IFI = 0.942, TLI = 0.929, χ^2/df = 1.35, and AIC = 258.203 (saturated model = 342.000), indicating a good model fit.

Table 9.11: AA/ACA model fit indices

Fit indices	Value
(1) Measures of absolute fit:	
• χ^2	174.203
• GFI	0.859
(2) Incremental fit measures:	
• CFI	0.940
• NFI	0.808
• IFI	0.942
• TLI	0.929
(3) Parsimonious fit measures:	
• χ^2/df	1.35
• AIC (Saturated model)	258.203 (342.000)

The significance of the path coefficients in the AA/ACA model show that H2, H3, H5, and H6 are supported. However, the insignificant path coefficients in the model indicate that H1 and H4 are rejected (see Table 9.12 and Table 9.13). As with the results of the ABC/M model, the findings of the AA/ACA model show that the use of AMT is not associated with differentiation strategy (β = 0.056, p = 0.688). Accordingly, H1 is rejected. Moreover, the results of the AA/ACA model indicate that both differentiation strategy and AMT are significant (p = 0.081 and 0.057 respectively) and have a positive relationship between them and the use of SMA practices (β = 0.221 and 0.281 respectively). Therefore, H2 and H3 are supported.

Unlike the results of the ABC/M model, the AA/ACA model indicates that SMA practices are not associated with the adoption of AA/ACA (β = 0.100, p = 0.389). Moreover, a significant relationship was found between AMT and the adoption of AA/ACA (β = 0.347, p = 0.011). Consequently, H4 should be rejected and H5 should be supported. Finally, an examination of the model indicates that the use of AA/ACA is significant and has a positive effect on business unit performance (β = 0.218, p = 0.043). Thus, H6 should be supported. The results of the AA/ACA structural model are presented in Fig. 9.11.

Table 9.12: AA/ACA structural equation model

Path	β	Sig.
Differentiation strategy – AMT	0.056	0.688
Differentiation strategy – SMA practices	**0.221**	**0.081**
AMT – SMA practices	**0.281**	**0.057**
SMA practices – AA/ACA	0.100	0.389
AMT – AA/ACA	**0.347**	**0.011**
AA/ACA – Performance	**0.218**	**0.043**

Table 9.13: Summary of hypotheses testing for AA/ACA model

Hypothesis	Support/Reject
H1: Business units that place a strong emphasis on differentiation strategy will employ AMT.	Rejected
H2: Business units that place a strong emphasis on differentiation strategy will employ SMA practices.	Supported
H3: Business units that have AMT will use SMA practices.	Supported
H4: Business units that have SMA practices will use AA/ACA.	Rejected
H5: Business units that have AMT will use AA/ACA.	Supported
H6: Business units that have AA/ACA will have higher performance.	Supported

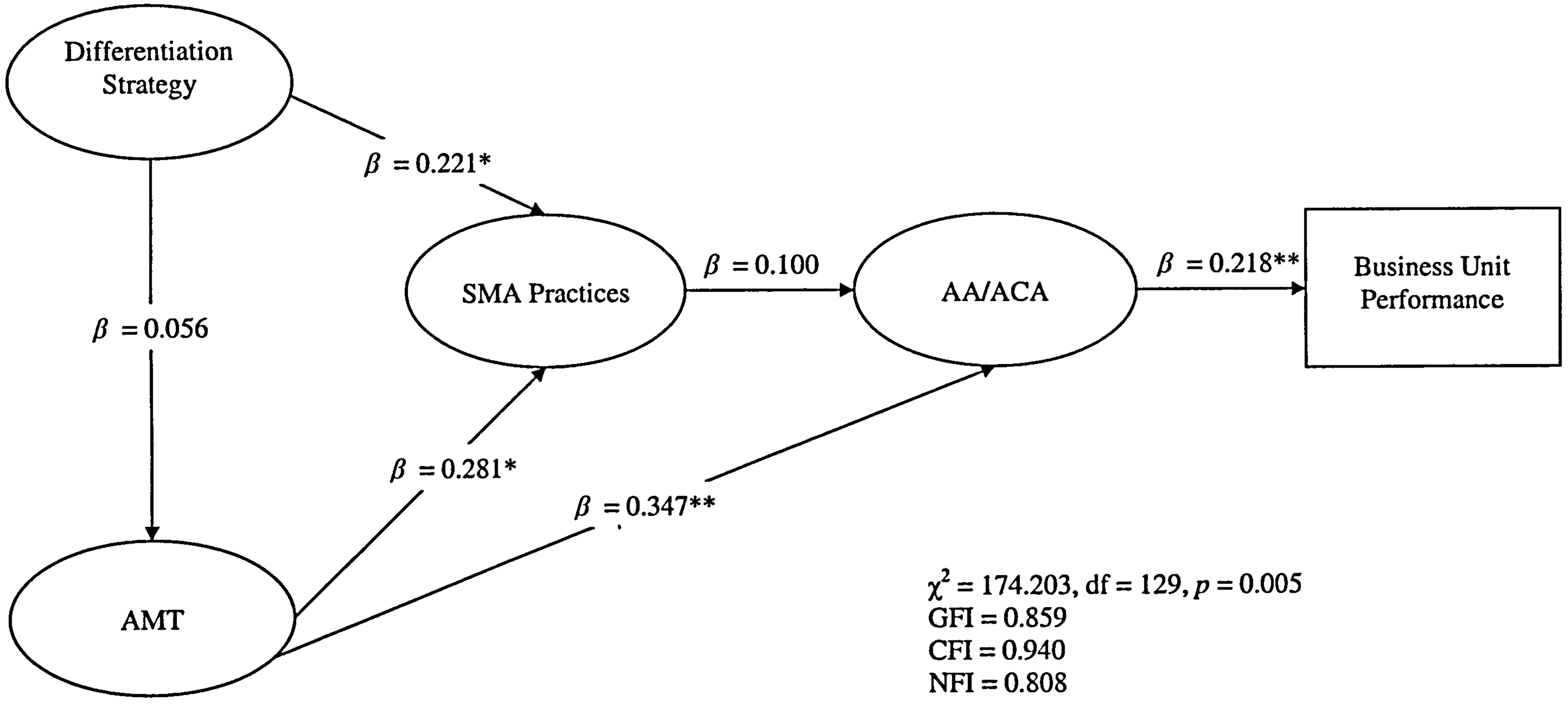

Fig. 9.11 The results of the AA/ACA structural model

Generally speaking, in this sub-section, a structural equation model (step 2) was conducted to identify or verify relationships and/or infer cause-and-effect for the phenomena of interest. A summary of the findings relating to the hypotheses is shown in Table 9.10 and Table 9.13. These findings are discussed in the light of previous research and some future directions are outlined in the next chapter.

9.4 Summary and Conclusion

This chapter focused on how to develop the structural equation model to indicate the relationships between the study contingent variables, using the AMOS 5.0 software program. Basically, CFA yields the measurement models for defining and assessing the study latent variables (differentiation strategy, ABC systems, AMT, SMA practices, and business unit performance), and structural equations are specified between the independent and dependent latent variables to indicate the structural model. In fact, a review of the ABC/M and the AA/ACA structural models reveals an interesting picture of the various relationships between the variables of interest in this study.

It can be stated that this chapter restricts itself to consideration of ABC systems and their associations with performance of the UK's manufacturing business units from the contingency theory point of view. The results from the ABC/M structural model present evidence in support of H2, H3, and H4 but do not find evidence in support of H1, H5, and H6. On the other hand, the results from the AA/ACA structural model present evidence in support of H2, H3, H5, and H6 but do not find evidence in support of H1 and H4. The next chapter discusses these interesting findings in more detail.

Chapter 10: Discussion of the Empirical Findings

10.1 Introduction

Having examined the study hypotheses in Chapter 8 and Chapter 9, this chapter provides a more detailed discussion of the empirical findings, to provide further insights into the relationships between the contingent variables that have been examined. The results of the study add to our understanding of the contingent relationships between ABC systems and the variables of interest and thus have the potential to contribute theoretically to the management accounting literature in general and ABC research in particular. The findings seem to be noteworthy in the light of the recent emphasis on the proactive use of management accounting systems to facilitate the organisational context.

The rest of the chapter is organised as follows. Section 10.2 discusses the empirical findings of the preliminary statistical analysis. Section 10.3 discusses the empirical findings of SEM statistical analysis. Section 10.4 provides further discussion and critique. The last section contains the main conclusion.

10.2 The Empirical Findings of the Preliminary Statistical Analysis

The purpose of this study was to empirically examine the research hypotheses on the UK manufacturing business units. The hypothesized relationships were: (1) business units that place a strong emphasis on cost leadership strategy will employ traditional management accounting practices, (2) business units that place a strong emphasis on differentiation strategy will employ SMA practices, (3) business units that place a strong emphasis on cost leadership strategy will adopt ABC systems, (4) business units that place a strong emphasis on differentiation strategy will employ AMT, (5) business units that have AMT will use ABC systems, (6) business units that have AMT will use SMA practices, (7) business units that have SMA practices will use ABC systems, and (8) business units that place a strong emphasis on differentiation strategy and have ABC systems and AMT will have higher performance. A discussion of the important findings is provided in the following sub-sections.

10.2.1 Competitive strategy, AMT, and business unit performance

This study examined the interactive effects of competitive strategy and AMT on business unit performance, examining two hypothesized relationships: (1) business units that place a strong emphasis on differentiation strategy will employ AMT and (2) business units that place a strong emphasis on differentiation strategy and have ABC systems and AMT will have higher performance.

The study found that business units pursuing a differentiation strategy employ more AMT. This validates earlier arguments that AMT use requirements are higher for business units pursuing a differentiation strategy than a cost leadership strategy. Moreover, higher performing business units emphasizing a differentiation strategy are more likely to employ AMT. In contrast, AMT is not likely to be used when it is utilized by business units pursuing a cost leadership strategy. In other words, higher performing business units emphasizing a cost leadership strategy are not willing to use AMT. In the light of these results, the exact strategic priorities and AMT combinations that are expected to result in higher or lower performance are presented in Fig. 10.1.

		Competitive Strategy	
		Cost Leadership	Differentiation
AMT	Low	Higher Performance	Lower Performance
	High	Lower Performance	Higher Performance

Fig. 10.1 Competitive strategy, AMT, and business unit performance

Generally speaking, the study provides evidence that competitive strategy and AMT interactively affect business unit performance. This result is consistent with Parker (2000), who found that technology policy tends to align with strategy in a comprehensible and predictable manner. Not only were the strategy dimensions correlated with the technology dimensions, but the strategic patterns were also associated with technology dimensions. Moreover, his findings suggested a relationship between strategy-technology interaction and organisation performance.

This result is also consistent with findings provided by Kotha and Swamidass (2000), who found no relationship between cost leadership strategy and AMT use as contrast to differentiation strategy. They pointed out that a fit between strategy and AMT use is associated with successful performance in US manufacturing firms. This finding is also consistent with the arguments of Parthasarthy and Sethi (1993), which cost leadership strategy will have an adverse impact upon AMT user performance. They found that a cost leadership strategy for higher performers shows a negative relationship with AMT (positive for lower performers).

10.2.2 Competitive strategy, AMT, and the adoption of management accounting practices

As indicated in Chapter 5 (section 5.6.5), management accounting practices play the role of a "mediating variable" in affecting the adoption of ABC systems and thus are dependent on both competitive strategy and AMT. Therefore, the study examined the relationship between competitive strategy (cost leadership and differentiation), AMT, and the adoption of management accounting practices (traditional and strategic). More specifically, the study examined three hypothesized relationships: (1) business units that place a strong emphasis on cost leadership strategy will employ traditional management accounting practices, (2) business units that place a strong emphasis on differentiation strategy will employ SMA practices, and (3) business units that have AMT will use SMA practices.

Exploratory factor analysis was used to form the factors for business units, based on their emphasis on strategic priorities, AMT, and management accounting practices. Using logistic regression, this allowed all variables to be included in the analysis and demonstrated the fit between competitive strategy, AMT, and management accounting practices. Overall, the preliminary statistical analysis did not provide support for the proposed associations. This result is inconsistent with Shank (1989) and Shank and Govindarajan (1993), who suggested that differences in management accounting emphases depend on the competitive strategy being followed.

An implication of this result is that the UK manufacturing business units probably do not intend to gain unique competitive advantage through their management accounting practices, but instead intend to use them to improve their operational, not strategic, effectiveness. One potential explanation for this might be the effects of the UK's national culture as regards the

use of management accounting practices. In fact, there are notable differences in the use of management accounting practices from one country to another, due to, for instance, cultural factors or governmental regulations (Granlund and Lukka, 1998).

10.2.3 Competitive strategy, AMT, management accounting practices, and the adoption of ABC systems

This study attempts to provide empirical evidence that organisational context seems to affect ABC adoption choices. Therefore, the study investigates the issue of fit between competitive strategy, AMT, and management accounting practices, and their impact on the adoption of ABC systems. In other words, three organisational factors were examined, competitive strategy, AMT, and management accounting practices, all of which were hypothesized to be positively associated with the adoption of ABC systems. More specifically, the study examined three hypothesized relationships: (1) business units that place a strong emphasis on cost leadership strategy will adopt ABC systems, (2) business units that have AMT will use ABC systems, and (3) business units that have SMA practices will use ABC systems.

The study provides empirical evidence that the use of SMA practices is positively related to the adoption of ABC systems, as opposed to traditional management accounting practices. The findings also suggest that business units pursuing a cost leadership strategy are more likely to adopt ABC systems than a differentiation strategy. This latter result is consistent with Chenhall and Langfield-Smith (1998b), who found that firms that place a strong emphasis on low price strategies will adopt activity-based techniques. It seems reasonable to conclude that choosing cost leadership requires accurate information on activities and their related costs and on their impact on product cost and product profitability. ABC systems offer one way of achieving such objectives.

However, this latter result is contrary to the findings of Gosselin (1997), who argued that prospectors' (see Miles and Snow, 1978) needs for information cover a much broader range than defenders, due to their quest for product-market opportunities; therefore, they are organisations that continually experiment with innovation (e.g., the activity management approach). He found support for the hypothesis that firms following a prospector strategy are more likely to adopt the activity management approach. Moreover, the preliminary statistical analysis did not provide support for the proposed association between AMT and the adoption of ABC systems.

10.2.4 The adoption of ABC systems and business unit performance

The study examined the association between the adoption of ABC systems and business unit performance. The results of the study provided support for the proposition that enhanced performance will be associated with the adoption of ABC systems. Moreover, the patterns of ABC used by adopters have been shown to be statistically significant. Specifically, higher performance was associated with the adoption of AA and ACA. It has been found that business unit performance is likely to be higher in situations with AA and ACA than in situations with traditional costing systems, ABC, and ABCM. This relationship is summarised in Fig. 10.2.

	Business unit performance	
	Lower	Higher
Traditional costing systems	✓	x
AA, ACA	x	✓
ABC, ABCM	✓	x

Fig. 10.2 The adoption of ABC systems and business unit performance

There are two main implications that may be drawn from these results. First, it seems likely that the UK manufacturing business units prefer to adopt AA and ACA rather than ABC and ABCM. Gosselin (1997) points out that AA and ACA require less time and effort and are less constraining than ABC and ABCM. It is certainly not difficult to imagine how ABC and ABCM systems become extremely complex and virtually impossible to manage. Complexity is brought about by the desire to cater for a vast number of cost elements, activities, and cost drivers (Mcom, 1993). Therefore, designers of ABC and ABCM systems should be aware of the complexity problem, because that are systems either too complex or too simple will not meet adopters' requirements.

Second, there is evidence that the introduction of ABC in many organisations has focused on the architectural and software design of the system, with insufficient attention being given to the organisational factors involved (Shields, 1995). Shields (1995) discovered that ABC

success was linked to some organisational variables such as competitive strategy. Therefore, it can be argued that the lack of attention to organisational issues, such as competitive strategy, AMT, and management accounting practices, is associated with less successful applications of ABC and ABCM.

This suggests that the overall fit of the research contingency model should be ascertained by using SEM analysis. SEM provided an opportunity to adopt a more holistic approach to the research contingency model building. Consequently, the study would explain why the UK's manufacturing business units were unsuccessful in adopting ABC and ABCM from the contingency theory point of view.

It should be noted that the statistical techniques used in the preliminary statistical analysis do not facilitate an overall model containing all the contingent relationships hypothesised in the research hypotheses "simultaneously". They are particularly not useful when a dependent variable in one relationship becomes an independent variable in another relationship. A further limiting assumption of these techniques is that all constructs are free of measurement error. Therefore, preference is given to the SEM results rather than the preliminary statistical analysis results, particularly where there is a conflict.

10.3 The Empirical Findings of SEM Statistical Analysis

Contingency-based research on the determinants of ABC adoption effectiveness has identified contextual factors that correlate with evaluations of ABC systems (e.g., Shields, 1995). An important aspect of ABC adoption that such studies have neglected is the patterns of ABC used by adopters. A very few contingency studies have investigated the patterns of ABC used by adopters (e.g., Gosselin, 1997), but they did not explore how ABC adoption levels affected business unit performance. Therefore, the objective of this research was to provide more understanding about this issue.

Chapter 9 based on a comprehensive literature review, developed two models of ABC systems and investigated whether differences in business unit performance were influenced by four contingent factors: differentiation strategy, AMT, SMA practices, and ABC systems (ABC/M and AA/ACA). In other words, these two models have different implications on how to improve performance. The ABC/M model implies that business unit performance can

be increased by using ABC/M. In contrast, the AA/ACA model predicts that business unit performance can be increased by using AA/ACA.

SEM was used to test the proposed models and related hypotheses. One advantage of SEM over multiple regression analysis, or path analysis, is that it includes both a measurement model, as well as a structural model, and provides tests of overall model fit (Viator, 2001). The measurement model defines relationships between observed variables (e.g., questionnaire items indicative of differentiation strategy, AMT, etc.). The measurement model helps control for measurement error since identified latent variables are free of the random error associated with observed variables (Hoyle, 1995). However, the structural model portion of SEM defines relationships between latent variables (e.g., the relationship between differentiation strategy and AMT). The significant implications of the results are discussed in the rest of this section.

10.3.1 Differentiation strategy and the use of AMT

The ABC/M model and the AA/ACA model dealt with the actual links between differentiation strategy and the use of AMT. The results of both models indicate that there is no relationship between differentiation strategy and the use of AMT. This result is contrary to the findings of Baines and Langfield-Smith (2003) who found support for the hypothesis that a change towards differentiation strategy will result in increased use of AMT. This may lend support to those observers claiming that AMT capacities are inappropriately utilized in many business units, because AMT is seen as merely an extension of labour-saving mass production techniques, while several authors have argued that AMT should be used in conjunction with revenue-producing, rather than cost-cutting strategies (Dean and Snell, 1996).

Dean and Snell (1996) point out that business units are missing an opportunity to combine integrated competitive strategy and AMT in ways that would substantially impact their performance. Kotha and Swamidass (2000) found that the use of AMT is associated with a differentiation strategy in firms showing superior growth. In contrast, in firms showing poor growth, there is no correlation between differentiation strategy and the use of AMT.

The logic underlying this result is that organisations are open social systems, which must cope with environmental uncertainty. To be effective, they must develop information processing mechanisms capable of dealing with uncertainty, where uncertainty is defined as

the difference between the amount of information required and the amount of information already possessed by the organisation (Kotha and Swamidass, 2000; Galbraith, 1973). In this context, AMT is viewed as a tool that enables business units pursuing a differentiation strategy to increase their information processing capability and consequently improve their performance. This could be seen as a possible reason for the lower performers of ABC/M adopters.

10.3.2 Differentiation strategy, AMT, SMA, and the adoption of ABC systems

The results of the ABC/M model support the expectation that there is a significant relationship between both differentiation strategy and AMT and the use of SMA practices. This result is partly consistent with findings provided by Baines and Langfield-Smith (2003) who found that increased emphasis on differentiation strategy was significantly related to the increased use of advanced management accounting practices. However, they did not find support for the hypothesis that the increased use of AMT will result in the increased use of advanced management accounting practices.

Moreover, it appears that the effect of differentiation strategy and AMT on the adoption of ABC/M is an indirect one via the use of SMA practices as a mediating variable. In contrast, the results of the AA/ACA model indicate that although both differentiation strategy and AMT have a direct impact on the use of SMA practices, SMA practices were found to be not associated with the adoption of AA/ACA. It seems reasonable to conclude that business units that use SMA practices are more likely to adopt the advanced forms of ABC systems (ABC and ABCM) than basic activity analysis (AA and ACA).

This study focuses on gaining an understanding of what factors influence the adoption of ABC systems. An examination of the analysis for the adoption of ABC systems reveals an interesting finding. The adoption of ABC/M is influenced by the use of SMA practices. However, when the theoretical model of AA/ACA is examined, another interesting finding appears. It would seem that AMT is directly associated with the adoption of AA/ACA. It is worthwhile noting that a similar effect did not occur with the ABC/M model. Geishecker (1996) points out that AMT would enhance the ability of ABC systems to improve business unit performance. ABC/M systems certainly require the handling of a vast amount of data and the comfortable extraction of information cannot be considered possible without the full

utilisation of technologies (Mcom, 1993). Consequently, it can be argued that the lack of AMT by ABC/M adopters has limited the success of ABC/M and hampers the overall success of a business unit performance.

10.3.3 The adoption of ABC systems and business unit performance

Although there are many significant path coefficients and the overall model is accepted, the results of the ABC/M model indicate that the use of ABC/M has a negative effect on business unit performance. However, the AA/ACA model suggests that the use of AA/ACA has a positive effect on business unit performance. Overall, the results suggest that the patterns of ABC used by adopters would influence business unit performance.

Johnson (1988; 1992) points out that, to be world-class competitors, companies should manage activities not costs. Activity-based information focuses managers' attention on the underlying causes of cost and profit. Both AA/ACA and ABC/M result from attempts to improve the usefulness of management accounting information for making decisions affecting work-force productivity and product mix. Consequently, both paths could lead firms towards more profitable, or less costly, ways to do business as usual.

However, the adoption of ABC/M requires a complex, comprehensive process that is costly and time-consuming (Estrin et al., 1994). Further difficulties associated with ABC/M have been attributed to the processes of establishing and operating such systems (Cobb et al., 1993; Mcom, 1993). The cost of ABC/M may be relatively high and therefore the benefits have to be substantial for it to be worth adopting (Staubus, 1990). This could be seen as a possible explanation for the evidence that business unit performance is likely to be higher in situations with AA/ACA than in situations with ABC/M. This is an interesting insight, since it is one of the few contingency-based studies in the UK to provide an overall look at ABC systems with four levels of ABC. Other explanations for the phenomenon of apparent ABC/M failure to improve performance are discussed below.

10.4 Further Discussion and Critique

It can be argued that the empirical findings of the study may be relevant to both practitioners and managers, because they highlight some of the variations not explained by previous contingency-based studies, which have described the relationship between ABC systems, competitive strategy, AMT, management accounting practices, and business unit

performance. This section attempts to provide further discussion and critique. It is hoped that this will help to redress apparent ABC/M failure to improve performance. Six issues will be discussed: (1) timing of ABC/M adoption, (2) economic and competitive factors, (3) the nature of ABC/M adopters, (4) sample size, (5) business unit performance, and (6) the methodological approach.

10.4.1 Timing of ABC/M adoption

When evaluating the effect of a new technique such as ABC, there is always a problem in deciding the timing of the evaluation. In practice, the adoption of ABC/M rarely takes place in convenient discrete time periods. If an evaluation takes place at a point where resources have been committed to an ABC/M project and, as a result, good performance has been achieved, then the ABC/M project will probably be deemed a success. However, if the evaluation takes place at a point where difficulties have been experienced, delays have occurred and there is little momentum or enthusiasm for the ABC/M technique, then the technique is more likely to be judged a failure. In both cases it would not take much to alter the circumstances considerably, and so an evaluation undertaken a few months later might produce a very different result (Friedman and Lyne, 1999).

Moreover, effective long-run cost reduction, such as ABC/M, is a continuous activity that must be a strategic and cultural priority. In contrast to traditional cost reduction, with its emphasis on expedient and quick reductions in short-run costs because of immediate crises, strategic cost reduction must be part of a competitive strategy that integrates technological and human resource management strategies to provide a coordinated, broad-based, and long-run approach to reducing costs. Long-run competitive advantage depends on establishing a culture of continuous improvement of quality, time and cost through innovation (Shields and Young, 1992). Thus, ABC/M systems report long-run average product costs (Drury and Tayles, 1994). In fact, ABC/M orientation recognises the long-run cash flow consequences from decisions, not their short-run impact (Cooper, 1990b).

Consequently, timing is a major issue for any organisation evaluating the use of ABC/M. For example, one East Coast-based utility in the US is initiating a major company-wide commitment to ABC/M. This effort is the culmination of a five-year process in which the company investigated and eventually embraced ABC/M. In this case, the changing competitive landscape for utilities and a fundamental need for better understanding of cost issues developed into an environment where the time was finally right for ABC/M

(Geishecker, 1996). One of the most important features of Friedman and Lyne's (1999) study referred to above is the long timescale that was analysed, eight years or more for their main cases.

The present study indicates that ABC/M had only been adopted in some business units over the last three years. Therefore, practical experience of it is still the exception, and, although short-run feedback from those using it is predominantly favourable, a long-run assessment will have to wait for a few years (Innes and Mitchell, 1991).

Moreover, while the business unit performance measure used in this study was a composite measure of financial and non-financial performance, it focused on performance over the last three years relative to competitors. During that time, the short-term consequences of adopting ABC/M were investigated. There could be an additional explanation of higher performance resulting from AA/ACA adoption: AA/ACA may be a quick fix cost reduction exercise whereas ABC/M is a longer term solution with additional costs causing a short term lower profitability. Consequently, it may be that the 3-year time frame is not sufficient to evaluate business unit performance for ABC/M adopters. Thus, it can be suggested that evaluations should continue over a more substantial period (e.g., ten years) for the full impact to be investigated. This could be the focus for additional empirical contingency-based research.

10.4.2 Economic and competitive factors

It should be noted that measuring the success of ABC/M is part of a more general challenge of measuring the success of any major change in managerial methods (be it accounting, quality, or customer-focus) (Foster and Swenson, 1997). Increasing competition in the market, due to deregulation of economies and privatization or corporatization of government owned enterprises, makes use of management accounting systems more important (Bromwich, 1990; Mia and Clarke, 1999).

In fact, there is a need to re-incorporate economics into social theory (Hopper et al., 2001). Broad scope economic and non-economic information external to the business unit becomes essential for evaluating competitive actions or market demand. Business units would also find that they need to respond rapidly to changes in the competitive environment and market demand, and as a result they would find timely and frequent management accounting systems information particularly useful (Gul, 1991).

There is evidence that an increasingly competitive environment has resulted in an increased focus on differentiation strategy. This, in turn, has influenced changes in organisational design, advanced manufacturing technology, and advanced management accounting practices. These three changes have led to improved organisational performance (Baines and Langfield-Smith, 2003). Moreover, Spulber (2003) points out that combining economic approaches to competitive strategy could produce useful insights into how companies compete and how organisations are designed.

In the light of the above, one potential explanation for the apparent ABC/M failure to improve performance might be the effects of the UK's economic and competitive environment on the adoption and success of ABC systems. Previous studies have indicated notable differences in the adoption and success of ABC systems between the US and the UK, such differences perhaps being due to, for instance, economic and competitive factors.

Therefore, the study contingency model could include other factors, such as competitive environment and general economic environment in order to explain how the contingent factors of this study are affected by competitive and general economic conditions (positive and negative). This may shed light on success or failure with ABC/M. Such additional empirical contingency-based research would be useful not only to verify, but also to extend, the evidence presented in this study.

10.4.3 The nature of ABC/M adopters

The nature of ABC/M adopters could be seen as a possible reason for the apparent failure of ABC/M in this study. Business units may adopt ABC/M because they are suffering from various financial problems, and they hope that it will improve their financial position. They expect that progress is being made just by having a new costing system. No modification to existing financial systems is performed, and the business units continue to run all their existing systems with their new ABC/M models. They continue to function as before. Moreover, it could be that the earlier adopters of ABC/M are in declining product markets. In fact, ABC/M adopters must recognize that a comprehensive ABC/M model is not an end in its own right. No business unit ever made more money merely because it had a more accurate costing system (Cooper et al., 1992).

Most the UK case studies have focused on identifying the adopters' problems and causes of ABC failure. For instance, Cobb et al. (1992) point out that the major problems experienced

with ABC relate to lack of time and resources (accountants, computer staff, and managers), the difficulty in selecting appropriate cost drivers, and the problem of overcoming resistance to change. In Friedman and Lyne's (1995) study, significant resistance was only found in the companies who failed to implement ABC. Friedman and Lyne (1999) also indicate some features that cause ABC failure. These features included technical problems, such as difficulty in obtaining data from other systems, and the problems of reliable activity analysis in rapidly changing organisations.

10.4.4 Sample size

As indicated in Chapter 7 (section 7.4.4), 112 completed questionnaires were used in the analysis. 72 business units had not considered the adoption of ABC systems and 40 business units adopted different levels of ABC systems. Therefore, the analysis involves only a relatively small proportion of all manufacturing business units in the UK. Consequently, the small sample size needs to be taken in account.

It may not have been obvious up until this point that SEM is very much a large sample multivariate technique (Kelloway, 1998). Nevertheless, the sample size (112 business units) is regarded as an adequate, but not generous, size for a stable SEM analysis. Clearly a greater number of responses would provide more confidence in the outcomes of the analysis.

10.4.5 Business unit performance

As indicated in Chapter 7 (section 7.3.5), financial and non-financial performance has been measured, based upon three seminal papers by Govendarajan (1984), Abernethy and Lillis (1995) and Van der Stede (2000). An important issue to be addressed is the delineation of the domain of the performance concept. In other words, the question is whether the treatment of business unit performance should be differentiated from the overall discussion on organisational effectiveness. The view taken in this research is that business unit performance is a sub-set of the overall concept of organisational effectiveness.

However, other measures, representing other important dimensions of performance, are added to it and a battery of performance indicators is thus constructed, such as: (1) the performance of the same business unit in previous time periods and (2) estimates of expected performance, made in advance. Moreover, the development of business unit performance measures involves the following major issues (Otley, 1987, pp. 51-52):

- Organisational purposes are complex and cannot easily be reduced to a single, integrated measure of overall performance.
- Some objectives are interdependent and require cooperation between sub-units; a performance measure for a sub-unit alone is bound to be inadequate.
- Some aspects of performance cannot be measured quantitatively.
- Some aspects of performance cannot be specified in advance; the evaluation of performance most also involve the exercise of judgment.

10.4.6 The methodological approach

As mentioned in Chapter 5 (section 5.3), this research leans towards the contingency/functionalist (positivistic) paradigm. Such a methodological approach involves an abstract theoretical model, which can be used to generate hypotheses for empirical testing. The testing of such hypotheses provides empirical evidence about the hypothesised relationships, but it does not confirm the underlying model. In other words, the model is merely an instrument for generating hypotheses; it does not explain "individual behaviour" (e.g., the resistance to ABC/M); rather it can predict certain phenomena at some level of generality (Ryan et al., 1992).

Moreover, it is assumed that a knowledge of generalizable relationships will enable managers to design accounting systems which are compatible with the characteristics of their organisations. However, such a methodological approach is subject to the limitations of positive theory, which can only predict general trends, but it cannot explain the processes through which accounting systems evolve in particular organisations. The methodology relies on statistically significant relationships and does not exclude the possibility of exceptions. This creates a real problem for the accounting systems designer – should his/her system be one of the exceptions. Answer such questions requires much more knowledge about how accounting systems evolve (Ryan et al., 1992). Scapens et al. (1984) recommended more qualitative and interpretative research, and especially case studies.

10.5 Summary and Conclusion

This chapter provided more detailed discussion of the empirical findings of the study in the light of the previous research. Such discussion includes the empirical findings of both the preliminary and SEM statistical analysis. Furthermore, it provides other explanations and a critique of the phenomenon of apparent ABC/M failure to improve performance.

Finally, it can be concluded that the apparent failure of ABC/M to improve business unit performance may not be a result of incorrect theory or technique. Rather, the failure may be the result of structural barriers to change. Barriers both inside (organisational) and outside (market) a business unit could frustrate and prevent effective managerial action (Roberts and Silvester, 1996).

Chapter 11: Conclusions and Contributions

11.1 Introduction

This chapter provides final conclusions and contributions of the research. The principal research question is re-addressed. Then, the chapter discusses the theoretical and methodological contributions. Moreover, it attempts to provide avenues for further contingency-based research. The final section of the chapter contains closing remarks.

11.2 Principal Research Question

The concept of strategy and its relationship to management accounting has rapidly gained ground in recent years. Porter (1980, 1985) pointed out that every organisation competing in an industry has a competitive strategy. He argued that, to compete effectively, organisations must derive competitive advantage in one of two ways: product differentiation, to provide customer satisfaction from factors such as superior quality, product flexibility, delivery and product design, or low cost production, which allows organisations to compete by offering products at a lower price than competitors.

Currently the business environment is characterised by intense global competition, with organisations competing not only on the basis of price but also on quality, product flexibility, and response time. These competitive circumstances have increasingly led organisations to focus on the manufacturing function as being of strategic importance, providing an important source of competitive advantage. For many organisations, this has led to the adoption of AMT (Kalagnanam and Lindsay, 1998). AMT has dramatically changed manufacturing cost-behaviour patterns. The direct labour and inventory components of product cost are decreasing, while depreciation, engineering, and data-processing costs are increasing. These changes have resulted in higher overhead rates and a shrinking base of labour over which to allocate those costs (Berliner and Brimson, 1988, p. 1).

Moreover, organisations need up-to-date information formatted to assist them in making the right decisions. Therefore, costing systems should provide the cost information necessary for both informed operational and strategic decisions about resources acquisition and use (Berliner and Brimson, 1988, p. 1). Most organisations know about these issues; however,

what they do not know is which costing systems would be successful in an automated manufacturing environment.

Organisations have always had to face the problem of choosing an appropriate cost-allocation system. However, changing cost-behaviour patterns demands that organisations re-evaluate their allocation decisions continually (Berliner and Brimson, 1988, p. 26). Many organisations continue to allocate overhead costs to products using volume-related allocation bases such as direct labour hours or machine hours, despite the fact that these costs are not related to physical production volume. Consequently, significant distortion could result when applying these bases. It has been argued that traditional costing systems provide distorted product costs. As a result, ABC has been developed as a remedial solution in order to eliminate the distortions of overhead costs allocation.

There is evidence that ABC has been adopted by many business units; however, many of them are not having much success. The main reason for this is that the adoption of ABC in many business units has focused on the design of the system itself, without sufficient attention being given to the organisational factors involved (e.g., Shields, 1995). Therefore, contingency-based research is introduced as a recent development in the ABC literature.

According to systems theory, an organisation is a system that consists of a number of cooperative sub-systems, which not only interact with one another but also are heavily dependent upon one another (Barnard, 1951). Contingency theory arose directly out of systems theory (Gannon, 1979). It developed from a view of organisations as open systems (Child, 1987). It is consequently a situational theory of organisational behaviour (Gannon, 1979).

Contingency theory suggests that there is no ideal form of MCS design. Rather, particular circumstances, or contingencies, dictate the best choice of MCS in each particular circumstance (Reid and Smith, 2000). Thus, identification of contextual variables potentially implicated in the design of effective MCS can be traced to the original structural contingency frameworks developed within organisational theory. Early accounting researchers drew on this work to investigate the importance of environment, technology, structure and size to the design of MCS. Contingency-based studies have examined MCS as both dependent and independent variables (Chenhall, 2003).

However, explicit consideration of organisational performance is a vital part of a true contingency theory of MCS design. As regards the fit between MCS and context, good fit means enhanced performance, while poor fit implies diminished performance. Since the ultimate goal of MCS research is to provide findings that help organisations to achieve their goals, it continues to include the dimensions of MCS, their use and usefulness, as the outcomes variable (Chenhall, 2003; Otley, 1980).

Many recent studies have focused on contemporary aspects of the environment, technologies, and structural arrangements. They draw on original organisational theories to develop arguments that help explain how the effectiveness of MCS depends upon the nature of contemporary settings. Thus, recent contingency-based studies have considered the relevance of additional contextual variables to the design of MCS. Perhaps the most important new stream of literature has been related to the role of competitive strategy. This has been assimilated within the traditional organisational model in ways that suggest important links between competitive strategy, the environment, technology, organisational structure, and MCS (Chenhall, 2003). Recently, contingency-based research has focused on a variety of contemporary aspects of MCS. These include examples of contemporary innovations in MCS such as ABC systems (Gosselin, 1997; Chenhall and Langfield-Smith, 1998b; Frey and Gordon, 1999).

In the light of the above, contingency-based research in the ABC literature attempts to investigate the possible integrations between ABC systems and other contingent factors. Consequently, this research has empirically examined the contingency relationship between competitive strategy, ABC systems, AMT, management accounting practices, and business unit performance. From a contingency theory point of view, such a contingency relationship is important because of the interdependence existing between MCS design and the organisation competitive strategy and technology (Otley, 1980).

When conducting empirical research, the researcher must determine whether prior expectations should dictate the design of investigation procedures. Should the study use hypotheses based on conceptual reasoning or should the hypotheses be deduced from the empirical findings? The choice for this study was to specify hypotheses prior to gathering the empirical data. Based on an extensive review of the management accounting literature, the hypotheses were specified for the study factors. These hypotheses determined the direction,

scope, and structure of the questionnaire. Findings derived from the empirical data were evaluated to determine whether the hypotheses were or were not supported.

In sum, the empirical data were analysed within the framework of the research hypotheses and the research question:

> How does the fit between ABC systems, competitive strategy, AMT, and management accounting practices affect the performance of the UK's manufacturing business units?

11.3 Theoretical and Methodological Contributions

The purpose of this study was to examine not only the contingent relationship between ABC systems and the variables of interest, but also to develop a new and complex contingency model of ABC to explain how and why this relationship exists. Therefore, the study contributes theoretically and methodologically to the management accounting literature in several ways.

11.3.1 The Contingency Approach to ABC Research

In recent years, despite the importance of understanding the organisational conditions that give rise to the design and use of ABC systems, this is the first contingency-based research, to the best of the researcher's knowledge, that has examined the contingency relationships between ABC systems, competitive strategy, AMT, management accounting practices, and business unit performance. The research contingency model pays particular attention to the way in which the variables of interest are conceptualized. This enables the development of a more coherent theoretical model for specifying the nature of the relationships examined.

This study has opened the door to a contingency approach to ABC research in the UK environment. Prior research on the fit between ABC systems and the organisational context has been limited. It was really not known whether a fit between ABC systems and the organisational context results in higher ABC performance, a critical question in contingency theory. Therefore, in this study, fit was conceptualised as a theoretically defined match between ABC systems and other contingent factors. This study tested important contingency design theory hypotheses regarding ABC systems, competitive strategy, AMT, management accounting practices, and business unit performance. In fact, this study is one of the few to have tested the fit between ABC systems and the organisational context.

Most of the previous studies classified their sample as either ABC users or non-ABC users. In contrast to previous studies, this study examines the degree of ABC adoption by classifying the sample business units into four levels: AA, ACA, ABC, and ABCM. The data allow for a more comprehensive assessment of ABC systems adoption and their effect on performance in the UK's manufacturing business units.

There is evidence that the framework of the contingency theory is continuing to expand (Reid and Smith, 2000). For instance, Anderson and Lanen (1999) emphasize both competitive strategy and national culture as having major effects on MCS design. Brignall (1997) used a contingency theory framework to focus on the design of costing systems. The present study concludes that three contingent variables are the main determinants of the adoption level of ABC systems, namely business unit competitive strategy, AMT, and management accounting practices.

Young and Selto (1991) provided a review of contemporary manufacturing practices and some implications for performance measures, arguing a need to consider AMT within organisational context. They indicated that AMT provided many opportunities for contingency-based research. Chenhall (2003) pointed out that manufacturing theories and understanding the appropriate fit between MCS and AMT are assisted by reflecting on the basic, generic notions of technology. Therefore, this study is itself an attempt to contribute to the growing contingency-based research by considering the role of AMT as a dimension of context.

This study provides a rich picture of management accounting practices across the UK's manufacturing business units. Moreover, it attempts to improve our understanding of the contingent factors that influence business units' choice of management accounting practices. To the best of the researcher's knowledge, there have been no empirical studies investigating the relationship between both business units' competitive strategy (cost leadership and differentiation) and AMT and the use of management accounting practices. This study has empirically examined such a relationship by developing a contingency framework for assessing how business unit competitive strategy and AMT influence management accounting practices.

Despite the critique that contingency-based studies should include organisational performance as the dependent variable, some studies still follow the approach of using MCS

as the dependent variable (Chenhall, 2003). However, this study has provided important insights into the extent of adoption and usefulness of ABC systems. It includes business unit performance as the dependent variable in order to prove how a combination of ABC systems and context enable enhancement of business unit performance. In fact, this study contributes to the ABC literature by validating the contingency relationships among the variables of interest and the effects of those variables on business unit performance.

In sum, this study contributes to the knowledge and management accounting literature by providing some explanations on the contingent factors that influence the adoption and success of ABC systems. These include competitive strategy, AMT, and management accounting practices. The study also contributes by providing an analysis of recent UK data. Using the study sample, it has been concluded that it is not necessarily true that business units that have not adopted ABC systems could improve their performance by simply introducing ABC as a stand-alone technique. The empirical findings of the study show that business unit performance would be associated with the patterns of ABC use by the adopters. The study provides evidence that the use of SMA practices is related to the adoption of ABC/M. In addition, the results support the expectation that there is a significant relationship between differentiation strategy and AMT and the use of SMA practices. Therefore, it appears that the effect of differentiation strategy and AMT on the adoption of ABC/M is an indirect one via the use of SMA practices as a mediating variable. These findings have significant implications for designing and implementing ABC systems and other types of management accounting techniques. Moreover, the use of SEM as a statistical technique can be viewed as an important methodological contribution, as will be explained in the next sub-section.

11.3.2 The SEM Statistical Technique

SEM provides a method for assessing the contingency relationship among variables within the context of a substantive theoretical framework. The modeling technique also provides an understanding of the kind of simultaneous structural relationships among variables (Rodgers, 1991). It is an appropriate statistical technique when assessing the relationships among latent constructs that are measured by multiple scale items, where at least one construct is both a dependent and an independent variable (Hair et al., 1995).

Therefore, a key contribution of this study is the use of SEM. To the best of the researcher's knowledge, this is the first contingency-based research to use SEM statistical technique in ABC research in the UK. This provides two statistical advantages compared to the more commonly used techniques in management accounting, such as regression analysis (Hunton and Gibson, 1999; Bains and Langfield-Smith, 2003):

First: it allows for error variances associated with multi-item constructs to be incorporated into the structural (theoretical) model. This provides a means for the inaccuracies associated with the imprecise measurement of multi-item variables to be included specifically.

Second: the mathematical advantage of SEM is that it simultaneously considers a measurement model and a structural equation model, providing overall model fit indices. This recognizes that competitive strategy, ABC systems, AMT and management accounting practices do not impact independently on business unit performance since the study contingency model acknowledges that each of these contingent factors work concurrently to influence other contingent factors.

In the light of the above advantages, the study hypotheses were tested using SEM. The theoretical advantage of using SEM in this study is the keen insight it provides into the impact of competitive strategy, AMT and management accounting practices on the adoption of ABC systems. Moreover, the SEM results obtained from the empirical data provide a clearer picture of the influences of ABC systems, competitive strategy, AMT and management accounting practices on business unit performance.

The AMOS 5.0 software (Arbuckle, 2003) was employed to test the measurement and structural (theoretical) models. The fit indices used in this study were the ratio of Chi-square (χ^2), the Goodness-of-Fit Index (GFI), the Comparative Fit Index (CFI), the Normed Fit Index (NFI), the Normed chi-square (χ^2/df), and the Akaike's Information Criterion (AIC). These fit indices were chosen because of their ability to adjust for model complexity and degree of freedom. Recommended values of these fit indices for satisfactory fit were presented in Chapter 9 (Table 9.1).

SEM may be recommended for future accounting research. It highlights the fact that covariance structural analysis requires a new way of thinking about accounting research methods and that it may have a significant impact on management accounting research. Although the use of SEM in management accounting research is still in an early growth

period, its application may accelerate as researchers become familiar with its language, scope and power (Rodgers, 1991).

11.4 Avenues for Further Research

Given the discussion above, it can be recommended that further empirical research should be conducted to assess the degree of effective organisational functioning under ABC systems to refine and sharpen our insights into the relationship between ABC systems and performance. It is apparent that scholars who engage in contingency-based research should pay attention to several design issues if they wish to reach theoretically sound conclusions. In general terms, while this study provides support for contingency theory, the following possibilities and suggestions provide fruitful avenues for further research:

First: it is important to develop contingency models in ways that ensure coherence in the study of elements of MCS and contextual variables, and in the findings of these studies. Such confidence can be derived from replication studies, which enhance the reliability of previous findings and thereby provide a strong base to move forward by way of new contingency model development (Chenhall, 2003). Therefore, the contingency model of this study can be replicated in different environments. Further research could be directed towards testing the model in different countries. This will enhance our understanding of the contingent variables of interest in a more global setting.

Second: the link between enhanced organisational performance and usefulness of the contemporary aspects of MCS may well depend upon the appropriateness of the use of MCS in the context of organisations (Chenhall, 2003). However, there is very little contingency-based research on contemporary aspects of MCS, such as target costing, balance scorecards, life cycle costing, and economic value analysis (EVA). Thus, it is not surprising that this research sought to gain clarification by modifying its contingency model towards the contemporary aspects of MCS.

Third: an interesting question is whether the adoption levels of ABC systems in business units are influenced only by business strategy or also by the corporate strategy of the (holding) company. In other words, do the adoption levels of ABC systems in two comparable business units pursuing the same strategy differ because the holding company is pursuing a different corporate strategy? Moreover, the role of ABC systems in manufacturing business units facing strategic change is a new contingency angle. Therefore, new insights can be achieved by investigating the change from cost leadership to differentiation competitive orientations and vice versa.

Fourth: there have been a considerable number of contingency studies in manufacturing organisations. There is a need for more contingency-based research into service and non-for-profit organisations, as these entities are becoming increasingly important within both developed and developing countries. In addition, the role of MCS contingency theory in smaller and medium sized business units has received little attention (Reid and Smith, 2000). Thus, the contingency model in this study can be applied in the area of small and medium sized business units.

Fifth: this study has measured business unit performance over the last three years. However, it seems that the 3-year time frame is not sufficient to evaluate the consequences of adopting ABC/M. Therefore, the focus of further research could cover a more substantial period (e.g., ten years). Moreover, the evaluation of performance could also involve other measures, such as: (1) the performance of the same business unit in previous time periods and (2) estimates of expected performance, made in advance.

11.5 Closing Remarks

In closing this study I shall state what at the present time seem to me to be the more important general conclusion which may be drawn from it. The conclusion to which I would especially invite attention is the following: the use of ABC systems is spreading on an international level. Nevertheless, the empirical evidence to date regarding the net benefit of ABC systems has been mixed. This research shows that the adoption and benefits derived from ABC systems depend upon three organisational dimensions: (1) competitive strategy, (2) AMT, and (3) management accounting practices.

Therefore, it can be concluded that it is the organisational context that drives ABC adoption and success and not only the functional benefits, as advocated in the management accounting literature. This contingency (situational) point of view could result in fruitful development of knowledge, both in terms of theory construction and practical concerns.

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Appendix A

Business Unit Competitive Strategy:

Please circle the number which most closely represents your true belief about your business unit's competitive strategy.

	Strongly Disagree						Strongly Agree
1. One of our most important objectives is to be the lowest cost producer in our industry.	1	2	3	4	5	6	7
2. We place considerable emphasis on reaping cost advantages from all sources.	1	2	3	4	5	6	7
3. We seek to maintain brand identification rather than compete mainly on price.	1	2	3	4	5	6	7
4. We seek to be unique in our industry, and find that buyers are willing to pay a premium price for that uniqueness.	1	2	3	4	5	6	7
5. We invest in technology to:							
a. Develop low-cost products.	1	2	3	4	5	6	7
b. Develop unique products.	1	2	3	4	5	6	7
6. We choose to specialize in a particular:							
a. Buyer group.	1	2	3	4	5	6	7
b. Market segment.	1	2	3	4	5	6	7
c. Geographical area.	1	2	3	4	5	6	7

Management Accounting Practices:

7. For each statement below please circle the number which most closely represents your true belief about your business unit's cost control or cost management emphases.

	Extremely Low						Extremely High
a. Role of standard product costs in assessing performance.	1	2	3	4	5	6	7
b. Importance of such concepts as flexible budgeting for manufacturing cost control.	1	2	3	4	5	6	7
c. Perceived importance of meeting budgets.	1	2	3	4	5	6	7

d. Importance of marketing cost analysis. 1 2 3 4 5 6 7

e. Importance of product cost as an input to pricing decisions. 1 2 3 4 5 6 7

f. Importance of competitor cost analysis. 1 2 3 4 5 6 7

8. To what extent does your business unit use the following practices? (Please see attached glossary of terms for definitions)

	Not Used At All						**Extensively Used**
a. Competitive position monitoring.	1	2	3	4	5	6	7
b. Customer profitability analysis.	1	2	3	4	5	6	7
c. Life cycle costing.	1	2	3	4	5	6	7
d. Quality costing.	1	2	3	4	5	6	7
e. Strategic costing.	1	2	3	4	5	6	7
f. Strategic pricing.	1	2	3	4	5	6	7
g. Target costing.	1	2	3	4	5	6	7
h. Value chain analysis.	1	2	3	4	5	6	7
i. Activity-based costing (ABC).	1	2	3	4	5	6	7

Business Unit Cost Structure:

9. What percent of your manufacturing costs came from the following sources in the last financial year for which you have data available? (Please note that your total should be 100%)

Purchased components or raw materials	_____
Direct labour	_____
Overhead	_____
Total	100%

10. For cost accounting purposes, approximately what percentage of your overhead did you allocate to products using each of the following bases in the last financial year for which you have data available? For example, if you allocate half of your total overhead based on direct labour hours and the other half based on machine hours, enter "50" on both of those lines below. Your total should be 100%.

Volume Drivers:

- Direct labour hours _____
- Machine hours _____
- Material amount _____
- Other (please describe briefly) _____ _____

Activity-Based Costing (ABC) Drivers:

- Machine set-up _____
- Material handling _____
- Stock related _____
- Quality related _____
- Administration and management related _____
- Other (please describe briefly) _____ _____

  Total 100%

11. Has your business unit adopted activity management by undertaking an analysis of the activities carried out to convert material, labour, and other resources into outputs?

    Yes No (circle one)

12. Has your business unit identified the cost drivers for each activity?

    Yes No (circle one)

13. Has your business unit adopted a full ABC system to cost its products?

    Yes No (circle one)

14. If ABC system has not been applied in your business unit, please indicate why? (Tick appropriate box)

- Current cost system gives satisfaction. ❑
- 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. ❑
- ABC system implementation costs too much. ❑
- Other (please specify) _____ ❑

  _____

If you do not use ABC system, please skip to question 17.

15. When did you begin to use ABC?

Month/Year _____ / _____

16. Has your business unit used ABC system for any of the following purposes? (Tick appropriate box)

- Assist process management. ❑
- Assist strategic cost analysis (such as product rationalisation). ❑
- Assist value chain analysis. ❑
- Assist quality management. ❑
- Assist just-in-time management. ❑
- Undertake customer profitability analysis. ❑
- Other (please specify) _____ ❑

_____

Advanced Manufacturing Technology (AMT):

17. How would you describe your manufacturing process? (Tick one)

a. Job shop. ❑

b. Traditional batch production. ❑

c. Continuous batch flow (e.g., MRP, MPP). ❑

d. Just-in-time. ❑

18. How complex are your production processes? (Tick one)

a. Not at all. ❑

b. Slightly. ❑

c. Significantly. ❑

d. Extremely. ❑

19. How complex are your products? (Tick one)

a. Not at all. ❑

b. Slightly. ❑

c. Significantly. ❑

d. Extremely. ❑

20. Please indicate the extent to which each of the following technologies is currently used in your business unit.

	Not Used At All						**Extensively Used**
a. Computer-aided design (CAD).	1	2	3	4	5	6	7
b. Computer-aided manufacturing (CAM).	1	2	3	4	5	6	7
c. Numerically controlled machines.	1	2	3	4	5	6	7
d. Robots.	1	2	3	4	5	6	7
e. Automated materials handling systems.	1	2	3	4	5	6	7
f. Flexible manufacturing systems (FMS).	1	2	3	4	5	6	7

Business Unit Performance:

21. Please rate the overall performance of your business unit relative to the industry average.

Well Below Average 1 2 3 4 5 6 7 Well Above Average

22. Which of the following terms best describes your business unit's economic performance in the last financial year for which you have data available? (Tick one)

a. Losing money. ❑

b. About break-even. ❑

c. Profitable, but less so than most of my direct competitors. ❑

d. Profitable, about the same as my direct competitors. ❑

e. More profitable than most of my direct competitors. ❑

23. For each measure below please rate your business unit's performance relative to competitors over the last three years.

	Unsatisfactory						**Outstanding**
a. Return on investment (ROI).	1	2	3	4	5	6	7
b. Sales growth rate.	1	2	3	4	5	6	7
c. New products development.	1	2	3	4	5	6	7

d. On time delivery performance record. 1 2 3 4 5 6 7

e. Number of customer complaints. 1 2 3 4 5 6 7

f. Incidences of products defects. 1 2 3 4 5 6 7

Respondent Information:

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

- Your age _____ years

- Your job title _____

- Number of years you have been:

  - In this job _____

  - In this business unit _____

- Your highest degree or qualification _____

Thank you for your kind participation in this survey.

Please return this questionnaire in the enclosed freepost self-addressed envelope.

<u>The return address is:</u>

Abdel Halim, Amr Mohamed Said (Research Student)
School of Management, Building 2
University of Southampton
FREEPOST
SO286
Southampton
Hampshire SO17 1YN

Telephone: 02380593557
E-mail: amr_saeid@hotmail.com

No.

Appendix 1: Glossary of the Questionnaire Terms

- **Competitive Position Monitoring:** the analysis of competitor's positions within the industry by assessing and monitoring trends in competitor sales, market share, volume, unit cost, and return on sales (ROS). This information can provide a basis for the assessment of competitor's market strategy.

- **Customer Profitability Analysis:** involves calculating profit earned from a specific customer. The profit calculation is based on costs and sales that can be traced to a particular customer.

- **Life Cycle Costing:** the appraisal of costs based on the length of stages of a product or service's life. These stages may include design, introduction, growth, decline, and eventually abandonment.

- **Quality Costing:** quality costs are those costs associated with the creation, identification, repair, and prevention of defects. These can be classified into three categories: prevention, appraisal, and failure costs. Cost of quality reports is produced for the purpose of directing management attention to prioritise quality problems.

- **Strategic Costing:** the use of cost data based on strategic and marketing information to develop and identify superior strategies that will sustain a competitive advantage.

- **Strategic Pricing:** the analysis of strategic factors in the pricing decision process. These factors may include: competitors price reaction, price elasticity, market growth, economies of scale, and experience.

- **Target Costing:** a method used during product and process design that involves estimating a cost calculated by subtracting a desired profit margin from an estimated price to arrive at a desired production, engineering, or marketing cost. The product is then designed to meet that cost.

- **Value Chain Analysis:** by dividing the business unit into different homogeneous activities (designing, manufacturing, selling, etc.) and then assigning costs and revenues to each activity.

- **Activity-Based Costing (ABC):** is implemented to assign indirect costs to individual activity or process (rather than departmental) cost pools, then traces costs to users of the activities (e.g., products) based on the cost driver (cause) of each activity or process.

Appendix B

University of Southampton

School of Management | Division of Accounting and Finance

University of Southampton
Highfield Southampton
SO17 1BJ United Kingdom

Tel +44 (0)23 8059 7677
Fax +44 (0)23 8059 3844

January 7th, 2003

Dear Sir/Madam,

I am writing to you in connection with my PhD research into the relationship between activity-based costing (ABC), competitive strategy, advanced manufacturing technology (AMT), and the performance of the UK's manufacturing business units.

Please could I ask you to take the time to complete the enclosed questionnaire, so that this research can add to the increasing need for the development of ABC systems that meet the needs of the UK's manufacturing business units.

The questionnaire has been developed under the supervision of Professor Andrew Goddard at the University of Southampton. The final analysis of the research could provide tangible benefits to the UK's manufacturing business units. However, in order to achieve that objective I need to ensure the enclosed questionnaire is completed and returned.

I sincerely hope that you can spare the time and look forward to receiving the completed questionnaire. Naturally, all data will be kept entirely confidential to this research and specific references to individuals or business units will not be made.

If you have more than one manufacturing business unit please forward the questionnaire to any one of them. The business unit's **Management Accountant** should complete this questionnaire. It would be very helpful to have your completed questionnaire returned to me as soon as possible. If you have any questions or concerns, please feel free to contact me on **02380593557**. Alternatively, you can e-mail me at **amr_saeid@hotmail.com**

Thank you in advance for your kind cooperation.

Yours sincerely,

Abdel Halim, Amr Mohamed Said

Abdel Halim, Amr Mohamed Said
Research Student

Appendix C

University of Southampton

School of Management | Division of Accounting and Finance

University of Southampton
Highfield Southampton
SO17 1BJ United Kingdom

Tel +44 (0)23 8059 7677
Fax +44 (0)23 8059 3844

February 25th, 2003

Dear Sir/Madam,

I am writing to you in connection with my PhD research into the relationship between activity-based costing (ABC), competitive strategy, advanced manufacturing technology (AMT), and the performance of the UK's manufacturing business units.

In January this year, you should have received a questionnaire and a letter from myself asking for your assistance in relation to my research. Whilst I do appreciate this is a very busy time for you, could I please ask again that you take some time to complete the enclosed questionnaire.

I have had some responses from the UK's manufacturing business units so far, but would appreciate more. Therefore, I would seek about 15 minutes of your time to help to make a difference.

I sincerely hope that you can spare the time and look forward to receiving the completed questionnaire. Naturally, all data will be kept entirely confidential to this research and specific references to individuals or business units will not be made.

If you have more than one manufacturing business unit please forward the questionnaire to any one of them. The business unit's **Management Accountant** should complete this questionnaire. It would be very helpful to have your completed questionnaire returned to me as soon as possible. If you have any questions or concerns, please feel free to contact me on **02380593557**. Alternatively, you can e-mail me at **amr_saeid@hotmail.com**

I look forward to hearing from you in the near future.

Thank you in advance for your kind cooperation.

Yours sincerely,

Abdel Halim, Amr Mohamed Said

Abdel Halim, Amr Mohamed Said
Research Student

Appendix D

Table 1: Descriptive statistics for differentiation strategy

Variable	Min.	Max.	Mean	Median	S.D.
Q.3 (maintain brand identification)	1.00	7.00	4.80	5.00	1.63
Q.4 (seek to be unique in industry)	1.00	7.00	4.59	5.00	1.67
Q.5.b (invest in technology)	1.00	7.00	5.03	5.00	1.52

Table 2: Correlation matrix for differentiation strategy

	Q.3	Q.4	Q.5.b
Q.3 (maintain brand identification)	1.000	0.466**	0.331**
Q.4 (seek to be unique in industry)	0.466**	1.000	0.606**
Q.5.b (invest in technology)	0.331**	0.606**	1.000

**Significant at $p < 0.01$

Table 3: Descriptive statistics for SMA practices

Variable	Min.	Max.	Mean	Median	S.D.
Q. 7.d (importance of marketing cost)	1.00	7.00	4.00	4.00	1.34
Q.7.f (importance of competitor cost)	1.00	7.00	4.25	4.00	1.32
Q.8.a (competitive position monitoring)	1.00	7.00	3.69	4.00	1.63
Q.8.b (customer profitability analysis)	1.00	7.00	4.59	5.00	1.59
Q.8.c (life cycle costing)	1.00	7.00	2.77	3.00	1.44
Q.8.d (quality costing)	1.00	7.00	3.81	4.00	1.66
Q.8.e (strategic costing)	1.00	7.00	3.57	4.00	1.64
Q.8.f (strategic pricing)	1.00	7.00	4.39	5.00	1.54
Q.8.g (target costing)	1.00	7.00	3.73	4.00	1.69
Q.8.h (value chain analysis)	1.00	7.00	3.14	3.00	1.78
Q.8.i (activity-based costing)	1.00	7.00	2.40	2.00	1.71

Table 4: Correlation matrix for SMA practices

	Q.7.d	Q.7.f	Q.8.a	Q.8.b	Q.8.c	Q.8.d	Q.8.e	Q.8.f	Q.8.g	Q.8.h	Q.8.i
Q. 7.d (importance of marketing cost)	1.000	0.119	0.201*	0.267**	0.222*	0.242*	0.235*	0.028	0.192*	0.205*	0.053
Q.7.f (importance of competitor cost)	0.119	1.000	0.206*	0.118	0.208*	0.258**	0.349**	0.297**	0.190*	0.228*	0.205*
Q.8.a (competitive position monitoring)	0.201*	0.206*	1.000	0.168	0.292**	0.126	0.203*	0.253**	0.195*	0.337**	0.096
Q.8.b (customer profitability analysis)	0.267**	0.118	0.168	1.000	0.104	0.077	-0.019	0.129	0.086	0.118	0.004
Q.8.c (life cycle costing)	0.222*	0.208*	0.292**	0.104	1.000	0.346**	0.515**	0.282**	0.410**	0.419**	0.270**
Q.8.d (quality costing)	0.242*	0.258**	0.126	0.077	0.346**	1.000	0.474**	0.259**	0.166	0.196*	0.313**
Q.8.e (strategic costing)	0.235*	0.349**	0.203*	-0.019	0.515**	0.474**	1.000	0.532**	0.344**	0.327**	0.405**
Q.8.f (strategic pricing)	0.028	0.297**	0.253**	0.129	0.282**	0.259**	0.532**	1.000	0.346**	0.313**	0.147
Q.8.g (target costing)	0.192*	0.190*	0.195*	0.086	0.410**	0.166	0.344**	0.346**	1.000	0.308**	0.217*
Q.8.h (value chain analysis)	0.205*	0.228*	0.337**	0.118	0.419**	0.196*	0.327**	0.313**	0.308**	1.000	0.275**
Q.8.i (activity-based costing)	0.053	0.205*	0.096	0.004	0.270**	0.313**	0.405**	0.147	0.217*	0.275**	1.000

**Significant at $p < 0.01$
*Significant at $p < 0.05$

Table 5: Descriptive statistics for ABC/M

Variable	Min.	Max.	Mean	Median	S.D.
Q.13 (business unit adopted ABC)	0.00	1.00	0.12	0.00	0.29
Q.16.a (ABC for process management)	0.00	1.00	0.05	0.00	0.23
Q.16.b (ABC for strategic analysis)	0.00	1.00	0.07	0.00	0.26
Q.16.c (ABC for value chain)	0.00	1.00	0.03	0.00	0.16
Q.16.d (ABC for quality management)	0.00	1.00	0.05	0.00	0.20
Q.16.e (ABC for just-in-time)	0.00	1.00	0.03	0.00	0.16
Q.16.f (ABC for customer analysis)	0.00	1.00	0.04	0.00	0.19
Q.16.g (ABC for other purposes)	0.00	1.00	0.01	0.00	0.10

Table 6: Correlation matrix for ABC/M

	Q.13	Q.16.a	Q.16.b	Q.16.c	Q.16.d	Q.16.e	Q.16.f	Q.16.g
Q.13 (business unit adopted a full ABC)	1.000	0.593**	0.692**	0.414**	0.539**	0.414**	0.480**	0.237*
Q.16.a (ABC for process management)	0.593**	1.000	0.704**	0.697**	0.717**	0.697**	0.595**	-0.023
Q.16.b (ABC for strategic cost analysis)	0.692**	0.704**	1.000	0.383**	0.612**	0.383**	0.694**	0.342**
Q.16.c (ABC for value chain analysis)	0.414**	0.697**	0.383**	1.000	0.500**	0.657**	0.564**	-0.016
Q.16.d (ABC for quality management)	0.539**	0.717**	0.612**	0.500**	1.000	0.767**	0.424**	-0.021
Q.16.e (ABC for just-in-time management)	0.414**	0.697**	0.383**	0.657**	0.767**	1.000	0.564**	-0.016
Q.16.f (ABC for customer profitability analysis)	0.480**	0.595**	0.694**	0.564**	0.424**	0.564**	1.000	-0.018
Q.16.g (ABC for other purposes)	0.237*	-0.023	0.342**	-0.016	-0.021	-0.016	-0.018	1.000

**Significant at $p < 0.01$
*Significant at $p < 0.05$

Table 7: Descriptive statistics for AA/ACA

Variable	Min.	Max.	Mean	Median	S.D.
Q.11 (business unit adopted activity analysis)	0.00	1.00	0.19	0.00	0.39
Q.12 (business unit identified the cost driver for each activity)	0.00	1.00	0.18	0.00	0.39

Table 8: Correlation matrix for AA/ACA

	Q.11	Q.12
Q.11 (business unit adopted activity analysis)	1.000	0.972**
Q.12 (business unit identified the cost driver for each activity)	0.972**	1.000

**Significant at $p < 0.01$

Table 9: Descriptive statistics for AMT

Variable	Min.	Max.	Mean	Median	S.D.
Q.20.a (computer-aided design)	1.00	7.00	4.42	5.00	2.25
Q.20.b (computer-aided manufacturing)	1.00	7.00	3.49	3.00	2.18
Q.20.c (numerically machines)	1.00	7.00	3.82	4.00	1.90
Q.20.d (robots)	1.00	7.00	2.15	1.00	1.74
Q.20.e (automated handling systems)	1.00	7.00	3.30	3.00	1.90
Q.20.e (flexible manufacturing systems)	1.00	7.00	2.86	2.50	1.80

Table 10: Correlation matrix for AMT

	Q.20.a	Q.20.b	Q.20.c	Q.20.d	Q.20.e	Q.20.f
Q.20.a (computer-aided design)	1.000	0.485**	0.196*	0.071	-0.110	0.177
Q.20.b (computer-aided manufacturing)	0.485**	1.000	0.292**	0.175	0.171	0.273**
Q.20.c (numerically machines)	0.196*	0.292**	1.000	0.292**	0.348**	0.252**
Q.20.d (robots)	0.071	0.175	0.292**	1.000	0.376**	0.154
Q.20.e (automated materials handling systems)	-0.110	0.171	0.348**	0.376**	1.000	0.405**
Q.20.e (flexible manufacturing systems)	0.177	0.273**	0.252**	0.154	0.405**	1.000

**Significant at $p < 0.01$
*Significant at $p < 0.05$

Table 11: Descriptive statistics for performance

Variable	Min.	Max.	Mean	Median	S.D.
Q.21 (overall performance)	2.00	7.00	4.96	5.00	1.09
Q.22 (economic performance)	1.00	5.00	3.80	4.00	1.29
Q.23a (return on investment)	1.00	7.00	4.21	4.00	1.15
Q.23.b (sales growth rate)	1.00	7.00	4.32	4.00	1.25
Q.23.c (new products development)	2.00	7.00	4.44	4.00	1.06
Q.23.d (on time delivery)	2.00	7.00	4.83	5.00	1.19
Q.23.e (number of customer complaints)	2.00	7.00	4.53	4.00	1.12
Q.23.f (incidences of products defects)	1.00	7.00	4.45	4.50	1.31

Table 12: Correlation matrix for performance

	Q.21	Q.22	Q.23.a	Q.23.b	Q.23.c	Q.23.d	Q.23.e	Q.23.f
Q.21 (overall performance)	1.000	0.591**	0.455**	0.278**	0.119	0.237*	0.158	0.155
Q.22 (economic performance)	0.591**	1.000	0.597**	0.468**	0.200*	0.214*	0.175	0.250**
Q.23a (return on investment)	0.455**	0.597**	1.000	0.549**	0.274**	0.050	0.060	0.122
Q.23.b (sales growth rate)	0.278**	0.468**	0.549**	1.000	0.235*	0.141	0.179	0.197*
Q.23.c (new products development)	0.119	0.200*	0.274**	0.235*	1.000	0.161	0.054	0.106
Q.23.d (on time delivery performance record)	0.237*	0.214*	0.050	0.141	0.161	1.000	0.421**	0.343**
Q.23.e (number of customer complaints)	0.158	0.175	0.060	0.179	0.054	0.421**	1.000	0.710**
Q.23.f (incidences of products defects)	0.155	0.250**	0.122	0.197*	0.106	0.343**	0.710**	1.000

**Significant at $p < 0.01$
*Significant at $p < 0.05$